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Trends in Leadership at Orthopedic Surgery Adult Reconstruction Fellowships



Nicholas C. Schiller, MS^{a,*}, Chester J. Donnally III, MD^b, Andrew J. Sama, BA^a, Benjamin I. Schachner, MS^a, Zachary S. Wells, DO^c, Matthew S. Austin, MD^b

^a Department of Education, University of Miami Leonard M. Miller School of Medicine, Miami, FL

^b Department of Orthopedic Surgery, Rothman Institute at Thomas Jefferson University, Philadelphia, PA

^c Department of Orthopedic Surgery, Philadelphia College of Osteopathic Medicine, Philadelphia, PA

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ABSTRACT

Background: Fellowship directors (FDs) in adult reconstruction have a profound impact on current and future trainees within orthopedics. Our group sought to evaluate the shared characteristics among current adult reconstruction FDs to provide a framework for those aspiring to achieve this position and identify possible areas of improvement.

Methods: Fellowship programs were identified using the American Association of Hip and Knee Surgeons Directory. Data for each FD were gathered via electronic mail, telephone, curriculum vitae, and online searches. Demographic information collected included age, gender, ethnicity, residency/fellowship training, residency/fellowship graduation year, year hired by current institution, time since training completion until FD appointment, length in FD role, and Scopus H-index.

Results: Information was gathered for 94 FDs. Of these, 100% were males; 80.6% were Caucasian, 12.90% were Asian American, 5.38% were Hispanic, and 1.08% were African American. The average age (52.6 years old), H-index (16.54), year of residency (2000) and fellowship (2001) graduation, and time since training until FD appointment (9.55 years) were analyzed. The top training programs to produce future FDs were Mayo Clinic (residency) and Harvard University (fellowship).

Conclusion: Adult reconstruction FDs are frequently distinguished by their level of research productivity and experience, but certainly more demographic diversity is needed within this cohort. Specific training programs may inherently have a vital role in the development of individuals for future leadership positions. These developments could be a result of unique features inherent to the training programs or because of a subset of applicants who pursue specific programs with aspirations of subsequent leadership opportunities.

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In medicine, like in many other professions, certain shared qualities can be found among the leaders of the field. Moreover, some physicians seek especially coveted positions of leadership, such as fellowship director (FD). Some factors that help physicians

reach leadership positions are improving patient outcomes, influencing peers, pioneering research, and training the next generation of physicians. Such individuals build a broad set of leadership skills purposefully through academic training, societal and community

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* Reprint requests: Nicholas C. Schiller, MS, Department of Education, University of Miami Leonard M. Miller School of Medicine, 1600 Northwest 10th Avenue #1140, Miami, FL 33136.

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involvement, and extensive experience. Unfortunately, the objective criteria that set these leaders apart remain ambiguous. In addition, there seems to be a lack of clear objective direction for young physicians who wish to acquire these leadership positions in orthopedic surgery.

FDs in adult reconstruction have a profound impact on current and future trainees within the field of orthopedics. An examination of the common qualities associated with these individuals to achieve this professional accomplishment needs to be addressed. Our group looked to determine objective characteristics held by these leaders. Specifically, our review discusses the demographics, institutional training backgrounds, and academic experience associated with the current adult reconstruction FDs. Overall, this study aims to serve as a framework for those aspiring to achieve this position in orthopedics and identify opportunities to improve the position, particularly with regard to diversity.

Methods and Materials

Data Collection

The Adult Reconstruction Fellowship Directory of the American Association of Hip and Knee Surgeons for 2019–2020 (accessed October 2019) was reviewed to incorporate all adult reconstruction surgery fellowships in the United States. All listed FDs with established leadership roles within each fellowship program were identified. The demographic and educational background data for each FD were gathered via author review of current curriculum vitae (CV) for each FD. Any information that was unavailable on CV review was gathered from institutional biographies, Scopus Web of Science, and electronically mailed (e-mailed) questionnaires sent to fellowship administrators. If there was no response via e-mail, the offices were followed up via phone call to ensure the collection as many data points as possible. The demographic information of interest included age, gender, race/ethnicity, past residency and fellowship training location, the year of residency and fellowship graduation, year hired by current institution, time since residency and fellowship completion until FD appointment, length in FD role, and each individual's H-index.

To obtain the individual H-index for each FD, the Scopus database (Elsevier BV, Waltham, MA) was queried to access their research-specific information. This database has a search engine feature that operates through an extensive repository of peer-reviewed scientific literature with a citation-tracking component. Scopus was used to retrieve the H-index for every FD in the study.

Pearson correlation coefficients were determined via Statistical Analytics System (Version 9.4 of the SAS System. Copyright © 2013 SAS Institute Inc) software. Data were interpreted according to the guide of Mukaka [1] for correlation coefficients. Values under 0.3, 0.3–0.5, 0.5–0.7, 0.7–0.9, and greater than 0.90 are indicative of negligible, low, moderate, high, and very high positive correlation, respectively.

Results

Information was completed for 94 FDs (Table 1). Of the total 94 FDs, 100% of the leadership were males. In addition, 80.65% ($n = 76$) of the leadership was Caucasian, 12.90% ($n = 12$) was Asian American, 5.38% ($n = 4$) was Hispanic/Latino, and 1.08% ($n = 1$) was African American. The mean age of current FDs was 52.6 years old (± 9.27 years), and the mean Scopus H-index was 16.54 (± 14.47). The mean calendar years for completion of residency and fellowship training were 2000 (± 10 years) and 2001 (± 9.76 years), respectively (Table 2). The mean duration from fellowship graduation until FD appointment was 9.55 years (± 7.28 years) (Table 2).

Table 1

The Roles, Demographics, and Training of Adult Reconstruction FDs.

Demographics and Training	
Male	94 (100%)
Female	0 (0%)
Race/ethnicity	
Caucasian	80.65% ($n = 76$)
Asian Americans	12.90% ($n = 12$)
Hispanic/Latinos	5.38% ($n = 4$)
African Americans	1.08% ($n = 1$)
Mean age	52.60 \pm 9.27 ($n = 80$)
Mean FD Scopus H-index	16.54 \pm 14.47 ($n = 93$)

FDs, fellowship directors.

Interestingly, the percentages of FDs currently working at the same institution where they completed residency training (21.27%), completed fellowship training (12.76%), or completed both residency and fellowship training (4.26%) were also observed (Table 2).

Among our results, we report the 10 most impactful FDs in research based on the Scopus H-index (Table 3). Specifically, the most impactful FD in research currently has a Scopus H-index value of 67. By comparison, the 10th most impactful FD in research had a Scopus H-index value of 37 (accessed October 1, 2019).

The top 6 residency programs that produced future FDs were Mayo Clinic ($n = 5$), University of Miami ($n = 3$), Johns Hopkins University ($n = 3$), Dartmouth-Hitchcock Medical Center ($n = 3$), Harvard University ($n = 3$), and Lenox Hill Hospital ($n = 3$). Residency programs at which at least 3 FDs trained were included (Fig. 1).

The top 8 fellowship programs that produced future FDs were Harvard University ($n = 10$), Rothman Institute, Thomas Jefferson University ($n = 6$), Washington University, St Louis ($n = 6$), University of Utah School of Medicine ($n = 5$), Rush University ($n = 4$), New England Baptist Hospital ($n = 4$), Hospital for Special Surgery ($n = 4$), and Anderson Orthopaedic Research Institute ($n = 4$). Fellowship programs at which at least 4 FDs trained were included in Figure 2. Interestingly, 11 FDs (11.7%) graduated from 2 fellowships, whereas 2 FDs (2.13%) did not graduate from any fellowship training program.

The Scopus H-indices for FDs are displayed as ranges that include 1–15 ($n = 54$), 15–30 ($n = 24$), 30–45 ($n = 8$), and 45–67 ($n = 7$) (Fig. 3).

Discussion

Investigations surrounding physician leaders through skill development and necessary training have previously been documented in other surgical specialties [2–5]. In the field of general surgery, 1 study evaluated the relationship between future academic career path to past residents' rank lists [6]. Previous studies within orthopedics have examined the relevant influencing factors of applicant selection used by residency and FDs as well as the insights into orthopedic specialty selection by medical students and residents [7–13]. As of late, leadership has come into focus within orthopedics, specifically focusing on discrepancies among representations by gender and cultural diversity [14–17]. Donnally et al [18] recently described demographic trends among spine fellowship leaders; the study concluded that spine surgery FDs are more likely to have graduated from certain residency and fellowship programs and that FDs were likely to be heavily involved in clinical research. They speculate that their finding could be a result of the training provided by these centers or the institution's predilection to select applicants who are more likely to later seek academic leadership roles after training [17,18]. Similarly, examination of leadership composition and trends has recently

Table 2
Education, Employment, and Leadership Progression of Adult Reconstruction FDs.

Education and Employment Progression	Mean Score ± SD
Mean calendar year of residency graduation	2000 ± 10.00 (n = 77)
Mean calendar year of fellowship graduation	2001 ± 9.76 (n = 74)
Mean duration from fellowship graduation to earning position of FD	9.55 y ± 7.28 (n = 53)
Mean duration of employment at current institution	14.07 y ± 9.06 (n = 57)
Mean duration that FD has held position as FD	8.15 y ± 6.49 (n = 57)
Mean time from year of hire by current institution to year promoted to FD	5.52 y ± 7.01 (n = 60)
Institutional Loyalty	n (%)
FDs currently working at same institution as residency training	23 (24%)
FDs currently working at same institution as fellowship training	13 (14%)
FDs currently working at same institution as both residency and fellowship training	3 (3%)
Correlated H-Indices	r (P)
Years as FD vs Scopus H-index	0.33 (.01) ^a
Age vs. Scopus H-index	0.37 (.001) ^a

FDs, fellowship directors; SD, standard deviation.

^a Correlation is significant.

been described in the field of plastic surgery and orthopedic spine surgery [18,19]. Evaluating insights into leadership trends to other areas of medicine can benefit specialty appointments for the future. To date, no examinations concentrating on the leadership trends specifically in the field of adult reconstruction have been described.

Academic careers within medicine are founded on clinical service, teaching, and research. Among those who achieve leadership positions, research productivity appears to be a significant metric. Our findings demonstrate a mean Scopus H-index of 16.56 for adult reconstruction FDs. In comparison, fellowship-associated adult reconstruction faculty, and all academic orthopedics surgeons, average a Scopus H-index of 12.8 and 5, respectively [20]. The similar spine publication by Donnally et al [18] further reinforced this trend of high Scopus H-indices in their evaluation of 103 spine fellowship program leaders, which demonstrated an exceptional

Table 3
Research Impact of Adult Reconstruction FDs as Determined by Scopus H-Index.

FD Research Productivity		
FD Name	H-Index	Fellowship Program
Stuart B. Goodman	67	Stanford University Adult Reconstruction Fellowship
Paul Tornetta	56	Boston Medical Center Adult Reconstruction Fellowship
Douglas A. Dennis	52	Rocky Mountain Adult Reconstruction Fellowship at Colorado Joint Replacement
Michael D. Ries	50	Tahoe Reno Adult Reconstruction Fellowship
Andy Engh, Jr	49	Anderson Clinic Post-Graduate Medical Education Foundation Adult Reconstruction Fellowship
Adolph V. Lombardi, Jr	49	Joint Implant Surgeons Adult Reconstruction Fellowship
Giles R. Scuderi	48	Lenox Hill Hospital (Knee) Adult Reconstruction Fellowship
William L. Healy	41	Newton-Wellesley Joint Reconstruction Fellowship
William D. Bugbee	39	Scripps Clinic Adult Reconstruction Fellowship
Mathias P. G. Bostrom	37	Hospital for Special Surgery Adult Reconstruction Fellowship

The Scopus H-index values are as of October 1, 2019. FDs, fellowship directors.

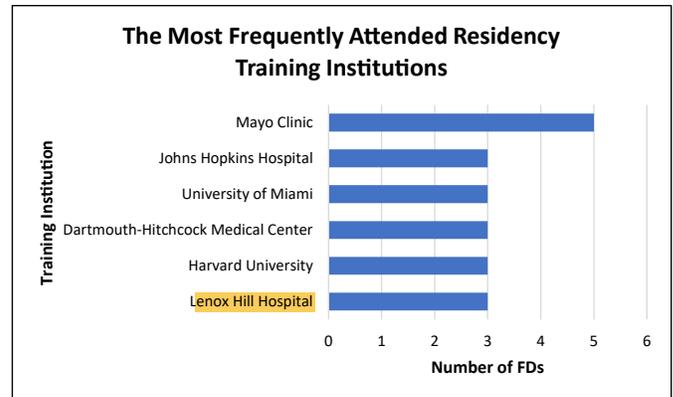


Fig. 1. A summary of the most attended residency training programs among current adult reconstruction FDs. Note: Residency programs at which at least 3 FDs trained were included. FDs, fellowship directors.

mean Scopus H-index of 23.75. This illustrates that spine FDs average H-indices is 43.4% higher than that of adult reconstruction FDs. Why spine FDs have a higher average H-index is not clearly understood. Potentially, the spine subspecialty places a greater emphasis on research productivity and impact or has more ability to be cited in that there is also an avenue in the neurosurgical literature. Another interesting parallel finding from this present study is that clinical experience appears to be a key attribute to adult reconstruction leadership appointment as the mean duration from fellowship matriculation to appointment was 10.42 years; with an average age of 52.6 years. This mirrors the only other orthopedics FD study in spine showing their mean duration from fellowship was 8.59 years; with an average age of 52.85 years [18].

Our data also suggest a potential association with certain residency and fellowship training programs to have a predilection for producing eventual program FDs. The Mayo Clinic (n = 5) was the most attended residency program among current program directors. Five other residency programs each produced at least 3 of the current FDs (Fig. 1). Interestingly, 11 FDs completed 2 fellowships, whereas 2 FDs did not undergo any postgraduate training. Among fellowship programs attended, the highest representation was seen from Harvard University (n = 10), Washington University (n = 6), and the Rothman Orthopaedic Institute at Thomas Jefferson University (n = 6). Donnally et al [18] also reported a similar trend among FDs with their most attended fellowship programs being

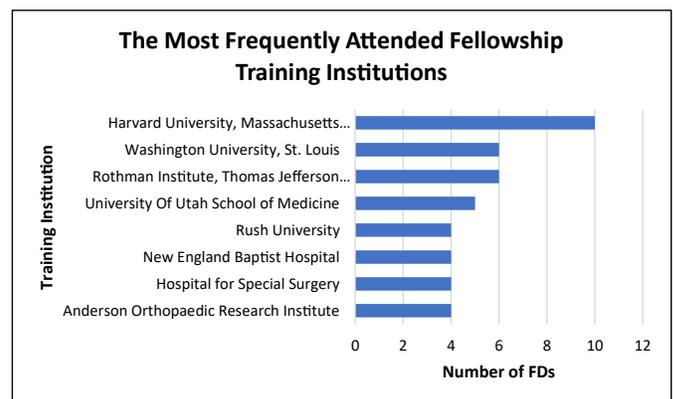


Fig. 2. A summary of the most attended fellowship training programs among current adult reconstruction FDs. Note: Fellowship programs at which at least 4 FDs trained were included.

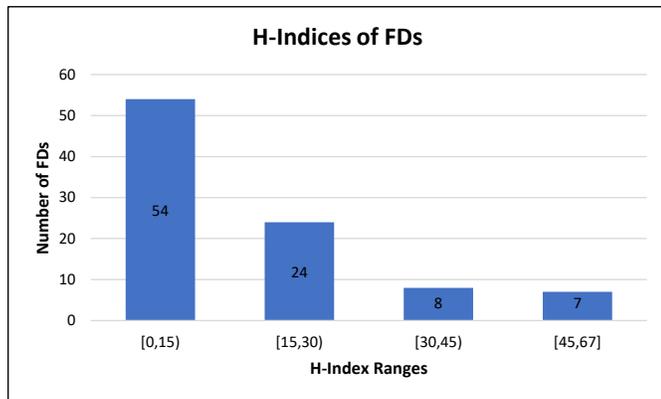


Fig. 3. A representation of the Scopus H-indices of all adult reconstruction FDs. Note: The Scopus H-index values are as of October 1, 2019. Interval notation is used. The symbol “[” indicates that the range includes the adjacent numerical value. The symbol “)” indicates that the range does not include the adjacent numerical value.

Case Western University, Washington University, and the Rothman Orthopaedic Institute at Thomas Jefferson University. These programs may incorporate specific training curricula to develop essential skills needed for leadership positions, such as a mentor style training with attendings or between residents of different training levels. Another possible explanation could be increased access to scholarly activity within these institutions. A recent analysis of faculty at US adult reconstruction fellowships demonstrated that most of the adult reconstruction literature is produced from only a few academic institutions [20]. Individuals with the desire to pursue academic leadership positions thus may be more inclined to select such programs. Other factors such as program reputation and professional networks could play a role as well. Although the decision-making process for adult reconstruction FD appointment is multifactorial, our analysis appears to support the correlation that attending specific graduate and postgraduate training programs has a greater probability to produce future program directors.

Another glaring observation among leadership at the fellowship level for adult reconstruction was a lack of female representation. Across all specialties, orthopedic surgery has one of the lowest proportions of current female residents [15,21]. Although the number of female orthopedic residents has increased during the past decade, the percentage increase still lags behind other historically male-dominated specialties [21]. This trend is also seen among specialty societies. For example, The Knee Society and The Hip Society have the lowest percentage of women: 0.5% and 0.6%, respectively [21]. This could be a key area of focus to help address gender disparities as membership can provide access to both mentorship and research collaboration. In addition, Ence et al [22] have reported that female orthopedic surgeons have a lower median H-index compared with male counterparts. This is an important consideration as our study shows that research productivity is a vital aspect to leadership roles.

Race and ethnicity were also considered in data collection, highlighting that adult reconstruction leadership also lacks under-represented minorities. Of the FDs, only 12.90% ($n = 12$) were Asian Americans, 5.38% ($n = 5$) were Hispanic/Latino, and 1.08% ($n = 1$) was African Americans. This remains a topic of discussion within orthopedics. Two previous reports, one in 1999 [23] and the other in 2004 [24], discussed the disparities in the field regarding under-represented minorities. Such discussions may have contributed to progressive changes in orthopedics, as a study by Okike et al [25] reported that from the years 2001 to 2008, total minority

representation in orthopedics averaged 20.2%, which included 11.7% Asians, 4.0% African Americans, and 3.8% Hispanics. Okike et al [25] reported these numbers noting the period of improvement with regard to representation among orthopedic residents. After this initial rise in representation of minority groups, a study by Adelani et al described a decline in representation as the number of programs per year with more than 1 under-represented minority resident decreased from 61 programs in 2002 to 53 programs in 2016 and reached as low as 31 programs in 2010. In addition, the same group found that the number of programs per year without a single under-represented minority resident increased from 40 programs in 2002 to 60 programs in 2016 and reached 76 programs in 2011. Ultimately, the review called for closer observation of program-level diversity and its effects on the recruitment of under-represented minorities to orthopedics [26]. Our review identified a similar trend with that reported by Okike et al. As medicine and the field of orthopedics continue to adapt, discussions of diversity will remain crucial to the development of a health care system that adequately represents the community it serves. One way that we can tackle these disparities is by increasing the number of under-represented minorities in leadership positions.

A key limitation to our study involves the reliance on CVs to compile databases for analysis. Given that CVs are usually self-reported, they could contain errors and could also be out of date. Any additional information that was not reported on CVs was obtained through other modalities (online searches and e-mailing/calling programs) that could have been subject to errors during compilation. Specifically, ethnicity can be a self-identified trait, and when responses to questionnaires did not include a direct answer, the authors used all available resources to form a strong educated estimation. Furthermore, our study design was cross sectional and therefore provides trends on a single time. Comparisons on a year-by-year basis could show varying results. Finally, our results focused on obtaining objective data for analysis. We did not attempt to obtain subjective factors that impact an individual's appointment and/or pursuit of academic leadership positions.

Adult reconstruction FDs are frequently distinguished by their level of research productivity and experience. Furthermore, specific graduate and postgraduate training programs play a vital role in the development of individuals for future leadership positions. This observation could be the result of unique characteristics inherent to these programs to facilitate such development. In addition, the subset of applicants may pursue specific programs for academic career aspirations knowing that certain fellowships have a precedent of leadership. The trends observed in this study provide objective data among current FDs within adult reconstruction and could serve as a guide for individuals who desire academic leadership roles.

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