

Trends in Pediatric Orthopaedic Fellowship

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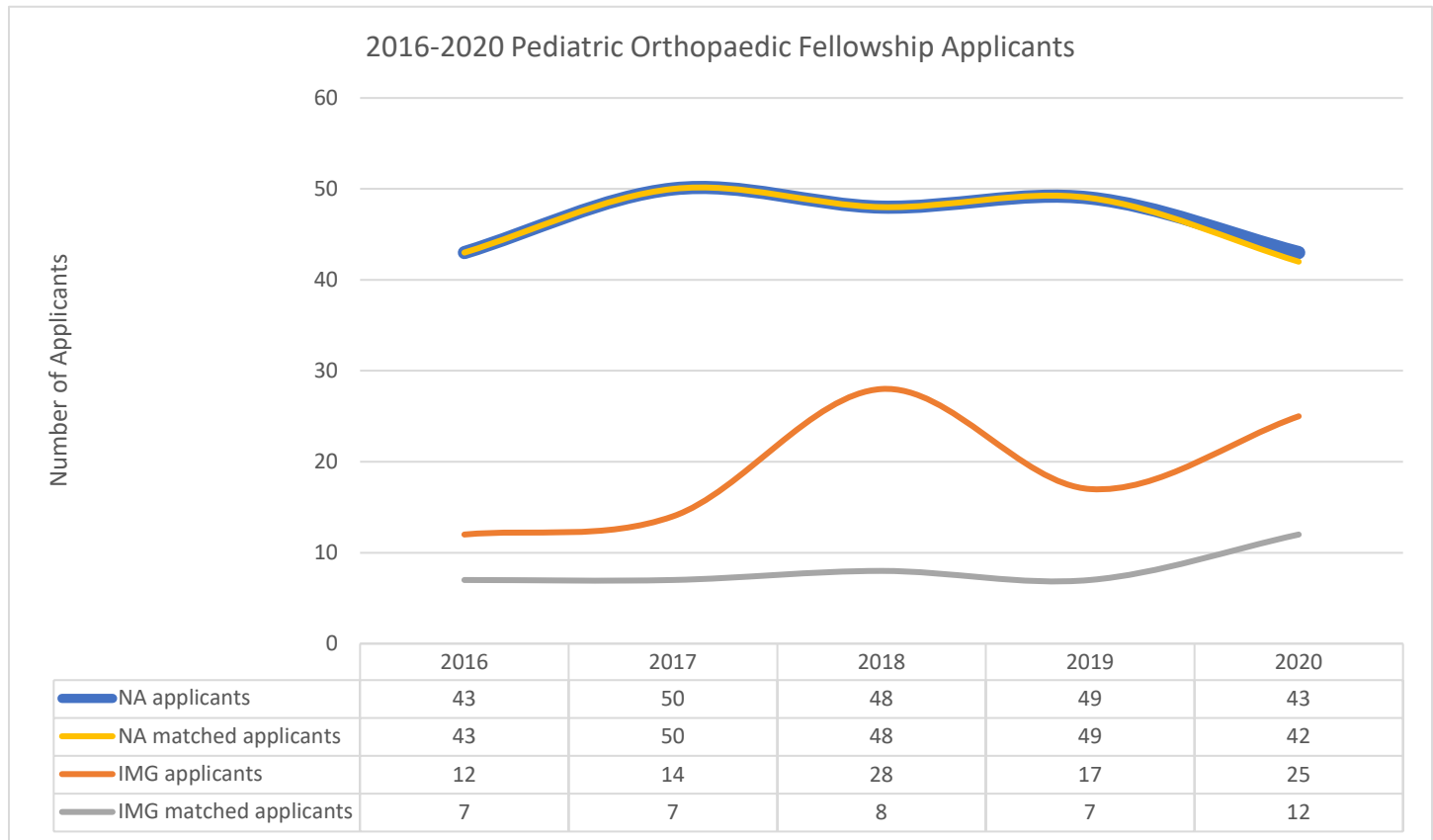
Introduction

With many orthopaedic job markets seeking fellowship-trained surgeons, the additional year of fellowship training has seemingly become one of necessity.¹ Over the past two decades, graduates of orthopaedic residency training programs have pursued subspecialized fellowship training at an increasing rate.²⁻⁴ Notably, the climate of pediatric orthopaedics has seen a steady increase in both the number of applicants and available positions offered. A recent report highlights that despite a 25% increased number of North American (NA) applicants since 2010, the match rate for NA applicants remains highly successful.⁵

In 2006, the Association of American Medical Colleges (AAMC) recommended that medical school enrollment and number of residency positions increase by 30% to accommodate the growing economy and workforce demands.⁶ Salsberg et al. found that this expansion effort manifested in a 7.1% increase in orthopaedic post-graduate year 1 (PGY-1) residents between 2001 and 2007.⁶ Additionally, their 2008 study on the orthopaedic workforce predicted that by 2020, a third of the orthopaedic physician population would retire.⁶ With an aging work force and an overall growing demand for pediatric orthopaedic surgeons, we raise the question if the recent growth in pediatric orthopaedic fellowship applicants and positions will appropriately match the workforce demand.

In this publication, we aim to analyze and discuss recent trends in pediatric orthopaedic fellowship match data over the past 5 years. Specifically, we present the number of applications submitted, interviews offered, interviews attended, number of programs ranked, and match rates for NA and international medical graduate (IMG) applicants separately. We will share additional pertinent information from the applicant match surveys completed in recent years. We will identify positive predictive factors associated with a successful match. With the presented information and discussion, we seek to enhance the match process efficacy for future applicants and fellowship programs.

It is notable that prior to 2019, the San Francisco (SF) Match database included 'Pediatric Orthopaedic Surgery' as an independent specialty. Starting with the 2019 match, all orthopaedic subspecialty matches were clustered within the specialty category named 'Orthopaedics.' Applicants in the 2019 and 2020 match cycles who applied for fellowship programs *across multiple subspecialties* were excluded from our analysis, as we were unable to quantify the number of applications submitted or interviews attended specifically for pediatric orthopaedic fellowship programs. Thus, included in our data are the applicants who applied exclusively to pediatric orthopaedic fellowship programs from 2016 through 2020. The SF

Figure 1. Trend in NA and IMG Applicants and Match Rates

match occurs in April of each year; thus, this study evaluates the past 5 years (2016, 2017, 2018, 2019, and 2020) of the SF match.

The Pediatric Orthopaedic Society of North America (POSNA) applicant post-match surveys from 2017-2020 were also analyzed to report on variables including total costs, cost per interview, time committed to travel and interviews, participation in a second fellowship, as well as the perceived value of ACGME and POSNA accreditation.

In addition to reviewing the match process, we will share the results of a web-based questionnaire recently sent to 42 pediatric orthopaedic fellowship program directors (PDs) in the United States. The survey was designed to identify the most important factors used in evaluating and, ultimately, ranking pediatric orthopaedic fellowship

applicants. Twelve criteria were displayed in a random order for each survey recipient. PDs were asked to rank all 12 factors in order of importance. In addition, a free-text field was provided in which PDs could write-in any additional factor(s) they considered important when ranking fellowship applicants. Completed surveys were then used to create a weighted score for each of the 12 criteria (and any write-in criteria).

The SF Match

In last year's match cycle (2020), 44 pediatric orthopaedic fellowship programs offered 72 training positions through the SF match system. Of these, 29 programs with 54 positions successfully matched a fellow. Sixteen programs did not match, with 18 positions remaining vacant. Of the applicants who successfully matched in 2020, all matched at a program ranked within the top three of their rank list. In 2019,

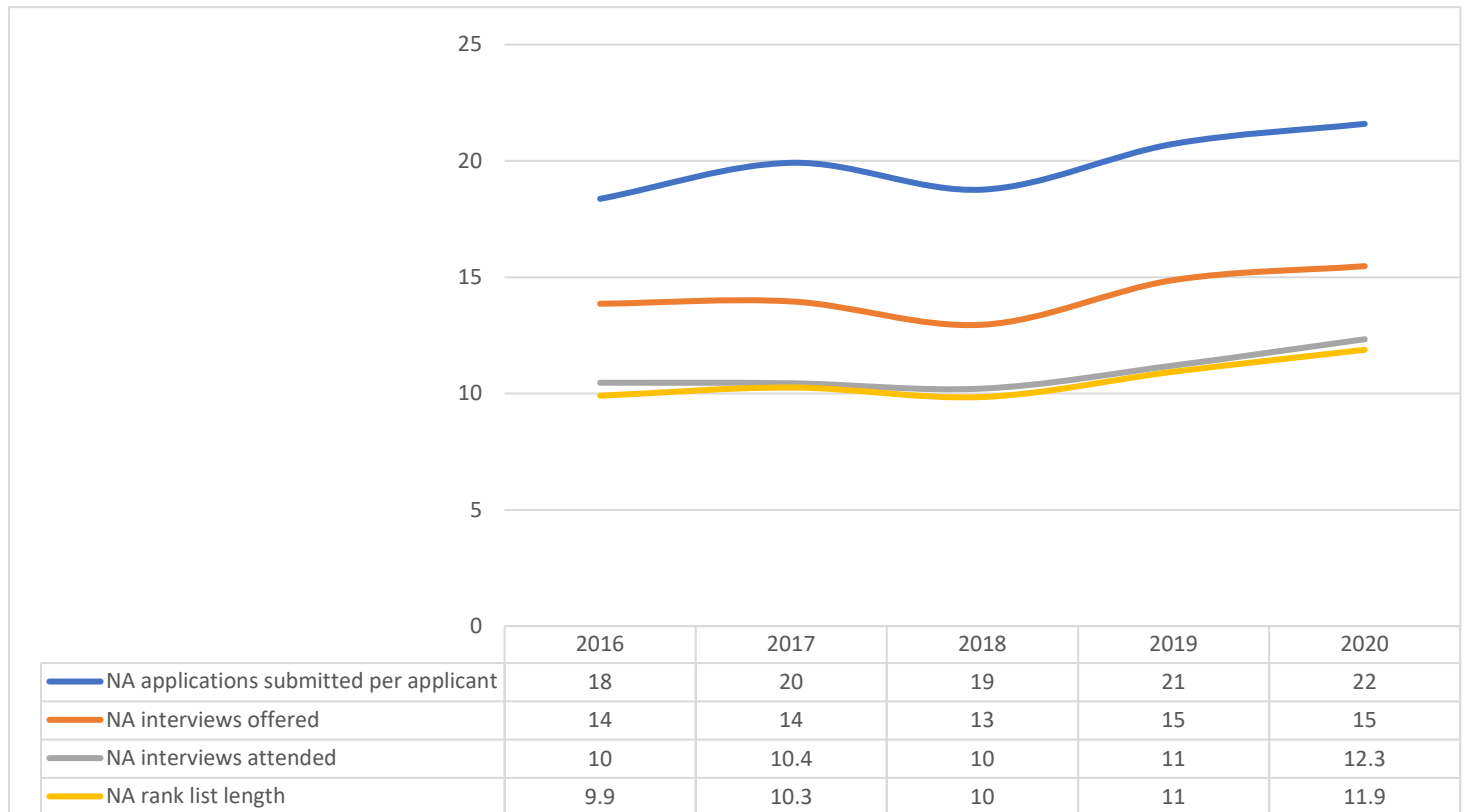
Figure 2. North American Applicant Trends

Figure 2. NA applications submitted per applicant (blue) and NA interviews offered (orange) – Y-axis on the left, NA interviews attended (gray), and NA rank list length (yellow) – Y-axis on the right

93% of matched applicants successfully matched at programs ranked within the top three of their rank list.

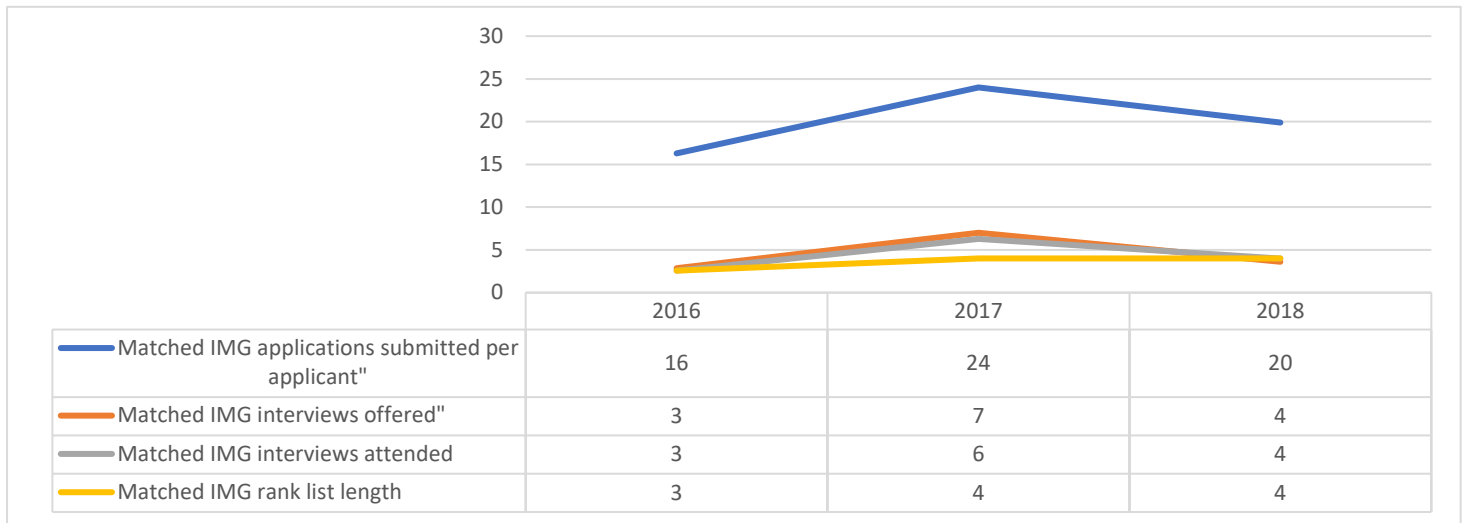
Over the past 5 years, 2016-2020, an average of 46 (range: 42-50) NA and 19 (range: 12-25) IMG applicants have applied to pediatric orthopaedics in the SF match per year (Figure 1). During this 5-year period, 99.6% of NA and 42.7% of IMG applicants successfully matched into a pediatric orthopaedic fellowship.

Amongst NA applicants, the average number of programs applied to per applicant has increased 12.7% ($p=0.081$) from 2016 to 2020 (Figure 2). NA applicants received an interview invitation to 71% of the programs to which they applied. In the 2020 match cycle, applicants completed 18% ($p=0.026$) more interviews than applicants in 2016, 12.3 vs. 10.4, respectively.

Similarly, applicants ranked 20% ($p=0.013$) more programs in 2020 than in 2016 (11.9 vs. 9.9 programs).

From 2016-2018, IMG applicants applied to an average of 19 programs. Among IMG applicants who successfully matched, the average number of interviews attended was 4.4 (Figure 3). Comparatively, IMG applicants who did not match attended only 2.4 interviews (Figure 4). The number of programs applied to per IMG applicant was not a factor in predicting a successful match. However, completing five or more interviews was a positive predictor of a successful match for IMG applicants (OR 6.69, CI: 1.55 to 28.85).

Fellowship programs ranked an average of 13.4 applicants in 2020, a 24% increase compared to the 2016 match (Figure 5). Fifty-nine percent of programs

Figure 3. Matched International Medical Graduate Applicant Trends

matched applicants ranked within their top five, and 76% of programs matched applicants ranked with their top 10 in 2020.

Fellowship Director Survey

There was an overall 69% (29 of 42) response rate to the fellowship program director survey. Results of the weighted scores showed the interview was found to be the most important factor overall, with a weighted score of 117, followed by letters of recommendation (weighted score 109), personal connections to the applicant and/or letter writers (weighted score 52), research experience (weighted score 35), and comments regarding the applicant's technical competence (weighted score 29). Forty-eight percent of responding PDs reported that the interview performance was the top ranked factor in determining an applicant's rank position. The lowest ranked factors (least important) included: the applicant's geographical ties to the fellowship city, the reputation of the applicant's medical school, and interesting life experiences.

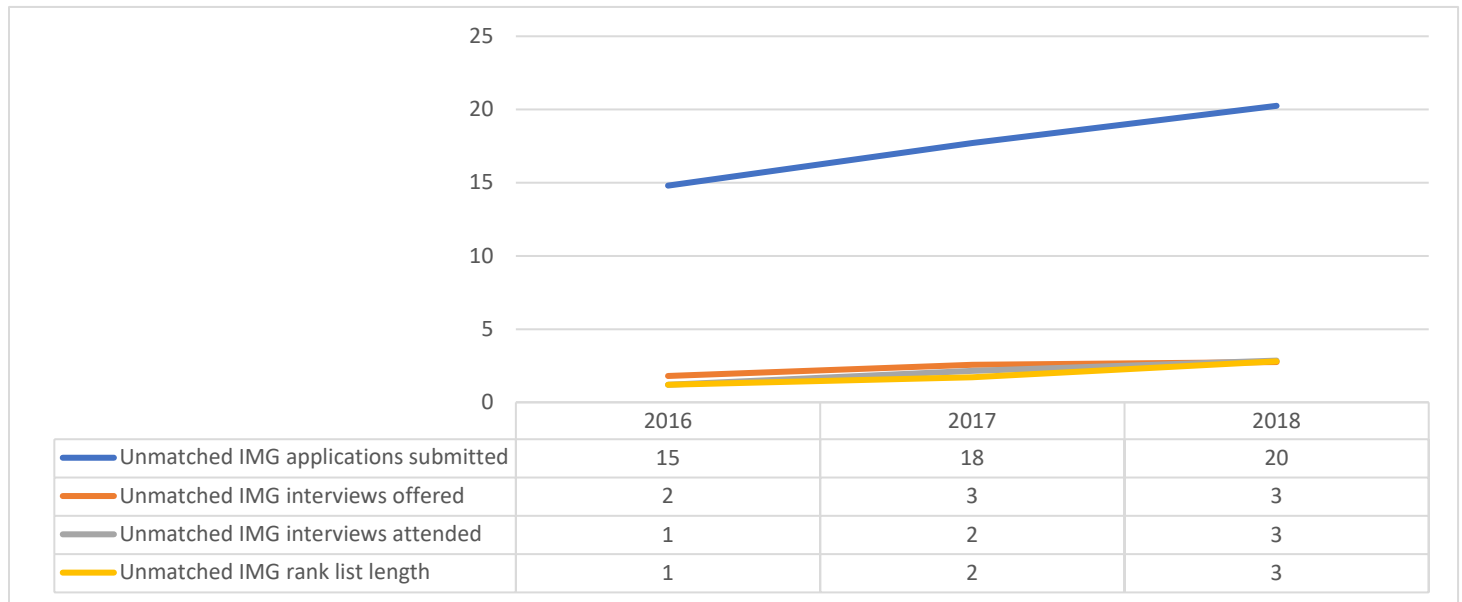
Post-Match Applicant Survey

Post-match applicant survey responses from 2017-2020 report an estimated per-interview cost ranging between

\$390 (2016) to \$472 (2019). Eighty-five percent of the applicants completed the 2020 post-match applicant survey, demonstrating an average overall cost for the application and interview process of \$4,260 per applicant.

Forty-two percent of applicants in the 2016 SF match reported completing at least one fellowship interview while at the International Pediatric Orthopaedic Society (IPOS) or American Academy of Orthopaedic Surgeons (AAOS) meetings. In both 2019 and 2020, however, only 2% of applicants reported completing interviews during the IPOS or AAOS meetings. The 2020 AAOS meeting was cancelled due to the COVID-19 pandemic. In 2020, 59% of applicants reported they were able to attend multiple interviews during a single travel itinerary due to the availability of regionally based interview dates.

In 2019 and 2020, applicants were asked if the accrediting body for the programs influenced their rank list (i.e., ACGME accredited programs vs. POSNA only accreditation). Eight of 10 IMG respondents (80%) reported that accreditation influenced their choices, whereas only eight of the 36 NA respondents (22%) reported accreditation as a factor in determining their rank list.

Figure 4. Unmatched International Medical Graduate Applicant Trends

In 2020, 33% of all applicants including 15% of NA applicants planned to complete another fellowship in addition to their pediatric orthopaedic fellowship. The most common second fellowship subspecialties were sports, hip preservation, and deformity correction.

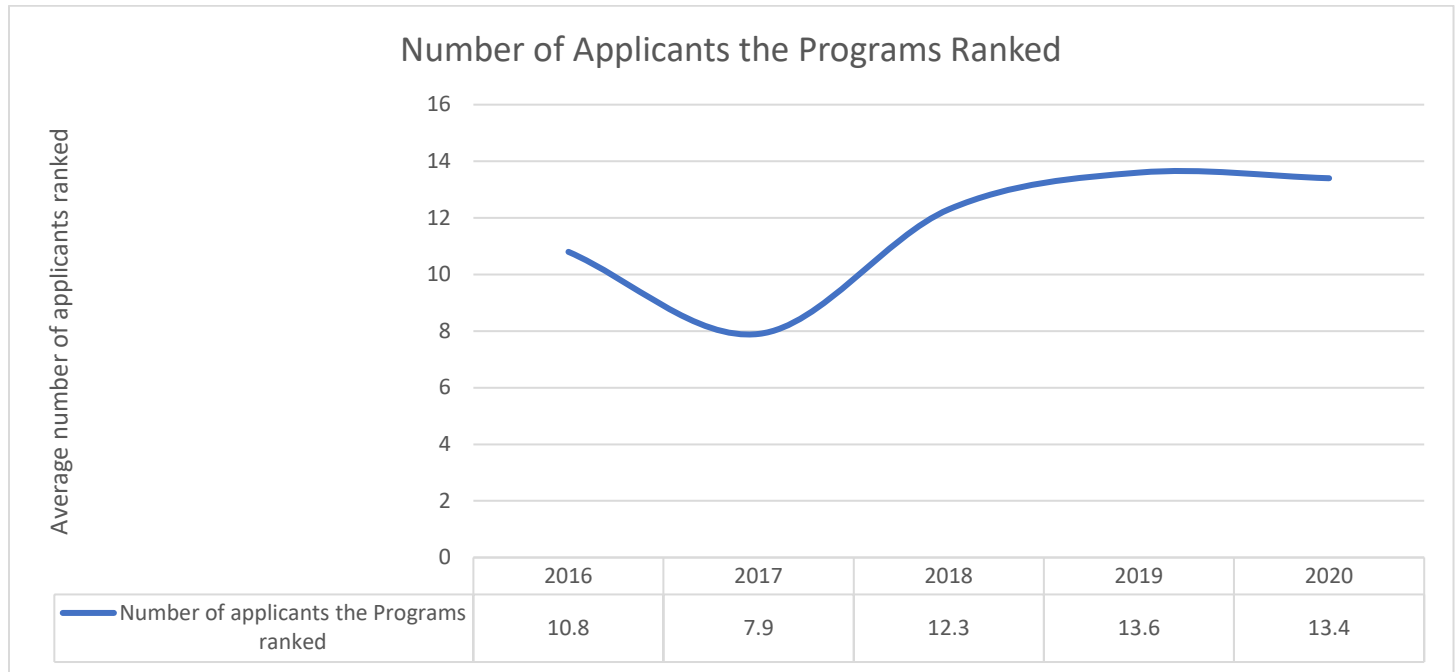
Summary

Despite a 99.6% successful match rate, NA applicants have submitted more applications, traveled to more interviews, and ranked more programs over the past 5 years (2016-2020). Moreover, these trends are consistent over the past decade since the inception of the SF-match program for pediatric orthopaedic fellowships. Our analysis reveals that NA applicants are offered an interview to more than 70% of the programs to which they apply. In 2019 and 2020, applicants attended an average of 11.7 and 10.5 interviews, respectively, nearly double the rate of interviews attended by applicants a decade ago in 2010 and 2011.³ This parallels a similar trend seen in the orthopaedic residency application and match process.⁷ While the total number of NA applicants has remained constant over the past 5 years, the observed culture of applying and interviewing widely

may be influenced by the increasingly competitive nature of matching into an orthopaedic residency.⁷

Over 90% of matched applicants have matched at a program ranked within their top five ranked programs since 2015.⁵ This trend has continued with 93% of 2019 matched applicants matching at their top three ranked programs, and 100% of matched applicants in 2020 successfully matching at their top three ranked programs. For over a decade, the pediatric orthopaedic fellowship match process has proven to be consistent at successfully matching both applicants and programs within top the five of their rank lists. Considering these statistics, the trend of increased application submission and interviews attended is arguably unnecessary.

The SF Match experience and results for IMG applicants have remained stable over the past decade. In the past 5 years, 7-8 IMG applicants have matched into pediatric orthopaedic fellowships each year. In 2020, there was an increase to 12 IMG matches. With an overall 43% (29-58%) match rate for IMG applicants, interviewing at a minimum of five programs is associated with a 6.69 times likelihood of matching compared to applicants

Figure 5. Average Number of Applicants Ranked by Programs

who interview at four programs or less. While an overall average of 19 applications were submitted per IMG applicant, an increased number of application submissions may yield more interview opportunities and subsequently, an increased likelihood of a successful match.

From the perspective of program directors, the interview day performance and letters of recommendation are the two most important factors in determining where an applicant is ranked. This further emphasizes the benefit of increasing opportunities to interview. Moreover, an estimated 51% of all orthopaedic surgeons leave their first job within 5 years; however, only 5% of pediatric orthopaedic subspecialty surgeons have been reported to change jobs early in their careers.^{8,9} The disproportionately low attrition rate is unique to the pediatric orthopaedic subspecialty. Opportunities to interview with pediatric orthopaedic faculty at various programs may ultimately have a positive influence on helping an applicant find the best fit post-fellowship job.

The COVID-19 pandemic did not have a significant impact on the 2020 interview season, with few reported instances of cancellations due to travel restrictions. The 2021 fellowship interviews, however, will be exclusively video based across all orthopaedic subspecialties. This may offer more interview opportunities for programs and applicants. Additionally, virtual interviews should have positive impacts for the applicants: decreasing the financial burden and less time spent away from residency training programs due to travel. Presuming travel restrictions are lifted and the interview process returns to “normal” in the coming years, we should continue to work toward strategies that diminish the costs of interview-related travel for applicants. This may include reimbursement of travel expenses/hotel accommodations, conducting interviews at the IPOS and AAOS meetings, and continued collaboration amongst programs to provide regionally coordinated interview dates. Understanding and improving the virtual fellowship interview formats may also prove to be a successful option for some programs/applicants, which

we hope to reflect upon as we conclude the upcoming interview season.

A new accrediting body of pediatric orthopaedic fellowships, POSNA, has recently been employed in addition to, or at many programs, in place of the Accreditation Council for Graduate Medical Education (ACGME).³ Since its inception in 2015, there has been a steady increase in the number of fellowship programs that have adopted it. All 45 programs in the 2021 SF match are POSNA accredited; 21 programs are accredited through POSNA alone, while 24 remain ACGME accredited. Notably, two pediatric orthopaedic fellowship programs changed their accreditation from ACGME to POSNA (Children's Healthcare of Atlanta and the University of Utah). There are also two newly formed fellowship programs (UCSF and Children's of Mississippi), which are accredited solely through POSNA.

Considering the increasing trend in the number of fellowship programs, positions available, and number of applicants in the past decade, the number of fellowship-trained pediatric orthopaedic surgeons entering the workforce is growing each year. The POSNA fellowship accrediting committee has been exemplary in their task of defining standards specific to the pediatric orthopaedic surgeon's core skillset. Only 22% of post-match survey NA respondents reported that accreditation status influenced their program rank list; however, as the POSNA accreditation further elucidates "standards of comprehensive pediatric orthopaedic training," we may see a decrease in the number of fellowship programs maintaining ACGME accreditation.

Final Note

While the number of applicants per year has remained relatively constant, there is a growing trend of applicants applying and ranking more programs in the past 5 years. Similarly, fellowship programs have ranked more applicants in the past 2 years compared to 2016. This information leads us to ask important questions about the

future of our workforce, the application process, and the accreditation of existing pediatric orthopaedic fellowship programs. Consistently each year, 40-50 NA applicants match and enter the workforce, and we speculate this trend will continue in future years. In light of this, here are some thoughtful questions we can also propose for future discussion: (1) How many fellowship programs should exist to train our workforce? There are currently 45 active programs, but 18 positions at 16 programs did not fill last year. (2) Should we continue to add more pediatric orthopaedic fellowship programs for training, considering that we do not have enough applicants to fill all available positions? (3) POSNA accreditation began in the past several years and has established multiple requirements for each program to ensure adequate training to our fellows. Should we also delineate the specific type/number of cases each fellow is required to experience—i.e., hip procedures, spine procedures, etc.? Furthermore, should we hold all programs accountable to these standards, including the ACGME accredited programs, to ensure that our pediatric orthopaedic workforce is providing consistent education and training to meet the needs of our pediatric patient population?

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