

Original Article

The Top 10 Orthopaedic Sports Medicine Fellowship Programs in the United States Frequently Select Fellowship Applicants From the Same Residency Programs

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Purpose: To determine which residency programs the fellows of the top 10 orthopaedic sports medicine fellowship programs attended and whether residents are selected from the same residency programs multiple years. **Methods:** The residency programs of current and former fellows at each of the top 10 orthopaedic sports medicine fellowship programs (based on a recent study) over the last 5 to 10 years was determined by searching program websites and/or contacting program coordinators/directors. For each program, we determined the number of occurrences of at least 3 to 5 fellows from the same residency program. We also calculated a “pipelining ratio,” defined as the ratio of the total number of fellows at the program over the duration of the study to the number of different residency programs represented within the fellowship program during that same time period. **Results:** Data were obtained from 7 of the top 10 fellowship programs. Of the remaining 3 programs, 1 declined to provide the information and 2 did not respond. Pipelining was found to be highly prevalent at one program, with a pipelining ratio of 1.9. Two different residency programs had at least 5 residents match at this fellowship program over the past 10 years. Four additional programs demonstrated evidence of pipelining with ratios of 1.4-1.5. Two programs exhibited minimal pipelining (ratio of 1.1). One program was found to take 2 residents from the same program in the same year on 3 different occasions. **Conclusions:** Most of the top orthopaedic sports medicine fellowship programs have matched fellows from the same orthopaedic surgery residency programs in multiple years. **Clinical Relevance:** It is important to understand how fellows are selected for sports medicine fellowship programs and to recognize the potential for inequitable bias in the selection process.

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Pursuing subspecialty fellowship training following orthopaedic surgery residency is increasingly common. From 2003 to 2013, the percentage of fellowship applicants increased from 76% to 90%.¹ Orthopaedic sports medicine fellowships are particularly competitive. In a recent study, Mulcahey et al.² found that in the period from 2010 to 2017, the number of sports medicine fellowship applicants exceeded the number of positions available in every year except one. This is in comparison with a 2014 study, in which Daniels et al.³ found that, overall, the 9 orthopaedic subspecialties had more positions than applicants.

Previous research has identified the factors considered to be most important among programs when ranking fellowship applicants. In a study of orthopaedic sports medicine fellowship interview days, Haislup et al.⁴ determined that the quality of the applicant interview was most significant to program directors when ranking

Table 1. The Top-10 Orthopaedic Sports Medicine Fellowship Programs as Ranked by Fellowship Applicants

Rank	Program
1	Steadman Philippon Research Institute Program
2	Rush University Medical Center Program
3	Hospital for Special Surgery/Cornell Medical Center Program
4	OrthoCarolina Sports Medicine, Shoulder & Elbow Program
5	Cedars-Sinai Kerlan-Jobe Orthopaedic Clinic Program
6	American Sports Medicine Institute (St. Vincent's) Program
7	University of Pittsburgh/UPMC Medical Education Program
8	Steadman Hawkins Clinic of the Carolinas Program
9	Steadman Hawkins Clinic – Denver Program
10	Duke University Hospital Program

NOTE. Data obtained from previous study.⁸

applicants. Similarly, Baweja et al.⁵ found that the applicant's residency program and personal connections were ranked among the top 5 most important factors. However, it is unclear how important these personal connections are in determining match success.

The term "pipeline" is commonly used to refer to programs that are designed to increase diversity and cultural competency in the workforce.^{6,7} However, this term may also pertain to the phenomenon that applicants from certain residency programs frequently match at the same fellowship programs. However, little is known about pipelining and its presence in the fellowship application process. The purpose of this study was to determine which residency programs the fellows of the top 10 orthopaedic sports medicine fellowship programs attended and whether residents are selected from the same residency programs multiple years. We hypothesized that fellows commonly would be selected from the same residency programs in multiple years.

Methods

The residency programs of current and former fellows at each of the top 10 orthopaedic sports medicine fellowship programs (based on a recent study⁸; Table 1) over the last 5 to 10 years were determined by searching program websites and/or contacting program coordinators/directors. We sought data for each program over a minimum period of the last 5 years and up to 10 years, if the information was available. For each program, we determined the number of times that at least 3, 4, or 5 fellows matched from the same residency program. We also calculated a "pipelining ratio," defined as the ratio of the total number of fellows at the program over the duration of the study to the number of different residency programs represented within the fellowship program during that same time period.

Statistical Analysis

Descriptive statistics were used to report the pipelining ratio of each fellowship program and the number

of residency programs with multiple fellows from the same residency at each fellowship program during the study period.

Results

Data were obtained from 7 of the top 10 orthopaedic sports medicine fellowship programs. Of the remaining 3 programs, 1 declined to provide the information and 2 did not respond. The following program numbers do not necessarily correlate with the numerical order of the programs listed in Table 1. Pipelining was found to be highly prevalent at one program (program 1), with a pipelining ratio of 1.9 (Table 2). Two different residency programs had at least 5 residents match at program 1 over 10 years. Although not as prevalent, there was also found to be evidence of pipelining at programs 2 and 3, with one residency program matching 5 residents over 5 years at program 2 and 2 residency programs matching at least 3 residents at programs 2 and 3 over 5 and 10 years, respectively. Programs 4 and 5 both had pipelining ratios of 1.4, and programs 6 and 7 exhibited minimal pipelining, with a pipelining ratio of 1.1. In addition, program 1 had 3 instances in the last 10 years in which 2 fellows from the same residency program matched in the same year. This only occurred 0 to 1 times at programs 2 to 7 during the study period.

Discussion

In this study, we found varying practices of applicants from the same residency programs matching at the same top orthopaedic sports medicine fellowship programs in multiple years. Evidence of pipelining was identified in 5 of the 7 programs evaluated, with pipelining ratios of 1.9, 1.5 (2 programs), and 1.4 (2 programs). This may negatively impact the match success rate among applicants from other residency programs without strong connections to a particular fellowship program.

Pipelining may refer to a positive strategy to increase diversity in certain fields. For example, Parsons et al.⁹ referred to diversity in medicine as an "academic imperative," especially as an important method for improving patient experiences and outcomes. This attitude is widely shared, and VanInwegen et al.¹⁰ described the efforts of a pipeline program at Virginia Commonwealth University School of Pharmacy to increase matriculation of students from underrepresented backgrounds. According to McNeill et al.,¹¹ these programs may be significant in mitigating racial disparities in medicine. Pipelining, used in this context, is essential to the future of medicine and quality of patient care. In contrast, pipelining among orthopaedic fellowship programs may limit opportunities for qualified applicants and may actually go against the traditional goal of pipelining.

Table 2. Residency Program Representation at the Top Orthopaedic Sports Medicine Fellowships

	Program 1	Program 2	Program 3	Program 4	Program 5	Program 6	Program 7
Number of years of data	10	5	10	10	5	5	10
No. fellows/no. residency programs (pipelining ratio)	69/37 = 1.9	41/27 = 1.5	19/13 = 1.5	26/19 = 1.4	25/18 = 1.4	18/16 = 1.1	50/45 = 1.1
Residency programs with ≥ 5 fellows at program during study	2	1	0	0	0	0	0
Residency programs with ≥ 4 fellows at program during study	3	1	0	2	1	0	0
Residency programs with ≥ 3 fellows at program during study	8	3	2	3	2	1	1
No. of times fellows from the same residency program matched in a given year	3	1	0	1	0	1	1

NOTE. Program numbers in this table do not necessarily correspond to those listed in Table 1.

Given the competitiveness of matching into a sports medicine fellowship, the application process is complicated and tolling on the applicant. A 2021 study examining the process from the applicant's perspective, based on orthopaedic surgery residents applying to sports medicine fellowships in 2016 and 2017, found that the majority of applicants (64.0%) applied to more than 20 programs, with most applicants (33.1%) spending \$4,001 to \$6,000 on interview expenses.¹² The most important factors influencing an applicant's impression of the program were interactions with faculty during interview day, case volume, and complexity.¹²

Due to the coronavirus disease 2019 pandemic, the interview process was held virtually during the last 2 application cycles. This eliminated the financial burden and allowed applicants to attend more interviews. According to a recent Letter to the Editor on the virtual interview process, not only were both time and money saved, but the time lost from residency training was dramatically reduced.¹³ The author felt no misgivings when ranking programs and advised consideration of these benefits for future interview seasons.¹³ However, losing the in-person aspect of the interview makes it more difficult to ascertain personalities and "feel" of a program.^{4,15} Previous studies indicated that for both applicants and program directors, the interview was one of the most important factors influencing their rank lists.^{4,12} In a recent study by Clark et al.,¹⁴ the majority of program directors (75%) and applicants (68%) thought it was important/very important to interview in-person, to meet faculty members in-person (85% and 67%, respectively), and for applicants to tour the facilities in-person (80% and 67%, respectively). In addition, 58% of program directors agreed/strongly agreed that the virtual interview process negatively impacted their personal connection with the applicant.¹⁴ According to Peebles et al.,¹⁵ this is a cause for concern, as sports medicine fellowship directors may shift their emphasis to "word-of-mouth references," personal

connections to the fellows or faculty, or residency programs. This would put applicants who lack these connections at a disadvantage, despite being potentially exemplary candidates.

Overall, the practice of pipelining as well as using word-of-mouth references are advantages based on an applicant's orthopaedic surgery residency program. This supports the idea of being "pigeonholed" into a certain tier of fellowship or geographic location, guided primarily by the residency program. For example, attending a residency program in the Northeast that doesn't typically match residents to fellowship programs in the Southwest puts those applicants at a disadvantage. The same concept applies to residents attending programs that lack a history of sending residents to top fellowship programs. The ramifications of this include inequitable bias, as the applicant's residency program may take priority over the remainder of the application in the eyes of fellowship programs, leading to inequitable outcomes for the applicants.

It is important for future studies to seek to find ways to reduce the practice of pipelining at orthopaedic sports medicine fellowship programs. This may include blinding the residency programs of applicants during the initial submission process, or blinding the names of attendings submitting letters of recommendation. However, neither of these ideas is perfect and can be easily circumvented. Thus, the most effective method of improving this process, however, is for fellowship faculty members to make a concerted effort to evaluate prospective fellows based on the applicants themselves rather than personal connections made through the applicant.

Limitations

The limitations of the study should be noted. This study was limited to the top 10 orthopaedic sports medicine fellowship programs as perceived by applicants,⁸ and therefore it is unknown whether pipelining is an issue at other fellowship programs. Data could not be obtained from 3 of the 10 programs included in this

study. The study duration differed among the programs based on the data that was available. Finally, the specific reasons for a high pipelining ratio at some programs could not be ascertained.

Conclusions

Most of the top orthopaedic sports medicine fellowship programs have matched fellows from the same orthopaedic surgery residency programs in multiple years.

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