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Original Research

Characterizing Leadership Trends in Hand Surgery Fellowship Programs



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Purpose: The purpose of this study was to characterize academic and demographic factors most associated with fellowship director (FD) roles in hand surgery programs. A secondary aim was to characterize educational and employment trends. The final aim was to compare these findings with those in other orthopedic subspecialties.

Methods: Domestic programs were identified using the American Society for Surgery of the Hand fellowship directory. Data were collected via internet searches of publicly available information and direct contact with programs. Variables included demographic characteristics (age, sex, and race/ethnicity), education and employment history, Hirsch index (H-index) research productivity, and membership of select hand surgery societies.

Results: Information about 86 FDs was collected from a total of 88 identified hand surgery fellowships. Seventy-six (88.4%) FDs were men, whereas 10 (11.6%) were women. The mean age was 53.3 years. Most FDs (n = 68, 79.1%) completed their residency in orthopedic surgery. The average Scopus H-index was 16.3. Most FDs were White (n = 64, 74%) followed by Asian (n = 14, 16%). The mean duration from fellowship completion to FD appointment was 12.6 years, whereas the mean duration of employment at an institution before FD appointment was 17.9 years. The mean duration of tenure as an FD was 9.8 years. Twenty-eight (32.94%) individuals served as an FD at their residency institution and 20 (23.5%) led at their fellowship institution. The most frequently attended residency institution by FDs was University of Pennsylvania, whereas Mayo Clinic was the most frequently attended fellowship program. Six FDs have served as the presidents of a hand surgery society.

Conclusions: Fellowship directors are largely White and men. They are distinguished by their research productivity. A few select programs contribute an outsized proportion of individuals to FD positions. This may be due to a pipeline effect or because applicants with ambition to become FDs pursue specific programs for training.

Clinical relevance: This study characterizes the academic/demographic factors of hand surgery FDs.

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Hand surgery is a coveted fellowship for residents from orthopedic, plastic, and general surgery. There has been a growing focus on evaluating trends in the representation and drivers of success in such fellowships.^{1–4} One study found that, from 1995 to 2012, there

was a significant increase in African American, Asian, and female representation in hand surgery fellowships.⁵ Another study found that letters of recommendation, evidence of technical prowess, and residency reputation were among the most important factors contributing to interview offers for applicants.⁴

However, little work has been done to characterize the leadership of the fellowship. Within orthopedic surgery more broadly, several recent studies have focused on demographic, educational, and geographic leadership trends within the spine, trauma, adult reconstructive, and pediatric orthopedic fellowship programs. These studies found that factors such as research output and

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residency program reputation were significant predictors of fellowship leadership across orthopedic subspecialties.^{6–9} Such studies not only characterize current leadership but also provide future leaders a possible roadmap. To our knowledge, there have been no similar published studies on fellowship directorship within hand surgery. The primary aim of this study was to characterize the demographic profile and educational backgrounds of current hand fellowship directors and compare these findings with those in other orthopedic subspecialties. This study hypothesized that levels of female and non-White representation are similar to those in other studied orthopedic subspecialties and that fellowship director training is evenly distributed among different residency and fellowship programs. Its primary outcomes were the sex, race/ethnicity, and training background of fellowship directors.

Materials and Methods

The American Society for Surgery of the Hand (ASSH) online directory was reviewed to obtain a comprehensive list of fellowship programs within the United States and identify current fellowship directors and coordinators. A review of publicly available curricula vitae on fellowship director websites was conducted to obtain demographic and educational background information for each fellowship director. Demographic information included age, self-reported race/ethnicity, and sex. Educational background included institutions attended from medical school onward and dates of degrees conferred. The year of appointment to the fellowship director position and the year of employment at the current institution were both noted. For directors with incomplete information after this review, a survey was emailed to fellowship coordinators and directors.

Lists of the past presidents of ASSH, the American Association for Hand Surgery, and the American Foundation for Surgery of the Hand were obtained and cross-referenced with the list of current fellowship directors. Finally, the online Scopus (Elsevier BV) database was used to obtain an H-index for each director as a metric for research productivity. The H-index is generated from an automated review of an extensive compilation of peer-reviewed literature and reflects an author's cumulative research output as a function of citation quantity and impact. Demographic characteristics were characterized by percentages. Mean intervals and standard deviations among fellowship, employment, and fellowship director appointment were calculated. Correlations among years as a fellowship director, age, and the H-index were calculated using the Pearson correlation coefficient.

Results

A total of 88 hand surgery fellowships were identified, and leadership information regarding 85 could be retrieved. The remaining 3 programs included 1 program that is no longer an orthopedic fellowship and 2 programs with no fellowship director listed online and with which communication could not be established despite repeated efforts. Eighty-four fellowship programs had 1 fellowship director, and 1 institution had 2 codirectors. Demographic information was gathered for the 86 fellowship directors (Table 1). Of the 86 fellowship directors, 76 (88.4%) were men and 10 (11.6%) were women. Sixty-eight (79.1%) fellowship directors completed residency in orthopedic surgery, whereas 15 (17.4%) fellowship directors trained in plastic surgery and 3 (3.5%) in general surgery. The mean age was 53.3 years. Of the fellowship directors, 64 (74%) were White, 14 (16%) were Asian, 2 (2%) were Hispanic/Latino, 2 (2%) were South Asian, 3 (3%) identified as Eurasian, and 1 (1%) was Black.

Table 1
Demographic Characteristics of Fellowship Directors

Characteristics	n	%
Sex		
Male	76	88.37
Female	10	11.63
Specialty		
Orthopedic surgery	68	79.07
Plastic surgery	15	17.44
General surgery	3	3.49
Ethnicity		
Asian	14	16.28
White	64	74.42
Hispanic	2	2.33
Black	1	1.16
South Asian	2	2.33
Eurasian	3	3.49
Mean age (years)	53.18	
Mean H-index	16.34	

The mean duration from fellowship completion to fellowship director appointment was 12.4 years (Table 2). The distributions of employment history, including residency and fellowship graduation years, year hired, year appointed as fellowship director, durations between these landmarks, and durations in these positions, can be seen in Figure 1. Twenty-eight (32.9%) individuals served as the fellowship director at their residency institution, 20 (23.5%) led at their fellowship institution, and 9 (10.6%) completed residency and fellowship at the same program and now serve as the director. The number of years as fellowship director was weakly correlated with the H-index ($r = 0.4$, $P = .001$); the correlation between age and H-index was not significant ($P = .106$) (Table 2). The most impactful fellowship director earned a Scopus H-index value of 60, whereas both the ninth and tenth most impactful fellowship directors in research had Scopus H-index values of 27 (accessed on April 15, 2021). The average Scopus H-index was 16.3. A histogram showing the distribution of all fellowship director H-indices shows that most fellowship directors have a score between 11 and 20 (36/86) (Fig. 2).

The top 6 residency institutions for producing fellowship directors were University of Pennsylvania ($n = 6$), Hospital for Special Surgery ($n = 5$), University of Pittsburgh ($n = 4$), and New York University, Columbia University, and University of Virginia in a 3-way tie ($n = 3$) (Fig. 3A). Nine programs produced 2 fellowship directors. Mayo Clinic was the most frequently attended fellowship program ($n = 8$), followed by New York University, Columbia University, and Indiana Hand to Shoulder Center, each of which trained 3 fellowship directors. University of Pittsburgh, University of Pennsylvania, Duke University, and Hospital for Special Surgery each produced 2 fellowship directors (Fig. 3B).

Regarding hand surgery society leadership, 6 current fellowship directors served as presidents of national societies in total. Three current fellowship directors served as ASSH president, 2 served as American Association for Hand Surgery president, and 1 served as American Foundation for Surgery of the Hand president.

Discussion

Advancement to educational leadership is a goal of many young physicians. However, there is little guidance for aspiring fellowship directors in tailoring their approach to training, society membership, and research. Our results suggest that research productivity is strength for many fellowship directors. An analysis suggests that certain residencies and fellowships produce a disproportionate number of future fellowship directors. Most hand surgery fellowship directors completed residency in orthopedic surgery, and the

Table 2
Education, Employment, and Career Progression of Fellowship Directors

Education and employment	Mean	SD
Mean year residency graduation	1997	±10.52
Mean year fellowship graduation	1998	±10.58
Mean duration from fellowship completion to fellowship director appointment	12.39	±8.06
Mean time from hire at current institution to fellowship director appointment	7.95	±7.07
Mean duration of employment at current institution	17.74	±10.02
Mean duration of fellowship director position	9.74	±9.29
Institutional loyalty	n	%
Number at same as residency	28	32.94
Number at same as fellowship	20	23.53
Number at same as both	9	10.59
Correlated H-indices	r	P value
Years as fellowship director versus H-index	0.3838	.001
Age versus H-index	0.2015	.106



Figure 1. Employment history distribution by **A** year and **B** duration. Fellowship–fellowship director (FD) duration refers to the length of time between graduating fellowship and being appointed FD. Hire-FD duration refers to the length of time between hire at the current institution and FD appointment. Boxes represent the interquartile range.

average time from fellowship completion to becoming a fellowship director was longer than that in all other studied orthopedic subspecialties. Finally, hand surgery fellowship directors have a similar demographic distribution as fellowship directors in other orthopedic fields and that societal leadership roles were uncommon.

One notable finding was the impact of the research output. Hand surgery fellowship directors had a mean Scopus H-index of 16.3, and the top 10 directors had H-indices of greater than 25 (Table 1, Fig. 2). This finding accords with the high research productivity of fellowship directors in other orthopedic subspecialties. In comparison, a study found that the mean H-indices across 2,061

H-indices of FDs

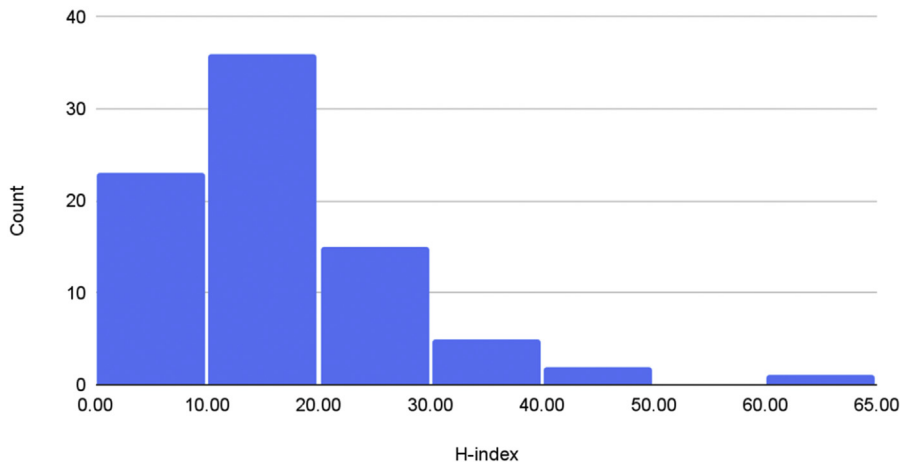
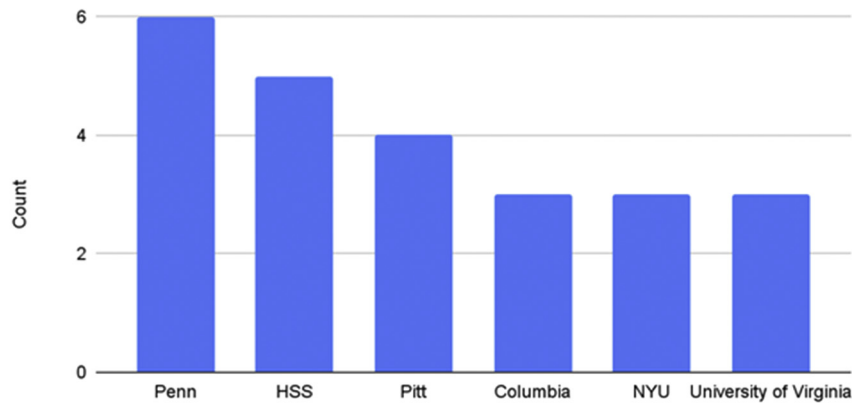


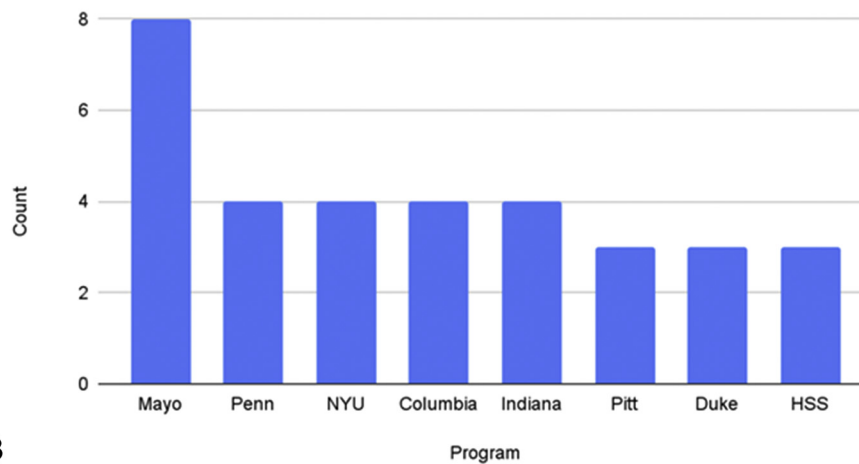
Figure 2. Hirsch indices of hand FDs. FD, fellowship director.

Most Frequently Attended Residency Programs



A

Most Frequently Attended Fellowship Programs



B

Figure 3. Most frequently attended A residency and B fellowship programs among hand fellowship directors. HSS, Hospital for Special Surgery; NYU, New York University; Penn, University of Pennsylvania; Pitt, University of Pittsburgh.

academic orthopedic surgeon associate professors and professors were 8.4 and 15.1, respectively.¹⁰ Fellowship directors in adult reconstructive, trauma, and pediatric orthopedics had similar mean

H-indices of 16.6, 15.1, and 17.2, respectively.^{7–9} However, fellowship directors for spine programs had the highest mean H-index of 23.8.⁶ The majority of hand surgery fellowship directors had

H-indices between 10 and 20, and only 7 (9.3%) of them had H-indices of greater than 30, paralleling the distribution in other orthopedic subspecialties in which most fellowship directors have H-indices of less than 30 (Fig. 2).^{6–9}

This study also demonstrates the pipeline effect that certain residency and fellowship programs have on producing fellowship directors. University of Pennsylvania, Hospital for Special Surgery, and University of Pittsburgh were the most common residency programs and trained 18% of the current hand surgery fellowship directors (Fig. 3A). With respect to fellowship programs, Mayo Clinic trained approximately 10% of the current fellowship directors. The next 4 programs (University of Pennsylvania, New York University, Columbia University, and Indiana Hand to Shoulder Center) encompass another 14% of the fellowship directors (Fig. 3B). Further work is necessary to better understand the success of trainees from these specific institutions. It is unknown whether these programs inherently select those candidates who they believe have the skillset to become future leaders or whether the social network associated with these programs breeds future fellowship directors. It is possible that mentorship at these institutions nurtures trainees to become fellowship directors. This is evidenced by programs such as Hospital for Special Surgery appearing in the top fellowship director–producing institutions for trauma and spine programs.^{6,9} It is also possible that candidates attracted to these programs were those interested in becoming fellowship directors in the first place.

The results of this study also revealed institutional loyalty: 28 (32.9%) of hand surgery fellowship directors serve at their residency institution, 20 (23.5%) at their fellowship program, and 9 (9.8%) at the institution where they completed both (Table 2). Although home-grown hand surgeons may have a hiring advantage at their home institutions, these numbers are greater than those for any other studied orthopedic fellowships.^{6–9} Interestingly, the time between fellowship completion and fellowship director appointment was the greatest for hand surgery relative to other orthopedic fields. The mean time from fellowship completion to fellowship director appointment was 12.4 years. For fellowship directors in other orthopedic subspecialties, the mean time from fellowship to fellowship director was less than 10 years.^{6–9} One explanation for this discrepancy may be that there are fewer fellowship director seats in hand surgery.^{6–9} Fellowships in trauma and pediatric orthopedics have recently increased in number, leading to more available positions.^{8,9}

Regarding demographic characteristics, hand surgery fellowship directors are predominantly White and men (Table 1). Only 10 (11.6%) hand surgery fellowship directors are women, paralleling the findings of other orthopedic subspecialties at all levels of training.¹¹ However, women hold more fellowship director positions in hand surgery than in spine, adult reconstruction, and trauma, in which women hold 3.9%, 0%, and 7% of the fellowship director positions, respectively.^{6,7,9} Despite this finding, Grandizio et al¹² noted that programs with female fellowship directors did not have increased female fellows or faculty. This is consistent with the overall low female presence in orthopedic surgery. From 2018 to 2019, women held 15% of the available residency positions, the lowest percentage for any medical field.¹¹ In comparison, from 2011 to 2020, the percentage of female trainees in general surgery programs increased from 36.2% to 43.1% in one study, whereas a separate study found that women compose 39% of plastic surgery residents.^{13,14} Although progress is to be made, the relatively increased representation in hand surgery is promising, as increased female representation at higher levels of leadership generally correlates with increased representation at all levels within an institution.^{12,15}

Orthopedic surgery has trailed other surgical subspecialties in racial/ethnic diversity of trainees as well.¹⁶ A 2006 cross-sectional

study found that African Americans and Hispanics/Latinos comprised a significantly smaller proportion of orthopedic residents than general surgery and neurosurgery residents. Orthopedic surgery also had the lowest representation of female residents and faculty of the surgical fields analyzed.¹⁷ According to a 2020 study, commonly cited barriers to diversifying the body of trainees have been the lack of underrepresented minority faculty and applicants.¹⁸ Indeed, 1 director in this study identified as Black and only 2 identified as Hispanic; 64 (74%) identified as White, 14 (15%) as Asian, and 2 (2%) as South Asian (Table 1). This is similar to that in other orthopedic subspecialties, with 80%, 77%, and 90% of fellowship directors identifying as White or Caucasian in adult reconstruction, pediatrics, and trauma, respectively.^{7–9}

Surprisingly, few current fellowship directors have served in the presidential roles of ASSH, American Association for Hand Surgery, and American Foundation for Surgery of the Hand. Only 6 of the 86 (7%) fellowship directors have served at least 1 term as president of one of these societies. In contrast, 13 of 106 (12%) spine surgery fellowship directors have served as the president of a major spine society.⁶

Limitations include sampling bias inherent to this study's nature as a survey study. Additionally, fellowship director information was unable to be obtained for 3 fellowships, and information was obtained from curricula vitae found online, which may be inaccurate or outdated. The cross-sectional nature of this study limits this analysis to one moment in time. This study serves as an initial comparison point for future studies to delineate trends in leadership.

Despite these limitations, this study demonstrates several important findings. Research productivity is more associated with fellowship director appointments than society leadership. Certain programs train a disproportionate number of fellowship directors, and institutional loyalty is more prevalent in hand surgery than in other orthopedic subspecialties. Additionally, the duration from hire to fellowship director appointment is higher in hand surgery than in other subspecialties. Finally, similar to other orthopedic subspecialties, sex and racial/ethnic representation among hand surgery fellowship directors has less parity than in other medical fields.

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