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Barriers to Increasing Diversity in Orthopaedics

The Residency Program Perspective

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Investigation performed at the University of Mississippi Medical Center, Jackson, Mississippi

Background: There are little data to explain why the surgical subspecialty of orthopaedic surgery struggles with improving the racial/ethnic composition of its workforce. The current work sought to determine what orthopaedic residency program directors and coordinators believe are the barriers to improving diversity at their own programs.

Methods: Between November 17, 2018, and April 1, 2019, a 17-question survey was electronically distributed to the program directors and coordinators of 155 allopathic orthopaedic surgery residency programs. Seventy-five of 155 programs (48.4%) responded to the survey. A p-value of < 0.05 was used to determine statistical significance.

Results: The most commonly stated barriers to increasing diversity within the orthopaedic surgery programs were the following: “We do not have enough minority faculty, which may deter the applicants” (69.3%), “We consistently rank minority applicants high but can never seem to match them” (56%), and “Not enough minorities are applying to our program” (54.7%). Programs with higher percentages of underrepresented minority (URM) faculty had higher percentages of URM residents ($p = 0.001$). Programs participating in the Nth Dimensions and/or Perry Initiative programs had a higher percentage of URM faculty as compared to the residency programs that did not participate in these programs ($p = 0.004$). URM residents represented 17.5% of all residents who resigned and/or were dismissed in the 10 years preceding the survey while also only representing 6% of all orthopaedic residents during the same time period.

continued

Disclosure: T.C. McDonald reports that he serves on a committee within the American Academy of Orthopaedic Surgeons. M.L. Graves reports personal fees from Depuy-Synthes, personal fees from Globus, and personal fees from Osteocentric, all outside of the submitted work. J.T. Brooks reports personal fees from Medtronic Spine, personal fees from Depuy-Synthes, personal fees from OrthoPediatrics; and is also a board member J. Robert Gladden Orthopaedic Society; and is also a committee member for the Pediatric Orthopaedic Society of North America and the Scoliosis Research Society. All other co-authors certify that they have no commercial associations (e.g., consultancies, stock ownership, equity interest, and patent/licensing arrangements) that might pose a conflict of interest in connection with the submitted article. The **Disclosure of Potential Conflicts of Interest** forms are provided with the online version of the article (<http://links.lww.com/JBJSOA/A156>).

Ethical Review Committee Statement: This study was performed in accordance with the ethical standards in the 1964 Declaration of Helsinki, and in accordance with relevant regulations of the US Health Insurance Portability and Accountability Act (HIPAA). All details that might disclose the identity of the subjects under study have been omitted.

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Conclusions: From the orthopaedic residency program perspective, the greatest perceived barrier to increasing the racial/ethnic diversity of residents in their program is their lack of URM faculty. Surveyed programs with more URM faculty had more URM residents, and programs participating in Nth Dimensions and/or Perry Initiative programs had a higher percentage of URM faculty.

The US population is becoming increasingly more diverse¹, but this diversity has not always been reflected within the field of medicine. The Association of American Medical Colleges (AAMC) definition of underrepresented in medicine is, "...those racial and ethnic populations that are underrepresented in the medical profession are relative to their numbers in the general population"². Underrepresented minority (URM) representation among practicing orthopaedic surgeons is extremely low, that is, 1.7% Hispanic/Latino and 1.5% African American/Black³, whereas Hispanics/Latinos make up 18.1% and African Americans/Blacks make up 13.4% of the US population⁴.

This discord in diversity between the provider and patient populations can perpetuate the problems of access to appropriate health care faced by many minorities because areas with larger percentages of minority patients are more likely to have physician shortages, and URM physicians are more likely than white physicians to serve such populations^{5,6}. There are still racial and ethnic disparities prevalent in the field of orthopaedic surgery, including fracture care, total joint arthroplasty, and spine surgery⁷⁻¹². To address these problems, the diversity of our orthopaedic training programs should increase to match that of our country's population. Currently, however, the composition of orthopaedic residents reveals the least diverse makeup compared with any other subspecialty^{13,14}.

Before a solution can be developed, the etiology of the problem must be elucidated. To our knowledge, there are no studies that seek to evaluate why the field of orthopaedic surgery has such a difficult time increasing the diversity of its surgeon workforce. The purpose of this study was to determine what orthopaedic residency program directors and coordinators believe are the barriers to improving diversity at their own residency programs.

Methods

Between November 17, 2018, and April 1, 2019, a 17-question survey was electronically distributed to the program directors and coordinators of 155 allopathic orthopaedic surgery residency programs. The survey (as shown in the Appendix, Supplement 1) was administered, and the data were collected and managed by using Research Electronic Data Capture (REDCap) tools hosted at The University of Mississippi Medical Center¹⁵. Using the anonymizing tool within REDCap, the authors were blinded to the identity of the respondents. REDCap was configured to automatically send reminder emails to nonrespondents every 2 weeks during the active 5-month survey period.

For the purposes of this analysis, the definition of URM was closely aligned with the AAMC definition of "underrepresented in medicine." Therefore, in this study, URM comprised the following racial and ethnic groups: "African American/Black," "Hispanic/Latino," "American Indian/Alaska Native," and "Native Hawaiian/Pacific Islander." We did not include "Asian" or "Other" in our definition of URM; Asian Americans account for 5.8% of the US population⁴; however, Asians make up 6.7% of the orthopaedic surgeon workforce³ and roughly 8.7% of active orthopaedic residents¹⁶.

Seventy-five of 155 (48.4%) programs responded to the survey. One program submitted incomplete values for faculty numbers, and 3 programs submitted incomplete values for the total number of residents. However, these 4 programs did provide answers for each of the barriers-to-diversity questions and were included in the aggregate answers to the barriers-to-diversity questions but excluded from analysis because it pertains to the quantitative data.

Statistical Analysis

Percentages were used to describe the frequency of endorsed barriers-to-diversity items. Because of the presence of outliers, medians were used as both descriptive and inferential statistical tests. Independent samples median tests were used to compare the group median responses for percent URM residents and faculty, and Spearman rho was used to assess the correlations. For nominal scaled variables, a χ^2 statistic was used to test for associations. An alpha level of $p = 0.05$ was used to determine statistical significance. SPSS was used for all statistical analyses (IBM Corp).

Results

Barriers to Diversity

The most common barrier to diversity chosen by 69% (52 of 75) of programs was "We do not have enough minority faculty, which may deter applicants." The next 2 most frequently chosen barriers were "We consistently rank minority applicants high but can never seem to match them" and "Not enough minorities are applying to our program" (Table I). For the free-text question where respondents could list a barrier not otherwise asked, common themes were related to program location, population size, or geography. All free-text responses are shown in the Appendix, Supplement 2).

Only one of the barrier questions was associated with a significantly lower median percentage of URM residents. Programs which answered "True" to the question "We are not specifically trying to recruit minority residents" had a median

TABLE I Barriers to Diversity as Reported by 75 Orthopaedic Surgery Residency Programs

Barrier	% of Programs Who Answered "True" (N)
We do not have enough minority faculty, which may deter applicants.	69.3 (52)
We consistently rank minority applicants high but can never seem to match them.	56 (42)
Not enough minorities are applying to our program.	54.7 (41)
We are not specifically trying to recruit minority residents.	32 (24)
The objective data (USMLE Step scores, clinical honors, AOA status, and LORs) for minority applicants often do not meet the threshold required to offer an interview or to be ranked to match.	32 (24)
The last minority resident that matriculated through our program did not perform well.	8.0 (6)
Minority medical students are deterred from applying to our program because we have never matched a minority resident before.	2.7 (2)
Key faculty within the department would be against a change in the cultural and/or racial makeup of the orthopaedic residents.	1.3 (1)

of 6.67% URM residents, whereas those which answered "False" had a median of 10% URM residents ($p = 0.033$). In addition, there was a moderate strength and positive correlation between percentages of URM residents and faculty (Spearman's rho $r = 0.401$, $p = 0.001$). Stated another way, programs with more URM faculty tended to have more URM residents. Our study was not powered to determine a threshold percentage of URM faculty needed to result in an increased frequency of minority residents; however, this will be the focus of future research.

URM Representation in Orthopaedics vs. Population

There were 1,710 filled resident positions, and 2,056 faculty were noted by the 71 orthopaedic programs reporting resident numbers. African American/Black, Hispanic/Latino, and American Indian/Alaska native residents and faculty are all underrepresented in orthopaedic surgery as compared to their representation in the U.S. population. Native Hawaiian/Pacific Islander residents and faculty are overrepresented (Table II).

Outreach Programs

Approximately half of the residency programs which responded (37 of 75, or 49.3%) indicated that their institution had some sort of "outreach program for mentorship/exposure of minority medical students to orthopaedic surgery". Nine of 37 residency programs (24%) offer some type of financial assistance with their outreach programs, and 11 participated in the Nth Dimensions and/or Perry Initiative programs^{17,18}. Residency programs which have Nth Dimensions and/or Perry Initiative involvement at their institution have a higher percentage of URM faculty compared with residency programs which do not ($p = 0.004$); however, there was no significant difference in the percentage of URM residents at these same programs.

Residents Resigned or Fired

In total, 64% of the programs (48 of 75) reported a total of 91 residents who resigned or were terminated in the past 10 years. These programs also reported that 17.5% (16 of 91) of these residents were URM.

TABLE II Representation of 1,710 URM Residents and 2,056 URM Faculty vs. ACGME and US URM Population*

Minority Group	% Orthoresident Representation in the Survey Cohort	% Orthoresident in ACGME Data Resource Book '18-'19 ¹⁶	% Orthofaculty Representation in the Survey Cohort	% Representation in US Population	% Resident Under/Overrepresentation	% Faculty Under/Overrepresentation
African American/Black	5.4	2.8	3.4	13.4	-8.0	-10.0
Hispanic/Latino	4.6	3.3	2.6	18.1	-13.5	-15.5
American Indian/Alaska Native	0.5	0.2	0.2	1.3	-0.8	-1.1
Native Hawaiian/Pacific Islander	0.6	8.8†	0.4	0.2	0.4	0.2

*ACGME = Accreditation Council for Graduate Medical Education. †Not comparable because the ACGME combines Asians with Native Hawaiians/Pacific Islanders and our survey did not.

Discussion

The purpose of this study was to determine, from the residency program viewpoint, the perceived barriers to improving race/ethnic diversity in orthopaedic surgery. Of the 192 responses to the barriers listed, 135 responses (70%) included the top 3 barriers, listed in descending order as follows: “We do not have enough minority faculty, which may deter applicants,” “We consistently rank minority applicants high but can never seem to match them,” and “Not enough minorities are applying to our program.” Second, we found that programs with increased numbers of URM residents had increased numbers of URM faculty. Third, we found that residency programs participating in the Nth Dimensions and/or Perry Initiative programs had a higher percentage of URM faculty compared with residency programs that did not participate in these programs. Finally, we found that URM residents represented 17.5% of all residents who resigned and/or were dismissed in the 10 years preceding the survey, despite the fact that URM residents composed 6% on average of all orthopaedic residents during the same time period. All of these findings are novel, having never been published in the literature.

The most commonly listed barrier of, “We do not have enough minority faculty, which may deter applicants,” is supported by our correlation data that show that orthopaedic programs with more URM faculty tended to have more URM residents; this positive correlation has not been found previously in the literature. Okike et al. did show that a high URM representation in the faculty and residents for an orthopaedic program resulted in an increased odds of URM medical students from that same institution applying to orthopaedics as a specialty⁹. A similar trend was found with gender, where medical schools associated with orthopaedic programs with high numbers of the female faculty and residents had higher numbers of female students applying to orthopaedics. Clearly, the focus must start with increasing the race/ethnic diversity of the faculty, which will likely result in a downstream increase in diversity of the residents and medical student applicants.

Thirty-two percent of programs listed the following barrier to diversity: “We are not specifically trying to recruit minority residents.” It is interesting that this was the only barrier listed that was associated with a statistically significant relationship with the percentage of URM residents, meaning that the programs that stated they were not trying to recruit URM residents actually had lower numbers of URM residents. Given that orthopaedic surgery has the lowest number of URM residents of any surgical subspecialty, a simple solution may be for 32% of our orthopaedic programs to simply make an effort to recruit this applicant pool.

An additional 32% of programs believed that the objective criteria (United States Medical Licensing Examination [USMLE] Step scores, clinical honors, Alpha Omega Alpha [AOA] status, and letters of recommendation [LORs]) for many URM applicants did not meet the minimum threshold to offer an interview. The authors would submit that some of these objective criteria are affected by bias and contribute to less diversity in our specialty. Boatright et al. evaluated the membership of 4,655 medical students to AOA during the 2014 to 2015 academic year²⁰. After controlling for Step 1 scores,

research productivity, community service, leadership activity, and Gold Humanism membership found that Black and Asian students were less likely to be AOA than Caucasian students, suggesting a bias in the selection process. Fadem et al. found a significant correlation between a medical student's parental income level and the student's Medical College Admission Test (MCAT) and USMLE scores for both minorities and nonminorities²¹. The National Residency Matching Program compared the USMLE Step 1 scores of medical students who were identified as Asian, Black, Hispanic, English as a second language (ESL), and female students, with the reference group defined as “a native English-speaking white male US citizen at average age”²². They found that Black students scored 16.5 points lower, Asian students 4.45 points lower, Hispanic students 12.1 points lower, female students 5.92 points lower, and ESL students 1.23 points lower on Step 1 than the English-speaking white male group. This difference decreased only mildly when adjusted for MCAT and grade point average. These studies show that a heavy emphasis on USMLE Step 1 in orthopaedic surgery is more likely to select students from higher socioeconomic backgrounds who happen to be English-speaking Caucasian men. Poon et al. found that between 2005 and 2014, URM applicants to orthopaedic surgery had greater numbers of volunteer experiences and publications, whereas Caucasian and Asian applicants had higher USMLE Step scores and AOA statuses²³. If the latter application items are playing a larger role in screening applicants, it is unlikely that a residency will significantly change the ethnic/racial composition of their residents.

Nearly half of the responding programs stated that they do have a formal outreach program to attract URM medical students, with some programs even offering financial stipends for sub-internship rotations. The Nth Dimensions program, which is specifically focused on increasing racial/ethnic diversity, was listed by many of these programs as their outreach program of choice to attract URM medical students, and there was a significantly higher number of URM faculty at programs that participated with the Nth Dimensions and/or Perry Initiative programs (specifically focused on increasing gender diversity). Although not all orthopaedic programs can participate with Nth Dimensions to attract the URM medical students at all stages of training. It is worth noting that although programs which participated in Nth Dimensions and/or Perry Initiative had a statistically greater number of URM faculty, these same programs did not have a statistically higher number of URM residents, although our data demonstrated a correlation of higher numbers of URM residents in programs that have higher numbers of URM faculty. This discrepancy likely arises from the fact that programs participating in Nth Dimensions and the Perry Initiative are grouped in our survey; however, these outreach programs potentially have very different medical student pools. Given that the Perry Initiative is primarily focused on gender diversity, and not race, there may be a high percentage of non-minority female students in these outreach programs. Thus, it would be unlikely that a residency program participating in the Perry Initiative would be able to convert their medical student participation into increased URM resident numbers.


URMs represented 17.5% (16 of 91) of all residents who resigned or were terminated in the 10 years preceding the survey. We find this interesting because Adelani et al. found that URM residents composed 6% on average of all orthopaedic residents between 2002 and 2017²⁴. No study to date has reported that URM residents have an attrition rate higher than their composition with the orthopaedic resident pool. The data do not exist however to determine whether URM residents have a higher attrition rate than the population at large because the Accreditation Council for Graduate Medical Education (ACGME) does not report the race/ethnicity in their attrition data. Bauer et al. did not find a significant risk of attrition based on resident minority status²⁵; however, at baseline, there was a significant difference in the number of URM residents in their respondent pool, compared with what was reported by the ACGME in the same academic year (20.3% vs. 35.3%, $p < 0.001$). Their results therefore may not be reflective of the true URM attrition rate; more research needs to be performed on this topic.

This study has a number of limitations; first, it was a survey-based study with an overall response rate of 48.4%, which could result in survey sampling bias, tending to systematically overestimate or underestimate population parameters. However our response rate is within the norm of the similar published literature²⁶⁻³⁰. Additionally, the survey has not been validated. Second, because the survey was only administered to allopathic orthopaedic surgery programs, our conclusions cannot be used to evaluate diversity within osteopathic orthopaedic training programs. Third, the surveys were completely anonymous to encourage honest responses, and only users with access to the program director or program coordinator emails could fill out the survey; however, we did not control for the accuracy of the responses beyond this point. Fourth, in reporting barriers to diversity, the authors could not control whether respondents considered Asians as part of the URM definition. Fifth, according to Table II, the percentage of URM residents from the programs who responded were all lower than their corresponding representation according to the 2018 to 2019 ACGME Data Resource Book¹⁶. It is possible that programs with less URM representation chose not to respond, which could introduce another source of sampling bias and dilute the strength of our results to reflect true opinion and perceived barriers to diversity in orthopaedic surgery. Finally, owing to the nature of this study design, these barriers represent the viewpoint of residency program directors and/or coordinators, and not the viewpoint of the URM applicants themselves. The URM viewpoint will be the subject of a future survey, which may better explain the etiology to the second and third most commonly perceived barriers, “We consistently rank minority applicants high but can never seem to match them” and “Not enough minorities are applying to our program.” Finally, because respondents were

asked to agree or disagree with a list of barrier questions, there may be other barriers at play that we are not aware of and therefore did not think to ask in our survey. Despite these limitations, this is the first study in the literature, highlighting the perceived barriers to increasing diversity with orthopaedic surgery from a residency program perspective.

In conclusion, our study presents a number of novel findings; from a residency program perspective, the top 3 barriers to increasing racial/ethnic diversity included: “We do not have enough minority faculty, which may deter minority applicants,” “We consistently rank minority applicants high but can never seem to match them,” and “Not enough minorities are applying to our program.” Second, we found that programs with increased numbers of URM residents had increased numbers of URM faculty. Third, we found that residency programs participating in the Nth Dimensions and/or Perry Initiative programs had a higher percentage of URM faculty as compared to residency programs that did not participate in these programs. Finally, we found that URM residents represented 17.5% of all residents who resigned and/or were dismissed in the 10 years preceding the survey, despite the fact that URM residents composed 6% on average of all orthopaedic residents during the same time period.

Appendix

 Supporting material provided by the authors is posted with the online version of this article as a data supplement at <http://links.lww.com/JBJSOA/A157>. ■

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