



## Original research

# The Cost of Getting in: Is It Time for Change in the Adult Reconstruction Fellowship Application Process?

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## ABSTRACT

**Background:** The number of applicants to adult reconstruction fellowships (ARFs) has increased significantly in recent years, making the application process increasingly competitive. With this, applicants are applying to and interviewing at more programs which has inherent cost and time implications. The purpose of this study was to assess these implications as well as investigate applicant attitudes toward proposed changes.

**Methods:** This is a cross-sectional survey study of 2019 and 2020 ARF applicants (n = 278) to a single institution. A 10-question survey was distributed to applicants regarding the application and interview process. This survey focused on application and interview volumes, financial and temporal commitments, as well as perceptions regarding potential application process changes. Descriptive statistics and chi-squared analysis were then performed.

**Results:** Of the 110 (40%) respondents, 87% spent >\$3000 and 43% spent >\$5000 during the application process. Most respondents applied to ≥26 programs (84%) and both received and attended ≥11 interviews (87% and 74.5%, respectively). Applicants missed significant training time for interviews (99% missed at least 1 week, 62% two weeks, and 15% three weeks). Attending more interviews (P = .001) and multiple visits to the same city (P = .049) were associated with spending >\$5000. Most applicants (72%) felt change to the process would be beneficial.

**Conclusions:** Applicants to ARF are applying to and interviewing at many programs resulting in significant time away from training and financial investment. Most applicants feel that a change to the system would be beneficial, although no consensus on the best solution was delineated. These data should be considered during the continued evaluation of the match process.

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## Introduction

Since the implementation of the Orthopedic Fellowship Match system in 2008, much has changed with regard to applying for an orthopedic fellowship [1]. The transition away from an informal application process has allowed applicants to more fairly assess their fellowship training opportunities. The same can be said for fellowship programs [1]. Over the same time, there has been considerable increase in the number of residents pursuing fellowship training, as the vast majority of residents now seek fellowship training and the number of residents pursuing 2 fellowships is

equal to those who do not pursue fellowship at all [2,3]. Greater fellowship demand has made applying to subspecialty fellowship training an increasingly competitive endeavor [4].

While the general trend has been that more applicants are applying for orthopedic fellowships on an annual basis, there are also subspecialty-specific trends [4]. In the case of adult reconstruction fellowship, applications are currently at an all-time high as the number of applicants has increased nearly 35% from 204 in 2014 to 276 in 2019 and 275 in 2020 [5]. In 2019, these applicants competed for 207 spots, and in 2020, 219 spots were offered. As such, a recent analysis found that adult reconstruction now has the lowest odds of an applicant successfully matching (68% in 2017) [5]. Accordingly, the mean number of applications submitted per applicant is increasing and has reportedly approached 30 programs per applicant [5]. In addition, applicants may feel pressured to attend a greater number of interviews to increase their perceived

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match likelihood. Given the burgeoning number of both applications and accepted interview invitations, it is not surprising to note that the interview process has become a time-intensive and financially straining endeavor [6].

Prior literature has surveyed orthopedic fellowship applicants, but only a small percentage of respondents were adult reconstruction applicants [1,6]. Given the increasing popularity of fellowship training, we sought to assess current applicant temporal and financial commitments required to apply for an arthroplasty fellowship program. As a secondary outcome, we assessed applicant attitudes toward proposed changes to the application process. We hypothesized that most applicants are currently spending significant time away from their training program with associated significant costs for the interview season.

## Material and Methods

This is an institutional review board–approved, cross-sectional survey study of applicants applying to a single adult reconstruction fellowship program in 2019 and 2020. Each applicant was emailed asking for voluntary participation in an anonymous survey. The survey was timed such that all interviews had been completed for the most recent (2020) cycle of applicants and that applicants from 2019 were approximately 1 year beyond their match day, although match status of each applicant from this subcohort was not ascertained. Only applicants to our adult reconstruction fellowship were eligible for inclusion.

The distributed survey was a 10-question response inquiry which was anonymized and conducted via SurveyMonkey (San Mateo, CA). This survey was distributed via e-mail. Applicants were asked to respond categorically to a series of 10 questions (see Supplement). In brief, these questions asked applicants to quantify the number of programs they applied to, interviewed at, the estimated financial commitment required to complete interviews, and time spent away from their training program. In addition, we obtained applicant perceptions of hypothetical changes to the fellowship application and interview process. This survey was sent out, and 2 reminder emails were subsequently sent at weekly intervals. The survey remained open for data collection for 1 month in total. The survey was distributed to a total of 278 applicants.

After responses were received, descriptive statistics were performed using SAS, version 9 (SAS Institute; Cary, NC). *Post hoc* analysis was performed on 2 cohorts of respondents (those reporting spending >\$5000 and those spending <\$5000). Univariate analysis was then performed to assess the influence of various applicant characteristics on financial spend. For this analysis,  $\alpha < 0.05$  defined statistical significance.

## Results

In total, surveys were distributed to 133 applicants from 2019 and 145 applicants from 2020. This constituted 57% and 61% of all applicants to adult reconstruction fellowship for each respective year [7]. In total, 110 responses (response rate 40%) were received. Most applicants (57%) reported applying to  $\geq 31$  programs, and 84% applied to at least 26 programs. In total, only 6 respondents applied to  $\leq 20$  programs. Thirty percent of those who responded received  $\geq 21$  interview offers, and only 12% of applicants received  $\leq 10$  interview invites. Ultimately, the majority (64%) attended between 11 and 15 interviews. In total, 75% of all respondents (and 85% of those with at least 11 interview offers) interviewed with at least 11 programs. The time away from work required to attend these interviews was substantial as 46% reported having missed 11–15 workdays, 62% missed at least 11 workdays, and 15% missed at least 3 weeks' worth of training time. Eighty-seven percent of applicants

spent  $\geq \$3000$ , and 43% reported spending  $\geq \$5000$ . Most applicants (62%) reported traveling to the same city at least 1–2 times, and 14% traveled to the same city on at least 3 separate occasions (Table 1).

Most respondents were open to some change to the application and interview process (72%). However, opinions on what changes should be made were mixed. The most popular potential changes were consideration of an application cap (50%) and holding interviews at a centralized location (40%). Only 25% felt videoconferencing would be a viable in-person interview alternative. Nearly all respondents (97%) felt that their in-person interviews changed their anticipated rank list. Forty-nine percent stated there were only small changes to their anticipated list, while 48% felt they made large changes (Table 2).

Our analysis of those who spent > or < \$5000 dollars found that the only significant differences between the 2 cohorts were that those spending >\$5000 were offered significantly more interviews ( $P = .022$ ), attended significantly more interviews ( $P = .001$ ), and more frequently traveled to the same city on multiple occasions ( $P = .049$ ) (Table 3).

## Discussion

Orthopedic fellowship training, particularly adult reconstruction fellowship training, is at its height of popularity [5]. This

**Table 1**  
Self-reported application submission data.

Survey response	n (%)
Applications submitted	
0-10	1 (0.9)
11-15	1 (0.9)
16-20	4 (3.6)
21-25	11 (10.0)
26-30	29 (26.4)
31+	63 (57.3)
Missing	1 (0.9)
Interview offers	
<5	1 (0.9)
5-10	12 (10.9)
11-15	32 (29.1)
16-20	31 (28.2)
21-25	25 (22.7)
26+	8 (7.3)
Missing	1 (0.9)
Interviews attended	
<5	1 (0.9)
5-10	27 (24.5)
11-15	70 (63.6)
16-20	10 (9.1)
21-25	2 (1.8)
Days of work missed	
0-5	1 (0.9)
6-10	41 (37.3)
11-15	51 (46.4)
16-20	15 (13.6)
20-30	2 (1.8)
Estimated total cost	
0-\$1000	1 (0.9)
\$1000-\$2000	3 (2.7)
\$2000-\$3000	10 (9.1)
\$3000-\$4000	24 (21.8)
\$4000-\$5000	25 (22.7)
\$5000-\$10,000	41 (37.3)
>\$10,000	6 (5.5)
Did you ever travel to the same city multiple times?	
No	42 (38.2)
Yes, 1-2 times	53 (48.2)
Yes, 3-5 times	14 (12.7)
Yes, >5 times	1 (0.9)

**Table 2**  
Applicant perceptions of proposed fellowship application process changes.

Survey response	n (%)
Interviews at a single location	
Yes	44 (40.0)
No	38 (34.5)
Unsure	28 (25.5)
Video conferencing interviews	
Yes	27 (24.5)
No	55 (50.0)
Unsure	28 (25.5)
Strict limits on number of applications	
Yes	55 (50.0)
No	29 (26.4)
Unsure	26 (23.6)
Open to any change	
Yes	79 (71.8)
No	31 (28.2)
Interview change perception	
No	3 (2.7)
Yes: small changes	54 (49.1)
Yes: large changes	53 (48.2)

growing demand for fellowship training is likely driven in part by the job market demand for specialization [8]. Regardless, it is clear that applying to and successfully matching into an arthroplasty fellowship is one of the most competitive career paths [5]. The general trend reported in the literature is that more applicants are applying to more programs. This has driven pressure to interview

broadly, leading to an increase in associated costs and time away from training [6]. Prior literature regarding these financial and time commitments included very few arthroplasty fellowship candidates [1,6]. The current investigation addresses this weakness, and our results indicate that nearly half of applicants are spending at least \$5000 and some residents are missing as much of 3 full weeks of training to interview for fellowship. Accordingly, and not surprisingly, the majority who responded to our survey are open to change in the fellowship application process. These findings warrant further discussion.

The time and financial commitments required for fellowship applications are not new [1,6,9]. However, these demands are a relatively recent construct of the match process [4]. The fellowship match has addressed many problems of the historic fellowship application process [4]. It has allowed both programs and applicants to thoroughly consider their options. In doing so, however, the match process has also driven a significant increase in both time and costs for the application process—particularly for the most competitive subspecialties such as adult reconstruction [1,2,5]. Our results indicate that to some degree, redundancy in the interview process may be to blame—as traveling to the same city for multiple interviews was significantly associated with applicants spending more than \$5000. Coordination of programs in the same city could conceivably save applicants time and money. For instance, 7 adult reconstruction fellowship programs currently exist in New York City alone. If these interviews were all conducted on adjacent dates, interested applicants could save money on travel and potentially miss fewer days of work given the consolidation.

However, it should also be recognized that applicants decide how many programs to apply to and how many interviews to attend and that this number was predictably related to increased applicant expenditures. Applying to more programs is associated with increased costs in a tiered fashion (ie, the cost is greater to apply to the 35th program than to the second), but each incremental addition represents a small increase (compared with the total costs of the interview season) in costs and is unlikely to be prohibitive. Still, the costs associated with the actual application process are a fraction of those associated with interviewing. While it is hard to blame applicants for interviewing broadly—both to assess programs and increase the chances of a match—the data suggest that this is unnecessary [2]. A recent study by Krueger et al. [2] found that 96% of applicants match in their top 10 programs, and therefore, interviewing at more than 10 programs is unnecessary, even for applicants from less-prominent residencies. This is an important consideration as nearly 75% of applicants in our study interviewed at >10 programs, and nearly 90% who spent >\$5000 did so. Fear of not matching is likely a strong driver of number of applications and number of interviews accepted. A similar mismatch between objective data and applicant fear of remaining unmatched is reported in the residency application literature [10–13].

The question that must then be answered is how to address these issues. This study revealed that there are discordant feelings regarding this, although 72% were in favor of some change. The most popular option was an application cap—that is, a strict limit to the number of programs an applicant may apply to. This option has been often mentioned as an option for reform of both the orthopedic residency [14] and fellowship application process [6]. If this were instituted, applicants would essentially be asked to be more intentional with where they sent applications and only apply to programs for which they have a genuine interest. Unfortunately, very little information is available to applicants seeking information about programs. Two recent studies assessing the quality of information on program websites found that there is a paucity of

**Table 3**  
Factors associated >\$5000 application costs.

Survey response	<\$5000 spent	>\$5000 spent	P value
Number fellowship applications			
0–10	1 (1.6%)	0 (0.0%)	.205
11–15	0 (0.0%)	1 (2.1%)	
16–20	4 (6.3%)	0 (0.0%)	
21–25	7 (11.1%)	4 (8.5%)	
26–30	19 (30.2%)	10 (21.3%)	
31+	32 (50.8%)	31 (66.0%)	
Interviews received			
<5	1 (1.6%)	0 (0.0%)	.022
5–10	9 (14.3%)	3 (6.4%)	
11–15	23 (36.5%)	9 (19.1%)	
16–20	18 (28.6%)	13 (27.7%)	
21–25	11 (17.5%)	14 (29.8%)	
26+	1 (1.6%)	7 (14.9%)	
Interviews attended			
<5	1 (1.6%)	0 (0.0%)	.001
5–10	22 (34.9%)	5 (10.6%)	
11–15	39 (61.9%)	31 (66.0%)	
16–20	1 (1.6%)	9 (19.1%)	
21–25	0 (0.0%)	2 (4.3%)	
Same city multiple times			
No	29 (46.0%)	13 (27.7%)	.049
Yes	34 (54.0%)	34 (72.3%)	
Restrictions on program applications			
No	15 (23.8%)	14 (29.8%)	.621
Yes	34 (54.0%)	21 (44.7%)	
Unsure	14 (22.2%)	12 (25.5%)	
Video conferencing			
No	27 (42.90%)	28 (59.60%)	.099
Yes	20 (31.70%)	7 (14.90%)	
Unsure	16 (25.40%)	12 (25.50%)	
Interview at a single location			
No	20 (31.7%)	18 (38.3%)	.728
Yes	27 (42.9%)	17 (36.2%)	
Unsure	16 (25.4%)	12 (25.5%)	
Open to any change			
No	14 (22.2)	17 (36.2)	.108
Yes	49 (77.8)	30 (63.8)	

available information online regarding arthroplasty fellowships [15,16]. This deficiency would need to be addressed by fellowship programs if such a system were adopted.

Another cost- and time-saving option would be to conduct virtual or videoconferencing interviews. We found that only 25% of applicants felt that videoconferencing interviews were an acceptable replacement for in-person interviews. Although our survey was conducted before the majority of the impact of the viral pandemic on this country, this finding underscores the importance that will be placed on being innovative in the conduction of these virtual interviews. It should be noted that the applicants surveyed likely did not participate in a virtual interview format. However, limited data on virtual interviewing from one arthroplasty fellowship suggest there is an 85% applicant satisfaction rate [9]. However, 30% of surveyed videoconference interviewees felt the virtual format was not preferable, and 34% stated that the videoconference format negatively impacted that program's rank position [9]. When virtual interviews are conducted, it is likely best that information about the program is distributed to the applicants before the interview so that informed questions can be asked. Video tours of the hospital may also be a positive for applicants [9]. Still, applicants did recognize the costs and time savings and were thankful for that aspect of virtual interviewing [9]. However, perceptions of remote interviewing may be worth revisiting after the 2020-21 fellowship application season.

Central location interviewing is yet another option which has been proposed [6]. Moving interviews to a central location could make interviews more efficient by allowing applicants to interview at multiple programs in a single location. However, it would not allow the applicant to personally visit and observe the facilities of each fellowship program. While many programs may not provide facility tours even during on-site interviews, only 40% of arthroplasty fellowship candidates in this study felt a switch to a central location for interviews was an acceptable alternative. Based on another survey of fellowship applicants, case volume, surgical variety, and program reputation were the most important factors associated with fellowship program choice [17]. To this end, we asked applicants whether interviews significantly altered their preinterview season rank lists. Nearly all applicants felt that an interview changed their feelings about a program's position on their rank list, and 48% felt they made large changes.

It is unlikely that one change will optimize the interview experience for both applicants and arthroplasty fellowship programs. Instead, a combination of changes may be best. For instance, it may be possible to limit the number of applications and conduct virtual or centralized interviews. Even if centralized interviews are centralized on a per city or per state basis (ie, 7 programs in New York City, 4 programs in Boston, and so on), this could significantly limit applicant travel burden for those interested in those regions. While this would require a coordinated effort, the smaller scale may be more logistically manageable than those conducted at a busy national meeting. In the absence of any changes to the adult reconstruction fellowship match process, it is likely that financial and temporal costs will continue to grow in an unrestrained fashion, as there appears to be applicant-perceived pressure to apply to and attend a large number of interviews to enhance match likelihood.

There are multiple limitations that should be considered with regard to the study. First, while our response rate was reasonable (40%), it would have been preferable to have an even higher response rate. Second, our survey questions were asked in a categorical format, and therefore, we are unable to calculate exact mean

values. While this was a decision made to optimize survey completion, offering free response options may have provided additional insight. In addition, we capped our survey at 10 questions (again, in an effort to maximize participation), and certainly more granularity may be gained with a more comprehensive survey. Finally, given that the surveyed cohort was drawn from applicants to a single fellowship program, findings may not be generalizable to the entire applicant cohort (although the surveyed cohort did represent a significant portion of the total applicant pool). Despite these limitations, this is the largest known study of this type to examine adult reconstruction fellowship candidates in particular and offers valuable insight regarding current trends.

## Conclusions

While adult reconstruction fellowship training has become increasingly competitive and remains a net-positive financial investment [18], the applicant burden from a financial and time perspective has become substantial. It is disheartening to learn that the application and interview process may cost some applicants >1-month's salary [19] and require a time commitment of up to 3 weeks. Therefore, it may be time to consider potential solutions to avoid unnecessary costs and time away from training. Our survey identified that applicants are mostly in favor of an application cap, although there is some support for centralized interviews, but less for virtual interviews. These results should be considered in attempts to improve the current fellowship application and interview process.

## Conflict of interests

G. A. Erens receives other financial support from Zimmer-Biomet; receives publishing royalties from UpToDate; and has stock or stock options in Johnson and Johnson.

For full disclosure statements refer to <https://doi.org/10.1016/j.artd.2021.01.008>.

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**Appendix**

1. How many fellowship programs did you apply to?
  - a. 0-10
  - b. 11-15
  - c. 16-20
  - d. 21-25
  - e. 26-30
  - f. 30+
2. How many interview offers did you receive?
  - a. <5
  - b. 5-10
  - c. 11-15
  - d. 16-20
  - e. 21-25
  - f. 25+
3. How many interviews did you attend?
  - a. <5
  - b. 5-10
  - c. 11-15
  - d. 16-20
  - e. 21-25
  - f. >25
4. Did your on-site interviews change your pre-interview season projected rank list?
  - a. Yes: large changes
  - b. Yes: small changes
  - c. No
5. Did you ever travel to the same city on multiple separate occasions to interview at different programs in the same city?
  - a. Yes, 0-2 times
  - b. Yes, 3-5 times
  - c. Yes, >5 times
  - d. No
6. How many days of work did you miss for travel/interviews?
  - a. 0-5
  - b. 6-10
  - c. 11-15
  - d. 16-20
  - e. 20-30
  - f. 30+
7. What is your estimated total cost for interviews (including travel, lodging, etc.)?
  - a. \$0-\$1000
  - b. \$1000-\$2000
  - c. \$2000-\$3000
  - d. \$3000-\$4000
  - e. \$4000-\$5000
  - f. >\$5000
8. Do you feel that interviews conducted at a single location (ie, national meeting like AAHKS or Academy) would be a satisfactory substitute for on-site interviews?
  - a. Yes
  - b. No
  - c. Unsure
9. Do you feel that interviews conducted via 2-way video conferencing (ie, Skype, Zoom, etc.) would be a satisfactory substitute for on-site interviews?
  - a. Yes
  - b. No
  - c. Unsure
10. Do you feel that a strict limit on the number of programs that applicants can apply to would benefit applicants and/or programs?
  - a. Yes
  - b. No
  - c. Unsure