Analysis of Unmatched Orthopaedic Residency Applicants: Options After the Match

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ABSTRACT

Background Orthopaedic surgery is one of the most competitive specialties, resulting in many applicants going unmatched. Many unmatched applicants pursue a preliminary internship or research fellowship, but whether these activities make them more successful in subsequent match cycles has not been studied.

Objective To determine the effectiveness of activities during the intervening period on match success in a subsequent cycle.

Methods After reviewing rank order lists for our program and National Resident Matching Program correspondence from 1994 to 2013, we identified 198 of 1216 ranked applicants (16.3%) who did not initially match. Of these, 57 applicants who matched through the Supplemental Offer and Acceptance Program did not reapply to orthopaedics or trained overseas.

Results Of 141 reapplicants, 56 matched into orthopaedic surgery, with 87.5% ($P < .001$) matching at a program in the same region where they had either completed their medical degree or postgraduate year, and 37.5% matching at their home institution ($P < .001$). Successful reapplicants after a research fellowship had a significantly higher number of publications than unsuccessful reapplicants ($P < .05$). There was no significant difference in success after research or internship ($P = .80$) and no significant difference in success rates for US versus international reapplicants ($P = .43$).

Conclusions Success of reapplication into orthopaedic surgery may be less dependent on the route taken during the interim period, and more dependent on developing relationships with faculty at a local or regional institution.

Introduction

Orthopaedic surgery is 1 of the most competitive core residency specialties. Over the past several years, the percentage of orthopaedic positions relative to total residency positions has decreased annually.[1] Concurrently, since the implementation of the 80-hour workweek restrictions in 2003, applications for orthopaedic surgery have increased by more than 20%.[2] In 2014, 1032 applicants applied for 695 orthopaedic surgery residency positions.[1] This results in many qualified applicants remaining unmatched. Unmatched applicants determined to reapply often complete a preliminary internship or a full-time research fellowship.

Several studies have examined the orthopaedic residency selection process and the methods used to identify applicants who will be successful residents.[3–5] However, these studies focus on graduating seniors and do not address applicants who are reapplying. There has been only anecdotal information about the success of an internship or a research fellowship for reapplicants matching into orthopaedics. A 2013 study first addressed the unmatched applicant, finding that orthopaedic program directors recommended a surgical internship over a research fellowship, especially if the internship was done at the director's institution.[6] The aim of our study was to expand this information by examining orthopaedic applicants to our residency program who did not match over a 20-year period; the object of this study was to determine how to most effectively use the time between match cycles to enhance success in matching into orthopaedic surgery.

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Editor's Note: The online version of this article contains a table of success rates of US versus foreign medical graduate applicants during the past 20 years, and a graph depicting distribution of reapplicant activities after not initially matching.

Methods

We reviewed all rank order lists for residency in orthopaedic surgery at our institution over a 20-year period from 1994 through 2013, and reviewed National Resident Matching Program (NRMP) data sent after the Match, indicating whether or not a candidate had matched successfully into orthopaedics. After compiling a database of applicants, we used *US News & World Report*, LinkedIn, and individual institution websites to find information regarding (1) whether candidates scrambled or accepted a position in the Supplemental Offer and

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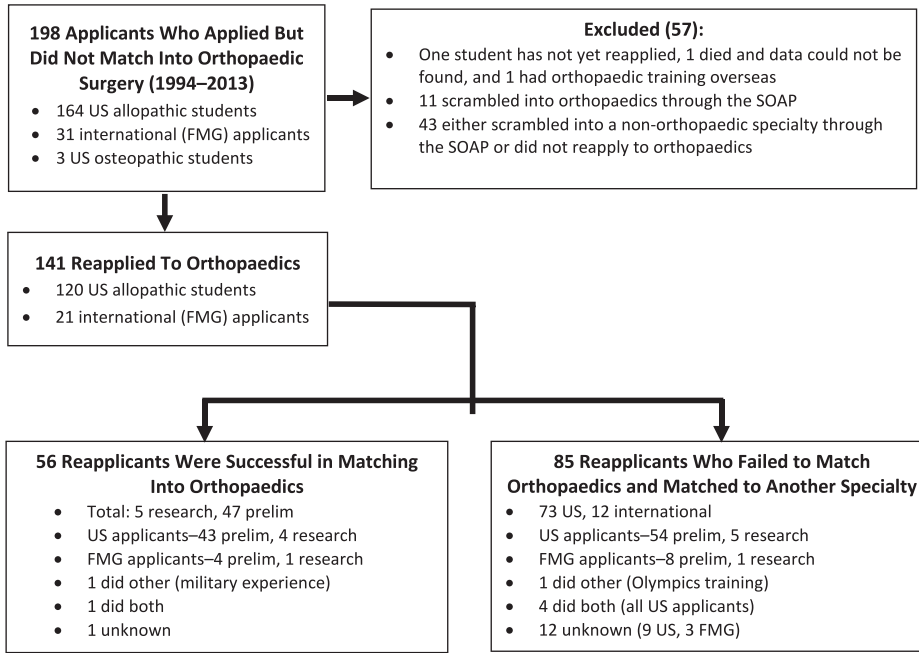

FIGURE

Flowchart Illustrating Outcome and Route Taken by All Ranked Applicants at Our Institution Who Did Not Initially Match Into Orthopaedics (1994–2013)

Abbreviations: FMG, foreign medical graduate; SOAP, Supplemental Offer and Acceptanace Program.

Acceptance Program; (2) how and where they spent the time between match cycles; (3) whether they succeeded in obtaining an orthopaedic surgery residency; and (4) whether they successfully matched at the institution where they did research or an internship. Applicants for whom we had multiple years of NRMP correspondence from were considered reapplicants.

The study received approval by our Institutional Review Board.

To analyze the data, we used Fisher exact test, χ^2 test, and *t* test to detect significant differences among those who matched and those did not match. Fisher exact test was used when 1 of the expected values in the calculation was less than 5, and a *t* test was utilized to compare the average number of publications for applicants who completed a research year. For all other analyses, a χ^2 test was used. All statistical analyses were performed using Minitab version 15.1.30.0 software (Minitab Inc, State College, PA).

Results

During the 20-year period, 198 of 1216 ranked applicants (16.3%) did not initially match into orthopaedics (FIGURE). The majority (n = 164) came from US allopathic programs, 3 came from US osteopathic programs, and the remaining 31 were international applicants. Three applicants were excluded from analysis as they opted for a multiyear research fellowship, and they either had not yet reapplied, had pursued a residency overseas, or the details of their education could not be obtained. Eleven applicants found a residency position through the Supplemental Offer and Acceptance Program, and 43 scrambled into non-orthopaedic specialties or did not reapply to orthopaedics, and were excluded from our analyses. Outcomes for the remaining 141 applicants were classified based on pursuing research, an internship, both, or neither (TABLE 1). Details for 2 successful and 12 unsuccessful applicants could not be obtained, and they were classified as unknown.

Our results showed that 56 of the 141 applicants (39.7%) who reapplied successfully matched into orthopaedics. Compared to the national average success rate using NRMP data from 1994 through 2013 (provided as online supplemental material), reapplicants were significantly less likely to succeed in matching into orthopaedics ($P < .001$).[7–26] Successful applicants averaged 1.2 years between match cycles (range, 1–3 years). The compositions of both successful and unsuccessful applicants were quite similar (provided as online supplemental material).

Of the applicants with information about their activities during the interim year, 80.1% (113 of 141) pursued an internship, and 7.8% (11 of 141) pursued

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TABLE 1
Reapplicant Activity Between Match Cycles

Reapplicants	Matched	Unmatched
US reapplicants who pursued research only (n = 9)[a]	4	5
US reapplicants who pursued internship only (n = 97)[a]	43	54
US reapplicants who pursued both research and internship (n = 5)[a]	1	4
US reapplicants who pursued neither research or internship (n = 2)[a]	1	1
FMG reapplicants who pursued research only (n = 2)[b]	1	1
FMG reapplicants who pursued internship only (n = 12)[b]	4	8
All reapplicants who pursued research only (n = 11)[c]	5	6
All reapplicants who pursued internship only (n = 113)[c]	47	66

Abbreviation: FMG, foreign medical graduate.
[a] No significant difference among US reapplicants between research versus internship versus both versus neither ($P = .78$).
[b] No significant difference among FMG reapplicants between research versus internship ($P = .60$).
[c] No significant difference among all reapplicants between research versus internship ($P = .80$).

an orthopaedic research fellowship. There was no significant difference in success among those who completed an internship versus a research fellowship ($P = .80$). Of note, 87.5% (49 of 56, $P < .001$) of successful reapplicants matched at programs in the same region where they had completed their medical degree, research, and/or internship (TABLE 2), and 37.5% (21 of 56, $P < .001$) of applicants matched at their home institution. For reapplicants who completed a research fellowship, we analyzed the average number of publications within 3 years of their research fellowship. Reapplicants who successfully matched had a significantly higher average number of publications than those who did not (4.8 versus 1.5, $P < .05$).

Of 56 successful applicants, 51 were graduates of US allopathic programs and 5 were international applicants. Interestingly, while NRMP data show that US applicants have a significantly higher ($P < .001$) overall success rate than international applicants (75.2% versus 24.5%; provided as online supplemental material), there was significant advantage among US reapplicants in our sample ($P = .43$).

Among those who ultimately matched into a nonorthopaedic specialty, the most common alternate specialty was general surgery (27.3%, 35 of 128), followed by radiology (13.3%, 17 of 128) and anesthesiology (11.7%, 15 of 128).

Discussion

Data for our program indicate that the majority of successful reapplicants completed an internship, but that the success rate among applicants who pursued research, internships, or another route was comparable ($P = .80$). Reapplicants who completed a research fellowship and matched had a significantly higher average number of publications than those who did not, suggesting publication productivity may impact the match success of these reapplicants. The comparable success rate for US and international reapplicants may speak to the importance of international applicants completing a research year or preliminary internship in the United States as a method to successfully match into orthopaedics.

Our study has limitations. First, we only analyzed data for applicants who were offered an interview, and our data may be biased by including only more highly qualified applicants. Second, our study encompasses data over a 20-year period from 1994 through 2013, during which the NRMP evolved. Some applicants in the earlier years of our data were able

TABLE 2
Location of Programs for Matched Reapplicants

Reapplicants Successful in Matching in Orthopaedic Surgery	Matched in Geographical Region	Matched Outside Geographical Region	Matched at Home Institution
US reapplicants	46	5	18
FMG reapplicants	3	2	3
All reapplicants	49[a]	7	21[b]

Abbreviation: FMG, foreign medical graduate.
[a] Applicants were significantly more likely to match to programs in the same region that they completed medical school, internship, and/or research.
[b] Applicants were significantly more likely to match to the home program, defined as the institution where they completed medical school, internship, and/or research.

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to scramble into an orthopaedic position without taking time off, an option that was not available in more recent years. Additionally, while the initial outcome (matched or unmatched) of applicants is from NRMP correspondence, we conducted an online search to review what reapplicants did during their year off, so there may be a reporting bias. In future studies, statistical analyses of United States Medical Licensing Examination scores among unmatched applicants would be valuable.

Conclusion

There was no significant difference in the success of reapplicants who pursued an internship year versus a research fellowship, but for research candidates, the number of publications may be used as a measure of success during their research fellowship. There was no significant difference between international and US reapplicants. Finally, a statistically significant number of reapplicants matched at their home institution, highlighting the value of establishing relationships with local faculty during an internship or research fellowship, which should be prioritized among reapplicants.

References

1. National Resident Matching Program. Results and data: 2014 main residency match. http://www.nrmp.org/wp-content/uploads/2014/04/Main-Match-Results-and-Data-2014.pdf. Accessed October 12, 2015.
2. Anakwenze OA, Kancherla V, Baldwin K, Levine WN, Mehta S. Orthopaedic residency applications increase after implementation of 80-hour workweek. *Clin Orthop Relat Res*. 2013;471(5):1720–1724.
3. Dirsch DR, Dahners LE, Adams GL, Crouch JH, Wilson FC. Correlating selection criteria with subsequent performance as residents. *Clin Orthop Relat Res*. 2002;399:265–271.
4. Dirsch DR, Campion ER, Gilliam K. Resident selection and predictors of performance: can we be evidence based? *Clin Orthop Relat Res*. 2006;449:44–49.
5. Egol KA, Collins J, Zuckerman JD. Success in orthopaedic training: resident selection and predictors of quality performance. *J Am Acad Orthop Surg*. 2011;19(2):72–80.
6. Amin NH, Jakoi AM, Cerynik DL, Kumar NS, Johanson N. How should unmatched orthopaedic surgery applicants proceed? *Clin Orthop Relat Res*. 2013;471(2):672–679.
7. Association of American Medical Colleges and National Resident Matching Program. Results and data: main residency match, 1994. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata1994.pdf. Accessed October 12, 2015.
8. Association of American Medical Colleges and National Resident Matching Program. Results and data: main residency match, 1995. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata1995.pdf. Accessed October 12, 2015.
9. National Resident Matching Program. Results and data, main residency match, 1996. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata1996.pdf. Accessed October 12, 2015.
10. National Resident Matching Program. Results and data, main residency match, 1997. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata1997.pdf. Accessed October 12, 2015.
11. National Resident Matching Program. Results and data, main residency match, 1998. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata1998.pdf. Accessed October 12, 2015.
12. National Resident Matching Program. Results and data, main residency match, 1999. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata1999.pdf. Accessed October 12, 2015.
13. National Resident Matching Program. Results and data, main residency match, 2000. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2000.pdf. Accessed October 12, 2015.
14. National Resident Matching Program. Results and data, main residency match, 2001. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2001.pdf. Accessed October 12, 2015.
15. National Resident Matching Program. Results and data, main residency match, 2002. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2002.pdf. Accessed October 12, 2015.
16. National Resident Matching Program. Results and data, main residency match, 2003. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2003.pdf. Accessed October 12, 2015.
17. National Resident Matching Program. Results and data, main residency match, 2004. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2004.pdf. Accessed October 12, 2015.
18. National Resident Matching Program. Results and data, main residency match, 2005. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2005.pdf. Accessed October 12, 2015.
19. National Resident Matching Program. Results and data, main residency match, 2006. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2006.pdf. Accessed October 12, 2015.
20. National Resident Matching Program. Results and data, main residency match, 2007. http://www.nrmp.

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org/wp-content/uploads/2013/08/resultsanddata2007.pdf. Accessed October 12, 2015.
21. National Resident Matching Program. Results and data, main residency match, 2008. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2008.pdf. Accessed October 12, 2015.
22. National Resident Matching Program. Results and data, main residency match, 2009. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2009.pdf. Accessed October 12, 2015.
23. National Resident Matching Program. Results and data, main residency match, 2010. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2010.pdf. Accessed October 12, 2015.
24. National Resident Matching Program. Results and data, main residency match, 2011. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2011.pdf. Accessed October 12, 2015.
25. National Resident Matching Program. Results and data, main residency match, 2012. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata20121.pdf. Accessed October 12, 2015.
26. National Resident Matching Program. Results and data, main residency match, 2013. http://www.nrmp.org/wp-content/uploads/2013/08/resultsanddata2013.pdf. Accessed October 12, 2015.

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