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Characterization of applicants for residency training in pathology: Does diversity exist?

Sharri J. Mortensen[a,b,*], Emmanuela J. Menard[c], Elena B. Olson[d], Holly C. Deng[e], Robert Hasserjian[a,c], W. Stephen Black-Schaffer[a,c], Trina Pappadia[c], David N. Louis[a,c], Rosalynn M. Nazarian[a,c]

[a] Harvard Medical School, Boston, MA, USA
[b] Department of Orthopedic Surgery, Beth Israel Deaconess Medical Center, Boston, MA, USA
[c] Pathology Service, Massachusetts General Hospital, Boston, MA, USA
[d] Center for Diversity and Inclusion, Massachusetts General Hospital, Boston, MA, USA
[e] University of North Carolina, Chapel Hill, NC, USA

A B S T R A C T

Context: A diverse workforce has been shown to improve productivity and innovation. The level of diversity among pathology residency applicants has not previously been reported.
Objective: This study aims to characterize the applicants at an academic pathology department to gain a better understanding of diversity among them.
Design: Between 2015 and 2017, data from a tertiary care center were analyzed for gender, US and international medical school, USMLE scores, and self-identified racial or ethnic group. For 2017, data was compared to that published by the Association of American Medical Colleges (AAMC).
Results: There were 1293 pathology applicants with 48–49% being female. The overall underrepresented minority (URM) applicant pool in pathology represented 12.6%, 9.5%, and 11.1% of our applicants for 2015, 2016, and 2017, respectively. URMs from US medical schools alone represented 4.7%, 3.7%, and 4.5% of our applicants for 2015, 2016, and 2017, respectively. The percentage of 2017 US medical school graduates applying to any US pathology training program was 22.2% versus 38.7% applying to pathology at our center ($p \leq 0.001$). URM applicants for pathology from US medical schools were significantly lower than URM applicants to all AAMC medical specialties ($p = 0.035$). Among our pathology applicants in 2017, USMLE I scores and number of applicants with any publications were higher for non-URMs compared to URMs ($p = 0.048$ and $p = 0.046$, respectively).
Conclusion: No significant difference related to gender was identified among our applicants while racial/ethnic groups remain underrepresented with significantly fewer URM applicants from US medical schools compared to published AAMC data for all medical specialties.

1. Introduction

In the United States, diversity among physicians is significantly less than that of the population. In 2013, 4.4% of physicians were of Hispanic or Latino ancestry, 0.4% were American Indian or Alaska native, and 4.1% were Black or of African American ancestry [1]. Studies regarding diversity have shown that groups enriched with members from a variety of backgrounds and experiences tend to contribute new perspectives and ideas in an organization or company, including the healthcare sector [2]. It has been suggested that diversity enhances the educational experience, strengthens communities, fosters personal growth and promotes a healthy society [3].

Unfortunately, women and minorities, including Black/African American, Hispanic, Alaskan native/American Indian are underrepresented (URM) in medicine. According to the National Institutes of Health, a diverse workforce among trainees and faculty has been shown to improve productivity and innovation [4]. A diverse medical workforce may improve the delivery of health care to underserved populations [5] and has been recognized as an approach to address health disparities and broaden physicians' cultural knowledge and understanding [6].

There have been several studies assessing diversity within various medical specialties, however there is a lack of research on diversity in pathology as an element in promoting institutional diversity and inclusion. This study aims to characterize applicants to an academic pathology department to gain a better understanding of diversity among medical students seeking pathology specialty training.

2. Methods and materials

Institutional Review Board approval was obtained. Available applicant data for gender, US and international medical school, and self-

* Corresponding author at: Center for Advanced Orthopaedic Studies, BIDMC, Harvard Medical School, 330 Brookline Avenue, RN115, Boston, MA 02215, USA.
E-mail address: smortens@bidmc.harvard.edu (S.J. Mortensen).

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identified racial or ethnic group over a three year period from 2015 to 2017 from the Electronic Residency Application System collected by Massachusetts General Hospital (MGH) Center for Diversity and Inclusion. The data was analyzed and compiled in an Excel database (Microsoft Office 2007, Redmond, WA) by three authors (RMN, HCD, and EMJ). This data was compared to that publicly reported by the AAMC for all medical specialties and for pathology (anatomic and clinical) for 2017 [7]. In addition, for 2017, associations between applicant racial or ethnic group and self-reported awards in medical school (any), publications (any abstract or journal article), USMLE scores, and age, were evaluated. Among US medical schools, residency applicants from both MD-granting and DO-granting institutions were included.

We utilized the Association of American Medical Colleges (AAMC) definition for URM: racial and ethnic groups that are underrepresented in medicine *relative* to the general population [8]. Racial and ethnic groups currently categorized as URM include: Black/African American, Hispanic/Latino, Alaskan Native/American Indian, and Native Hawaiian/Pacific Islander. Racial and ethnic groups were self-reported by the applicant, optionally provided, and categorized on the basis of self-identity meant to reflect social and cultural affiliation as opposed to genetics alone [7]. Racial and ethnic group data self-reported as multiple, unknown, or other were excluded from this URM analysis.

2.1. Statistical analysis

For each applicant characteristic, the mean and/or percentage was calculated and compared. Statistical analyses were performed using unpaired two-tailed Student's *t*-test for continuous variables and Fisher's exact test or Chi-square test for categorical variables ($p < 0.05$ considered statistically significant) using SPSS Statistics version 24.0 (IBM Corporation, Armonk, NY).

3. Results

3.1. Study population characteristics

A total of 1293 MGH pathology residency applications were received in the years 2015–2017. Females represented 48–49% of all MGH applicants during this time period, while students from US medical schools represented 33.9%, 37.7% and 38.7% of applicants for 2015, 2016, and 2017, respectively. Together, Black/African American, Hispanic, and Alaskan Native/American Indian URM groups represented 12.6%, 9.5%, and 11.1% of all MGH applicants for 2015, 2016, and 2017, respectively. URMs from US medical schools alone represented 4.7%, 3.7%, and 4.5% of MGH applicants for 2015, 2016, and 2017, respectively.

3.2. Gender

For 2017, female applicants represented 49.0% of all MGH pathology applicants as compared to the 44.5% of female applicants for all medical specialties as reported by the AAMC ($p = 0.093$), and 46.8% of female applicants to pathology as reported by the AAMC ($p = 0.493$), (Table 1).

Table 2
Characterization of MGH pathology applicants by self-identified race/ethnicity—year 2017.

	URM ($N = 43$)	Non-URM ($N = 287$)	P-value*
Average age	32.7	32.4	0.787
USMLE I	222.1	227.0	**0.048**
USMLE II	229.2	233.1	0.187
Publications	44.2%	61.0%	**0.046**
Awards	53.5%	62.4%	0.314

Abbreviations: MGH, Massachusetts General Hospital, URM, under-represented in medicine; USMLE, United States Medical Licensing Examination.
* Significant P-values are highlighted in bold font.

3.3. US (MD/DO) medical school graduates

The percentage of all 2017 US medical school graduates applying to any pathology training program (AAMC) was 22.2% versus 38.7% applying to MGH pathology ($p \leq 0.001$), (Table 1). Among US medical school applicants, the percentage of US URM applicants was similar for MGH Pathology (11.5%) and the AAMC report for all pathology training programs (15.5%, $p = 0.241$), however the percentage of URM applicants to MGH pathology from US medical schools alone (11.5%) was significantly fewer than URM applicants to all AAMC medical specialties (18.0%, $p = 0.035$), (Table 1).

3.4. MGH pathology applicants

Among 2017 applicants to MGH pathology, the percentage of US medical school URM applicants (11.5%) was similar to international medical school URM applicants (8.9%), ($p = 0.397$), (Table 2). No significant difference in age was observed between non-URM and URM groups (average 32.7 vs. 32.4 years, $p = 0.787$); USMLE I scores were higher for non-URMs compared to URMs (step I average 227.0 vs. 221.1, $p = 0.048$); USMLE II scores trended higher for non-URMs compared to URMs (step II average 233.1 vs. 229.2, $p = 0.187$, not significant); the proportion of non-URM applicants with any publications was significantly higher than for URM applicants (61.0% vs. 44.2% respectively, $p = 0.046$), and there was a trend for fewer URMs to have received awards as compared to non-URMs (53.5% vs. 62.4% respectively, $p = 0.314$, not significant), (Table 2).

4. Discussion

The underrepresentation of minorities in medical settings is a pervasive problem with potentially significant implications. This study sought to assess the level of diversity among MGH pathology applicants. No significant difference related to gender was identified among

Table 1
Characterization of MGH Pathology applicants compared to AAMC data—year 2017.

MGH Pathology ($N = 403$)	AAMC Data ($N = 100{,}332$ all specialties; $N = 2447$ pathology)	P-value*
49.0% Female applicants	44.5% Female applicants to all medical specialties	0.493
	46.8% Female applicants to pathology	0.093
38.7% US medical school applicants[a]	22.2% US medical school pathology applicants	**< 0.001**
11.5% US URM applicants	18.0% US URM applicants to all medical specialties	**0.035**
	15.5% US URM applicants to pathology	0.241

Abbreviations: AAMC, Association of American Medical Colleges, MGH, Massachusetts General Hospital, URM, under-represented in medicine; US, United States.
* Significant P-values are highlighted in bold font.
[a] Among US applicants, data for both MD and DO granting medical schools are included in the analyses.

applicants seeking MGH pathology training. However, racial/ethnic groups remain under-represented with significantly fewer URM applicants to MGH pathology from US medical schools as compared to published AAMC data for all medical specialties. Among MGH pathology applicants, USMLE step I scores for URMs were significantly lower than for non-URMs.

Diversity and inclusion are increasingly recognized as the foundation for optimal organizational performance. There have been studies demonstrating the lack of diversity in many different medical specialties, particularly within surgical specialties [6,9-13]. Furthermore, there have been many efforts to find drivers of this phenomenon [5,14,15], and some of the initiatives to reverse it have been studied and shown to be effective [16,17]. Tunson et al. examined three strategies at the Denver Health Residency in Emergency Medicine program. The initiatives included a one month scholarship-based externship program, a funded two day second-look event and increased involvement and visibility of URM faculty, which after a year of implementation doubled the percentage of their URM applicants [17]. Mason et al. reported on an alternative initiative, a targeted pipeline curriculum that included an Orthopaedic Summer Internship Program. The goal of the program was to expose URM and female medical students to the specialty and prepare them to be competitive applicants. This program was judged to be successful, evidenced by the increase of URM applicants to orthopaedic surgery residency programs [16]. In our study, scientific publications were significantly fewer among URM applicants as compared to non-URM applicants. A potential intervention is the availability of funding resources and structured mentorship programs for URM medical students to pursue research. Given that success in the residency selection process relies, in part, upon number of publications as well as USMLE Step 1 scores [18,19], such an intervention may have an impact. In addition, improved encouragement, outreach efforts, financial counseling from college through medical school and residency, and debt forgiveness programs for URMs in academia could increase the number of minorities ultimately choosing academic careers [20].

Limitations of this work include the single institution nature of the investigation as well as the use of available applicant-reported self-identified race and ethnic group. Self-identity is meant to reflect social and cultural group identification voluntarily provided by the applicant. In addition, the study interval was limited to three years of available single subspecialty archival data. To our knowledge, specific pathology residency diversity metrics have not been previously reported.

We have demonstrated that racial/ethnic groups remain under-represented with significantly fewer URM applicants to MGH pathology from US medical schools than to that of all AAMC-tracked specialties and residency programs. Diversity in the medical workforce has been identified as a strategy to address health disparities and enhance the cultural competence of the physicians. Given the benefits of a diverse and inclusive workforce within medical specialties, these findings suggest an opportunity for pipeline initiatives in pathology to improve exposure among URM medical students, particularly in the US.

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