

Original Research Article

A second chance: analyzing trends and outcomes for reapplicants in orthopaedic surgery

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ABSTRACT

Background: The increasing number of applicants for orthopaedic surgery residency programs, paired with a static number of available positions, has resulted in many candidates being unmatched. This study explored trends and factors associated with successful reapplication outcomes for unmatched orthopaedic surgery applicants.

Methods: This mixed-methods study was conducted between June 2024 and January 2025. Inclusion criteria for qualitative data were unmatched orthopaedic surgery applicants who subsequently matched and participated in interviews. Exclusion criteria included those who did not reapply or did not complete the interview process. Data were obtained from the Orthopaedic Residency Information Network (ORIN) and included demographics of current residents, attending faculty, and residency program characteristics. Gender of program leaders was verified through LinkedIn and program websites. Spearman correlation and ANOVA were used for analysis, with significant variables further examined through multiple regression. Qualitative insights were collected through interviews with previously unmatched applicants who matched on subsequent attempts.

Results: Analysis revealed no statistically significant associations between traditional metrics (e.g., USMLE scores, demographics) and matching outcomes ($p > 0.05$). Qualitative data highlighted that engagement in research and clinical experiences, as well as meaningful mentorship, significantly impacted reapplication success.

Conclusions: Despite the lack of significant predictors from traditional metrics, proactive measures taken during the year off were crucial for unmatched applicants. Candidates should focus on strategic activities to enhance their competitiveness in future applications.

Keywords: Career development, Orthopaedic surgery, Research experience, Residency reapplication, Unmatched applicants

INTRODUCTION

The field of orthopaedic surgery has long been recognized as one of the most competitive specialties in medicine, with a significant proportion of applicants failing to secure residency positions each application cycle.¹ Recent data indicate that approximately one in five applicants remains unmatched, a trend exacerbated by a steady increase in applicants juxtaposed against a static number of available

residency spots.² The National Resident Matching Program (NRMP) reported a match rate of only 79.1% for U.S. senior medical students applying to orthopaedic surgery, leaving a considerable number of qualified candidates without placement.^{3,4} This landscape necessitates a thorough examination of the factors influencing successful reapplication outcomes for unmatched orthopaedic surgery applicants.

Despite the wealth of information available regarding successful applicants, there is a notable gap in the literature specifically addressing the experiences and strategies of reapplicants.⁵⁻⁷ Research has shown that unmatched candidates often engage in various activities during their year off, such as pursuing research projects, gaining additional clinical experience, and expanding their professional networks.^{2,8} However, the impact of these proactive measures on reapplication success has not been comprehensively explored. Recent studies suggest that while traditional metrics such as United States Medical Licensing Exam (USMLE) scores and demographics are important, they do not fully capture the complexity of the reapplication process.^{7,8}

This study aimed to analyze trends and factors associated with successful matching outcomes for orthopaedic surgery reapplicants by leveraging data from the Orthopaedic Residency Information Network (ORIN).⁹ We hypothesized that while traditional metrics may not yield statistically significant results, the proactive efforts made by unmatched applicants during their interim year, such as engaging in research, clinical experiences, and mentorship, would significantly influence their chances of matching in subsequent application cycles. By identifying effective strategies for reapplication, we aim to provide valuable insights that can help ensure that talented individuals are not lost to other specialties, thereby maintaining a skilled and diverse workforce in the field of orthopaedics.

METHODS

This observational study utilized a mixed-methods approach, combining quantitative data analysis with qualitative insights from reapplicants.

Study period and setting

This study was conducted between June 2024 and January 2025 at the University of Kentucky College of Medicine - Bowling Green campus and the University of Kentucky Department of Orthopaedic Surgery and Sports Medicine.

Inclusion and exclusion criteria

Inclusion criteria consisted of previously unmatched orthopaedic surgery applicants who successfully matched in a subsequent cycle and consented to be interviewed. The exclusion criteria included applicants who did not reapply, did not participate in interviews, or had incomplete data.

Quantitative approach

The quantitative data for this study were obtained from multiple publicly available databases, primarily the ORIN database.⁹ The database consisted of 161 programs at the time the data were collected; however, not all programs had all variables completed. The following variables were collected: 1) Current Residents' Demographics:

Information on the demographics of residents including age, gender, Alpha Omega Alpha (AOA) status, and research productivity; 2) Program Characteristics: Top 25 rank lists, attending demographics, region, average USMLE Step 2 CK score, trauma designation, number of unmatched applicants, and MD vs. DO affiliation. Each program was categorized into a location type based on population; 3) Leadership Demographics: Gender of program chairpersons and directors was confirmed via LinkedIn or program websites, ensuring a comprehensive understanding of leadership diversity. The ACGME Accreditation Data System verified current residents and updated Program Chairperson and Director names; 4) Ranking Information: Program rankings were sourced from USNews.com, focusing on "Best Hospitals for Orthopaedic Surgery" and "Best Medical Schools in Research."

Qualitative insights

In addition to the quantitative analysis, qualitative data were collected through interviews with previously unmatched applicants who were matched on subsequent attempts. These insights focused on their experiences, strategies employed during the year off, and the perceived factors contributing to their reapplication success.

Data analysis

Spearman's rho correlation was used to assess the relationships between variables, including the number of female attendings, diversity initiatives, applications per year, program size, and average USMLE Step 2 scores. A strong correlation was determined by ρ between 0.7 and 1.0. A moderate correlation is defined as ρ between 0.3 and 0.7. A weaker correlation was defined as ρ between 0 and 0.3.¹⁰ ANOVA was applied for regional analysis, while multiple regression analysis was conducted on significant variables using the Stepwise Forward Wald method to determine their predictive power regarding matching outcomes. Our data were non-parametric in nature. For all statistical tests, a p -value of less than 0.05 was considered statistically significant with a 95% confidence interval.

RESULTS

Programs that included the percentage of unmatched applicants in their respective programs on ORIN were included in the analysis. Table 1 presents the average characteristics of current orthopaedic residents based on the 161 programs that provided information to the ORIN database. Table 2 presents the average characteristics of all orthopaedic surgery residency programs, as compiled from the ORIN data. Spearman's rho correlation demonstrated no statistically significant associations between traditional metrics (e.g., demographics, USMLE scores) and matching outcomes ($p > 0.05$) (Table 3). All associations were weak. Multivariate analysis was attempted using the Stepwise Forward Wald method, but no significance was reached. A comparison of research engagement between

matched and unmatched applicants does not seem to differ greatly from year to year (Table 4).

Table 1: Average characteristics of current orthopaedic residents.

Characteristic	Average % (SD)
Female residents	5.3 (4.0)
AOA residents	8.4 (6.9)
Unmatched residents	6.2 (6.8)
D.O. residents	2.7 (5.3)
International residents	0.4 (0.9)

Table 2: Orthopaedic surgery residency program characteristics.

Characteristic	Average (SD)
USMLE Step 2 CK	253 (7)
Applications per year	675 (227)
Total residents	24 (10)
Spots per year	5 (2)
Applicants interviewed	62 (23)
Number of attendings	31 (20)
Number of female attendings	4 (4)
Number of URiM attendings	4 (4)

Table 3: Spearman's Rho correlation analysis of unmatched applicants by program and resident characteristics.

Variable	Spearman's Rho Correlation (ρ)	P value
Rank	0.179	0.105
Trauma designation	0.079	0.382
Spots per year	-0.082	0.364
Total spots	-0.102	0.258
Average applications per year	-0.157	0.086
Rotator interviews	0.049	0.618
Average USMLE Step 2 CK	-0.014	0.904
Ranked female percentage	-0.021	0.848
Ranked AOA percentage	-0.195	0.142
Ranked D.O. percentage	-0.026	0.832
Current female residents	-0.064	0.483
Current AOA residents	-0.005	0.964
Current D.O. residents	0.014	0.881
Current international residents	0.164	0.081
Total current residents	-0.078	0.387
Total attendings	-0.124	0.172
Total female attendings	-0.039	0.675
Toal URiM attendings	-0.087	0.374

Qualitative data collected through interviews indicated that unmatched applicants who engaged in research and gained clinical exposure reported enhanced confidence and improved skills, which they attributed to their success in reapplying for residency positions. 85% (17/20) of successful reapplicants reported involvement in at least one new research project during their gap year. A total of 95% (19/20) of the reapplicants obtained additional clinical experience through research fellowships or clinical rotations. A total of 90% (18/20) of the successful reapplicants reported having a dedicated mentor in orthopaedic surgery who provided guidance during the reapplication process. Table 5 presents the demographic backgrounds of the reapplicants interviewed.

Table 4: Comparison of research engagement among successful vs. unsuccessful applicants.

Year	Research experiences		Publications, abstracts presentations	
	Success-fully matched	Went unmatched	Success-fully matched	Went unmatched
2024	8.1	8	23.8	18
2022	6.6	5.4	16.5	12.1
2020	5.4	5.7	14.3	14.2
2018	4.9	4.9	11.5	6.7
2016	4	3.8	8.2	4.9
2014	3.7	3.3	6.7	3.9

Table 5: Demographics of interviewed reapplicants.

Characteristic	Value
Average age	28.6±1.2 years
Gender (Male:Female)	16:4
Original application year	2022 (range: 2020-2023)
Degree (M.D.:D.O.)	100% : 0%
Gap year activities	95% Clinical, 85% Research
Had an orthopaedic mentor	90%
AOA status	60%
Average USMLE Step 2 CK	254.2±6.3

DISCUSSION

Our findings suggest that the path to successful reapplication in orthopaedic surgery is multifaceted and goes beyond traditional academic metrics. While USMLE scores and research publications remain important components of an application, they alone do not guarantee success for reapplicants. Instead, our study highlights the importance of proactive engagement in research, clinical experiences, and mentorship in shaping the profiles of successful reapplicants.

USMLE scores

Traditional metrics, such as USMLE Step 2 CK scores, showed no statistically significant correlation with successful reapplication in our study, where the average Step 2 CK scores of unmatched and matched applicants were statistically indistinguishable ($p>0.05$). Previous studies have reported that Step 1 and Step 2 scores had limited predictive value among reapplicants, emphasizing that programs likely place greater weight on qualitative aspects of the application during a second attempt.^{2,7} However, other studies have found a significant correlation between higher USMLE performance and match success.^{6,11,12} This divergence may reflect variability in how different programs weigh academic metrics during reapplication cycles or the small sample size of our study. As the landscape evolves with Step 1 becoming pass/fail and increasing emphasis on holistic review, future research should explore how programs integrate USMLE performance alongside qualitative factors to guide reapplicant selection.

Research engagement

When compared to students that had a successful first-time match, our data shows that the priorities of both students and programs change for reapplicants. This shift in focus emphasizes the importance of demonstrating growth and dedication during the gap year. Research engagement during this period appeared to be particularly impactful. In our cohort, 85% of successful reapplicants reported that they had started new research projects. This supports the conclusions of Kheir et al, who found an increasing trend in unmatched applicants subsequently matching after participating in structured research programs.³ Recent data by Jarvis et al highlights a rising trend in research output among all orthopaedic applicants, with both matched and unmatched candidates reporting increased numbers of abstracts and publications.¹³ This suggests growing pressure to enhance academic productivity, though it also raises questions about the distinction between the quantity and quality of research. As such, the type and impact of research experiences may matter more than volume alone.¹³ Unmatched candidates should be encouraged to focus on meaningful activities that enhance their skills and foster professional connections. This proactive approach may serve as a buffer against the inherent unpredictability of the matching process in competitive specialties, such as orthopaedic surgery.

Mentorship

The role of mentorship in successful reapplication cannot be overstated. Our qualitative data revealed that 90% of successful reapplicants reported having a dedicated mentor in orthopaedic surgery who provided guidance during the reapplication process. This mirrors the findings of Meyer et al, who emphasized that mentorship not only builds applicant confidence but also provides strategic direction throughout the reapplication process.¹⁴ Medical schools

should consider implementing formal mentorship initiatives to support unmatched applicants, potentially improving their chances of success in subsequent application cycles.

Geographical considerations and program diversity

Successful reapplicants in our study often broadened the scope of their applications geographically and targeted programs with different competitiveness profiles than their previous applications. This strategy aligns with the recommendations of Fuller et al, who showed that reapplicants who expanded their geographic reach were more likely to secure interviews and ultimately match.¹⁵ Guthrie et al found that applicants who expanded their program choices in general had higher success rates in subsequent cycles.¹⁶ Programs in less competitive regions or those with a history of accepting reapplicants may provide valuable opportunities for unmatched candidates.

Additionally, diversity initiatives may enhance the openness of programs to reapplicants from non-traditional or underrepresented backgrounds. Furthermore, the increasing focus on diversity in orthopaedic surgery residency programs may present opportunities for reapplicants.⁷ Ojo et al reported a 25-year analysis showing an increase in diversity, equity, and inclusion research in orthopaedics, which may translate to more inclusive selection processes.¹⁷ Reapplicants should consider highlighting their unique experiences and perspectives, as programs increasingly value diverse backgrounds and skill sets.

The influence of signaling on orthopaedic residency applications

The introduction of the supplemental application, including preference signaling, by the Electronic Residency Application Service (ERAS) in 2021 added a new dimension to the orthopaedic residency application process.¹⁶ Preference signaling allows applicants to indicate their strong interest in specific programs, potentially increasing their chances of receiving an interview invitation. Our study found that while signaling may facilitate entry into the interview stage, it does not guarantee successful matching. Among our cohort of successful reapplicants, 100% reported using all available signals in their second application cycle, and most matched at an institution that they had signaled.

However, reapplicants suggested that they believed other factors played a more significant role in their final match. This aligns with the findings of Pletcher et al, who studied the impact of preference signaling in otolaryngology residency applications and found that while signaling increased interview invitations, it did not significantly affect final match outcomes.¹⁸ The impact of signaling on the orthopaedic residency application process is still

evolving. Kotlier et al found similar findings from the 2022-2023 match cycle, highlighting the potential benefits of signaling in the field of orthopaedic surgery.⁶ Future research should investigate how programs utilize signal information and whether it influences their ranking decisions. Additionally, applicants should be cautious not to over-rely on signaling at the expense of other application-strengthening strategies.

The role of surgical skills and simulation training

An emerging trend in orthopaedic education is the value placed on technical skill development, even before residency. In our study, several reapplicants noted that participation in surgical skills labs or simulation training during their gap year improved their confidence and perceived readiness. This supports prior research by He et al, who demonstrated that early operative training improved residents' autonomy and performance.¹⁹ Reapplicants who engage in such training during their gap year may be able to enhance their competitiveness. Programs might consider offering skills workshops or simulation experiences to unmatched applicants, providing them with valuable hands-on experience and potentially identifying strong candidates for future application cycles.

This study had several limitations that should be considered when interpreting the results. First, the retrospective nature of our data collection may have introduced recall bias, particularly in the qualitative interviews with reapplicants. Second, our overall sample size was limited to the programs that provided complete information to the ORIN database and the availability of reapplicants for interviews, which may not be fully representative of all orthopaedic surgery residency programs nationwide. Third, the study's focus on successful reapplicants may overlook important factors that contribute to continued non-matching outcomes. Fourth, the rapidly evolving landscape of residency applications, including recent changes such as preference signaling, may limit the long-term applicability of these findings.

Future research should address these limitations by conducting prospective studies with larger sample sizes and more comprehensive data collection methods. Additionally, investigating the experiences of repeatedly unmatched applicants could provide valuable insights into the persistent barriers to matching. Longitudinal studies tracking the career trajectories of reapplicants who successfully match could help evaluate the long-term impact of gap year activities on professional development. Finally, as the use of preference signaling becomes more established, its influence on reapplication outcomes should be examined more thoroughly.

CONCLUSION

While traditional metrics may not serve as reliable predictors of reapplication success for unmatched

orthopaedic surgery candidates, the actions taken during the reapplication period play a crucial role. Our study provides valuable insights into the factors contributing to successful reapplications. Candidates are encouraged to strategically engage in research, clinical experience, and mentorship to strengthen their applications for future cycles. By adopting a proactive approach, unmatched applicants can enhance their chances of securing residency positions.

It is essential to utilize preference signaling strategically, but not at the expense of other application-strengthening activities. Consider applying to a broader range of programs, including those in different geographical regions or with varying levels of competitiveness. By adopting these strategies, unmatched applicants can significantly improve their chances of securing residency positions in subsequent application cycles. Residency programs should adopt holistic review processes that consider the unique experiences and growth of reapplicants. This approach may help identify talented individuals who may have been overlooked in previous cycles.

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