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Diversity in Orthopaedic Surgery Residencies Based on Allopathic Medical School Affiliation

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Introduction: Orthopaedic surgery is one of the most competitive and least diverse specialties in medicine. Affiliation of an orthopaedics with an allopathic medical school impacts research opportunities and early exposure to clinical orthopaedics. The purpose of this study is to examine the potential effect allopathic medical school affiliation has on orthopaedic surgery resident demographics and academic characteristics.

Methods: All 202 Accreditation Council for Graduate Medical Education (ACGME)-accredited orthopaedics programs were divided into 2 groups: Group 1 consisted of residency programs without an affiliated allopathic medical school, and Group 2 consisted of programs with an affiliated allopathic medical school. Affiliations were determined by cross-referencing the ACGME residency program list with the medical school list published by Association of American Medical Colleges (AAMC). Program and resident characteristics were then compiled using AAMC's Residency Explorer including region, program setting, number of residents, and osteopathic recognition. Resident characteristics included race, gender, experiences (work, volunteer, and research), peer-reviewed publications, and US Medical Licensing Examination Step 1 scores.

Results: Of the 202 ACGME-accredited orthopaedics residencies, Group 1 had 61 (30.2%) programs, and Group 2 had 141 (69.8%) programs. Group 2 had larger programs (4.9 vs. 3.2 resident positions/year; $p < 0.001$) and 1.7 times the number of residency applicants (655.8 vs. 385.5; $p < 0.001$). Most Group 2 residents were allopathic medical school graduates, 95.5%, compared with 41.6% in Group 1. Group 1 had 57.0% osteopathic medical school graduates, compared with 2.9% in Group 2. There were 6.1% more White residents in Group 1 residencies ($p = 0.025$), and Group 2 residencies consisted of 3.5% more Black residents in relation to Group 1 ($p = 0.03$). Academic performance metrics were comparable between the 2 groups ($p > 0.05$).

Conclusion: This study demonstrated that candidates who successfully match into an orthopaedic surgery residency program achieve high academic performance, regardless of whether the program was affiliated with an allopathic medical school. Differences may be influenced by increased representation of minority faculty, greater demand for allopathic residents, or stronger emphasis on promotion of diversity in those residency programs.

Availability of Data and Material: Available on reasonable request.

Level of Evidence: Level III. See Instructions for Authors for a complete description of levels of evidence.

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Introduction

Orthopaedic surgery is among the most competitive residencies and consistently ranks in the top 5 specialties with the lowest match rates according to annual National Residency Match Program (NRMP) data. From 2020 through 2022, orthopaedic surgery residency match rates were 71.2%, 67.3%, and 59.6%, respectively¹. The majority of orthopaedic surgery training programs are affiliated with allopathic medical schools; however, this is not universal because 22/202 (10.9%) Accreditation Council for Graduate Medical Education (ACGME) orthopaedic surgery residency programs exist that do not maintain such an affiliation. The converse is also a reality with 21/154 (13.6%) allopathic medical schools in the United States (13.6%) that are also “orphaned” because they lack a formal association with an ACGME-accredited orthopaedic surgery residency program.

Prospective residents with a home orthopaedic residency program may have an advantage in the match. Although the reasons underlying this benefit are multifactorial, orthopaedic surgery residents frequently match from home medical schools, as evidenced by the recent 2021 NRMP application cycle, in which orthopaedic surgery residency programs matched up to 31.6% of incoming residents from home medical schools^{2,3}. The existing literature has also posited that medical school ranking or reputation may play a role in the recruitment of orthopaedic surgery residents—notably, orthopaedic residency programs that are ranked higher according to the Doximity medical networking platform match a greater number of residents from higher-ranked, predominantly allopathic medical schools as delineated by US News and World Report⁴. Despite the subjective nature of rankings and tiers in evaluating the qualities of an orthopaedic resident, educational background and medical school affiliation of residents undoubtedly remain central to the identity of orthopaedic surgery residency programs.

There is a paucity of evidence to suggest whether resident characteristics within orthopaedic surgery residency training programs differ based on existing medical school affiliations—specifically, regarding an allopathic medical school affiliation. Therefore, we sought to assess potential differences between orthopaedic residents receiving training at programs with a home allopathic medical school vs. orthopaedic residents training at residency programs without an affiliated allopathic medical school. We hypothesize that there is no difference in the characteristics of orthopaedic surgery residents from either of these groups.

Methods

This study received institutional review board exemption, and there was no external funding obtained for its completion. All 202 ACGME-accredited orthopaedic surgery residency programs were analyzed and divided into 2 groups: Group 1 consisted of residency programs without an allopathic medical school affiliation, and Group 2 enveloped programs with an affiliated allopathic medical school. These affiliations were determined by cross-referencing the ACGME orthopaedic residency program list with the list of medical schools in the United States generated by the Association of American Medical

Colleges (AAMC). An allopathic medical school affiliation was confirmed if an orthopaedic surgery residency was explicitly listed as a “teaching site” for an allopathic medical school according to the American Medical Association Fellowship and Residency Electronic Interactive Database Access (FREIDA) available for public search.⁵ Residency educational settings (University-Affiliated Hospital, University Hospital, Community Hospital, Military, Other, and Not Applicable) were defined according to program administration-reported information also accessible in the FREIDA Database. Individual program characteristics and residency class profiles were then compiled using the AAMC Residency Explorer tool⁶. Program characteristics included program region, setting, osteopathic recognition, number of residents, available Postgraduate Year-1 (PGY-1) positions, number of applicants, and percentage of applicants interviewed. Characteristics of orthopaedic surgery residents were compiled through data request from the AAMC Residency Explorer tool and its component National Graduate Medical Education (GME) Track Survey—incorporating both self-reported resident data and program administration-reported data—including race, gender, medical school (i.e., allopathic, osteopathic, or international institution) as well as US Medical Licensing Examination (USMLE) Step 1 score, number of peer-reviewed publications, number of work, volunteer, and research experiences, and Alpha Omega Alpha (AOA) or Gold Humanism Honor Society (GHHS) status⁷. Demographic and census terminology (i.e., race, gender, and region) were defined as per the AAMC⁷, and because this study sought to interrogate characteristics of orthopaedic residents in training during our investigation, our retrospective data set cross-sectionally examined 2021 orthopaedic surgery residency program data. Continuous data were evaluated using *t* test, and categorical data were assessed with the Pearson χ^2 test. Statistical analysis was conducted using SPSS Version 27.0 (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp). We considered results to be significant at $p < 0.05$.

Results

Of the 202 ACGME-accredited orthopaedic surgery residencies, 61 (30.2%) were identified in Group 1, and 141 (69.8%) were identified in Group 2. Programs in both groups were similarly distributed across the 4 geographic regions in the United States. The majority of Group 1 programs were housed at affiliate hospitals (41.0%) or community hospitals (39.3%), whereas most Group 2 programs were tied to university hospitals (70.9%) (Table I). Programs in Group 2 had more total residency positions per program (24.6 vs. 15.8, $p < 0.001$) and 1.7 times the number of residency applicants (655.8 vs. 385.5, $p < 0.001$). Both groups interviewed a similar percentage of applicants—approximately 11.0%. The educational background of residents in each group differed as well; a majority of Group 2 residents (95.5%) were graduates of allopathic medical schools in contrast to Group 1 residents (41.6%) [$p < 0.001$]. Group 1 consisted of 57.0% osteopathic graduates, compared with 2.9% in Group 2 ($p < 0.001$) (Table II). The percentage of osteopathic graduates in Group 2 is comparable

TABLE I Distribution of Orthopaedic Surgery Residency Programs in the United States

	Group 1		Group 2	
	No. of programs	Percentage (%)	No. of Programs	Percentage (%)
Osteopathic recognition				
No	56	91.80	141	100.00
Yes	5	8.20	0	0.00
Educational setting				
University-affiliated hospital	25	41.00	34	24.10
Community hospital	24	39.30	2	1.40
Military	5	8.20	1	0.70
Not available	6	9.80	2	1.40
Other	0	0.00	2	1.40
University hospital	1	1.60	100	70.90
US region				
Central	19	31.10	36	25.50
Northeast	18	29.50	42	29.80
Southern	14	23.00	43	30.50
Western	10	16.40	20	14.20

with the total proportion of international medical graduates (IMGs)—both US and foreign nationals. As there are fewer osteopathic graduates than allopathic graduates in orthopaedic training programs, this translates to 95.2% of all osteopathic graduates matching at a Group 1 residency program. A higher percentage, 7.7% of residents in Group 1 had 9 to 10 publications, compared with 4.1% of residents in Group 2 ($p = 0.010$). Furthermore, the percentage of residents with an AOA or GHHS distinction was similar in both groups. The details of program characteristics are summarized in Tables I and II.

Demographic differences were noted pertaining to residents; expressly, there were 6.1% more White residents in Group

1 residencies ($p = 0.025$), and Group 2 residencies consisted of 3.5% more Black residents in relation to Group 1 ($p = 0.03$). The distribution of other racial data was similar between both groups, as was gender makeup (Table III). With respect to resident characteristics, work experiences—a category encompassing a wide range of experiences (i.e., part/full-time occupation, academic tutor, and research assistant)—were similar between both groups, with most residents, 69% in Group 1 and Group 2, having 1 to 4 experiences. Small but statistically significant differences were noted in the categories of volunteer experiences, research experiences, and peer-reviewed publications. Research experiences were also similar across all categories except for those with 13 or more

TABLE II Characteristics of Orthopaedic Surgery Residency Programs in the United States

	Group 1		Group 2		p Value
	Mean	SD	Mean	SD	
Residents	15.75	6.27	24.61	10.36	<0.001
Available PGY-1 positions	3.18	1.27	4.99	2.01	<0.001
No. of applications received	385.52	219.95	655.76	188.63	<0.001
% of applicants interviewed	11.41	8.31	10.89	5.94	
% of PGY-1 residents with Alpha Omega Alpha Membership	29.43	17.86	35.33	16.28	
% of PGY-1 Residents with Gold Humanism Honor Society Membership	10	6.64	11.07	7.08	
% of US allopathic residents	41.63	46.36	95.54	14.04	<0.001
% of US osteopathic residents	57	47.39	2.85	13.64	<0.001
% of US citizen IMG residents	1.31	3.39	1.23	2.89	
% of non-US citizen IMG residents	0.06	0.43	0.39	1.4	

Bold text denotes statistical significance. IMG = international medical graduate, and PGY-1 = Postgraduate Year-1.

TABLE III Demographic and Academic Performance Metrics of Orthopaedic Surgery Residents in the United States

	Group 1		Group 2		p value
	Mean	SD	Mean	SD	
Race					
White	81.94	12.38	75.81	15.21	0.025
Asian	10.82	10.14	12.51	9.91	
Hispanic	3.88	5	6.82	9.69	
Black	1.63	3.41	5.12	7.24	0.003
American Indian	0.47	2.12	0.57	1.54	
Native Hawaiian	0.53	1.92	0.25	1.15	
Other/no response	2.82	4.04	2.98	3.55	
Gender					
Men	84.43	13.87	83.22	9.05	
Women	13.94	9.38	16.84	9.04	
Not reported	
No. of work activities					
0	5.43	6.34	6.17	6.34	
1-2	30.38	11.15	30.83	10.54	
3-4	39.05	16.56	36.49	11.51	
5-6	14.95	9.23	16.12	8.88	
7-8	4.81	6.25	5.9	5.07	
9-10	2.62	3.56	2.2	3.1	
11-12	1	2.65	0.61	1.77	
13+	0.71	2.39	0.37	1.19	
Average	3.57	0.51	3.46	0.6	
No. of volunteer activities					
0	0.81	2.09	0.92	2.04	
1-3	11.38	10.11	10.31	6.89	
4-6	25.86	12.61	31.79	11.41	0.011
7-9	30.05	13.19	28.23	9.83	
10-12	13.76	10.81	15.89	7.62	
13-15	9.86	8.86	7.06	5.2	0.009
16-18	2.48	3.52	2.27	3.05	
19+	0.33	1.06	2.21	3.43	0.013
Average	8.07	1.14	7.78	1.07	
No. of research experiences					
0	2.19	4.69	2.49	3.75	
1-2	22.19	19.39	20.54	10.15	
3-5	37.14	11.82	36.75	11.46	
5-6	22.57	12.23	23.58	8.57	
7-8	6.86	5.35	8.67	6.33	
9-10	1.95	3.43	3.37	4.09	

*continued***TABLE III (continued)**

	Group 1		Group 2		p value
	Mean	SD	Mean	SD	
11-12	1.14	2.67	1.38	2.37	
13+	4.86	5.53	1.83	2.98	0.001
Average	5	0.88	4.43	0.84	
No. of publications					
0	0	0	0	0	
1-2	34.14	20.09	35.02	16.74	
3-4	21	10.76	21.08	9.59	
5-6	13.43	10.77	13.67	8.61	
7-8	6.21	5.73	7.94	6.8	
9-10	7.71	9.02	4.1	4.28	0.010
11-12	4.5	4.49	3.01	3.76	
13+	11.21	11.6	12.94	11.28	
Average	7.36	5.36	6.73	3.56	

entries, with Group 1 having a higher number of residents in this category at 4.8% compared with 1.8% in Group 2 ($p < 0.0001$). Similarly, the number of peer-reviewed publications was comparable in both groups across all but one category (Table III).

Discussion

The 202 ACGME-accredited orthopaedic surgery residency programs in the United States can be divided into those with an affiliated allopathic medical school and those without any such affiliation. This study sought to determine whether there were differences in the characteristics of orthopaedic surgery residents in both groups. The programs in Group 1 and Group 2 were found to have differences on the basis of resident demographics, but there were few differences in performance-driven academic metrics. Specifically, Group 2 orthopaedic residencies had fewer White residents and more Black residents. In addition, Group 2 programs had nearly twice the proportion of residents with allopathic degrees as compared to Group 1, which consisted of a majority of graduates from osteopathic medical schools.

Considering objectively measured performance metrics, USMLE scores, research experiences, volunteer experiences, and honor society membership provide a quantitative measure of a prospective orthopaedic surgery resident's overall competitiveness. An increase in these metrics generally correlates with more successful matches¹. No differences were found in the average values for these factors between Group 1 or Group 2 residents. Small differences in volunteer experiences, research experiences, and peer-reviewed publications were elucidated in our analysis. However, these differences did not establish a clear relationship between the 2 groups.

The most notable difference between orthopaedic residents in the 2 groups is rooted in the greater ethnic diversity in the residents who successfully match into orthopaedic

residencies in the United States with an affiliated allopathic medical school. Current trends within orthopaedics reflect awareness of these issues because residency program directors have recently highlighted the need for increased representation among women and underrepresented minorities (URM) in orthopaedics⁸. As programs strive to increase diversity nationwide, candidates with underrepresented backgrounds are critical to the growth of orthopaedic surgery as a subspecialty⁸⁻¹⁰. Beyond ethical considerations, increased gender and ethnic diversity in healthcare organizations have yielded better quality patient care and higher financial performance⁹. Our analysis revealed that orthopaedic surgery residencies associated with established allopathic medical schools, those in Group 2, were also part of larger healthcare systems. Therefore, prioritization of efforts to increase diversity in residency classes may arise from a top-down organizational approach as part of a broader institutional initiative rather than organic movement at the program level.

The most successful initiatives for increasing the number of orthopaedic surgeons from underrepresented backgrounds have arisen through pipeline programs including Nth Dimension and the Perry Initiative, whereby early exposure and mentorship are contributing factors to a candidate's successful match^{11,12}. Results of our study may indicate that demographic differences in Groups 1 and 2 may, in fact, underscore the effects of larger structural issues affecting diversity in orthopaedics—such as the limited representation of underrepresented minorities among orthopaedic surgery faculty in the United States¹³. Although orthopaedics is characterized by low representation of URM physicians across residency programs, a difference may still exist in faculty representation in Groups 1 and 2 because of their largely community and university-based relationships, respectively. Undoubtedly, diverse faculty attracts diverse students, and demographic differences of academic and community programs are reflected in the demographics of the applicants they attract¹⁴. This correlation suggests that an increased female¹⁵ and URM¹⁶ presence in academic centers serves to attract more diverse applicants because of equitable physician representation, a key modifiable factor in consideration of program diversity¹¹.

Differences with respect to allopathic and osteopathic medical degrees across both groups can describe the increased demographic diversity in Group 2 residencies. Orthopaedic residencies without an affiliated allopathic medical school were often affiliated with an osteopathic medical school. A “cultural fit” within a given orthopaedic residency program plays a role in determining the characteristics of applicants to that program¹⁷, and programs that historically recruit allopathic or osteopathic residents will likely continue to attract individuals of similar academic backgrounds. Notably, this notion of “cultural fit,” is often defined by orthopaedic surgery residency programs themselves and may explain the difference in distribution of allopathic and osteopathic residents in either group.

AAMC and American Association of Colleges of Osteopathic Medicine annual reports for matriculating medical students in 2020 revealed a total of 918 underrepresented minorities beginning osteopathic medical schools¹⁸ and 3,747 underpre-

sented minorities in allopathic schools¹⁹. More specifically, 80% of all URM students matriculating to a medical school in the United States in 2020 attended an allopathic school. Therefore, residency programs included in Group 2, which consists of more allopathic medical school graduates, also select residents from an applicant pool with a higher proportion of URM applicants. However, it is difficult to ascertain whether Group 2 residencies are seeking out diverse applicants or those holding an allopathic degree in comparison with Group 1 programs—many of which are affiliated with osteopathic medical schools.

In similarly competitive surgical subspecialties, previous studies have compared PGY-1 residents from medical schools with a home program to those without one^{20,21}. In particular, Wang et al. determined that fourth-year medical students applying for an otolaryngology residency position from an institution with a home program did not differ in USMLE scores or number of publications in comparison to students without a home otolaryngology program. The lack of difference in numeric measures of incoming otolaryngology residents as well as orthopaedic residents serves to reinforce the idea that, at baseline, a highly competitive application is requisite for a successful orthopaedics match, regardless of the characteristics of a particular residency program²⁰. A minor correlation between the objective, academic performance-driven metrics in this study and clinical success in orthopaedic surgery residency leaves the potential for Group 1 or Group 2 residents to differ in work ethic, personality, or preparation despite similarities in their academic profiles²².

Our analysis was limited by a few intrinsic factors. Although the AAMC and ACGME lists of allopathic medical schools and accredited residency programs in the United States provide comprehensive data, neither group categorizes institutional data in a manner relevant to the experimental design of this study. In addition, variation exists in the relationships between residency programs and their affiliated medical schools. In consideration of medical schools with multiple campuses, it is difficult to determine the degree of access that each campus is afforded to a home orthopaedic surgery residency program. In addition, the association between a medical school and health system (and the relationship between a health system and a residency program) is not quite clear-cut. Therefore, the classification of some residency programs as affiliated or nonaffiliated in relation to an allopathic medical school may be imprecise. As academic institutions and health systems increase their networks, and new medical schools seek out partnerships and affiliations, this distinction will become less clear. Another distinction not well established in this study is the relationship between academic affiliation with university-based institutions, specifically. University-based institutions may be held in higher academic regard and may have access to better resources in comparison with independent counterparts, thereby driving further discrepancies. Additional limitations of this study arise from the standardized score reporting for the USMLEs. We had limited access to USMLE score reports, which provide average score ranges, rather than raw scores for residents; with access to more complete score data, we would be better equipped to elucidate a difference in academic performance for Group 1 and 2 residents.

This study demonstrates that candidates who successfully match into orthopaedic surgery residency in the United States maintain superior academic standards and performance metrics. However, there is a shift in resident demographics because programs are separated into those with an affiliation to an allopathic medical school and those without. Academic metrics were comparable across both groups, but programs with an allopathic medical school affiliation have higher proportions of Black and allopathic residents. This difference could be due to increased representation of URM faculty, greater demand for allopathic residents, or stronger emphasis on promotion of diversity in those residency programs. Future studies are necessary to further qualify the characteristics desired by program directors in either of the 2 groups and to determine the effect of an orthopaedic home program on a medical student's path to residency. ■

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References

- Residency Data & Reports. NRMP; 2022; <https://www.nrmp.org/match-data-analytics/residency-data-reports/>. Accessed June 17, 2022.
- Schrock JB, Kraeutler MJ, Dayton MR, McCarty EC. A comparison of matched and unmatched orthopaedic surgery residency applicants from 2006 to 2014: data from the national resident matching program. *J Bone Joint Surg.* 2017;99(1):e1.
- Nestler AJ, Feibel BM, Beason AM, Besserman K, Mounce SD, Bailey JR, Delfino KR, Allan DG. The student you know: orthopedic surgery home program match rates and geographic relationships before and after COVID-19. *J Surg Educ.* 2023;80(3):476-82.
- Holderread BM, Liu J, Craft HK, Weiner BK, Harris JD, Liberman SR. Analysis of current orthopedic surgery residents and their prior medical education: does medical school ranking matter in orthopedic surgery match? *J Surg Educ.* 2022;79(4):1063-75.
- FREIDA™. American Medical Association (AMA); 2022. <https://freida.ama-assn.org/>. Accessed August 20, 2022.
- Residency Explorer™. Association of American Medical Colleges (AAMC); 2022. <https://www.residencyexplorer.org/explore>. Accessed August 20, 2022.
- AAMC FACTS Glossary. Association of American Medical Colleges (AAMC); 2022; <https://www.aamc.org/data-reports/students-residents/interactive-data/facts-glossary>. Accessed August 20, 2022.
- Gebhardt MC. Improving diversity in orthopaedic residency programs. *J Am Acad Orthopaedic Surgeons.* 2007;15(suppl 1):S49-50.
- Gomez LE, Bernet P. Diversity improves performance and outcomes. *J Natl Med Assoc.* 2019;111(4):383-92.
- Dooley JH, Bettin KA, Bettin CC. The current state of the residency match. *Orthop Clin North America.* 2021;52(1):69-76.
- McDonald TC, Drake LC, Replogle WH, Graves ML, Brooks JT. Barriers to increasing diversity in orthopaedics: the residency program perspective. *JB JS Open Access.* 2020;5(2):e0007.
- Lattanza LL, Meszaros-Deaerolf L, O'Connor MI, Ladd A, Bucha A, Trauth-Nare A, Buckley JM. The Perry initiative's medical student outreach program recruits women into orthopaedic residency. *Clin Orthop Relat Res.* 2016;474(9):1962-6.
- Chen RE, Kuhns BD, Kaupp S, Voloshin I, Mannava S. Diversity among academic orthopedic shoulder and elbow surgery faculty in the United States. *J Shoulder Elbow Surg.* 2020;29(4):655-9.
- Okike K, Phillips DP, Johnson WA, O'Connor MI. Orthopaedic faculty and resident racial/ethnic diversity is associated with the orthopaedic application rate among underrepresented minority medical students. *J Am Acad Orthop Surg.* 2020;28(6):241-7.
- Rohde RS, Wolf JM, Adams JE. Where are the women in orthopaedic surgery? *Clin Orthop Relat Res.* 2016;474(9):1950-6.
- Day CS, Lage DE, Ahn CS. Diversity based on race, ethnicity, and sex between academic orthopaedic surgery and other specialties: a comparative study. *J Bone Joint Surg.* 2010;92(13):2328-35.
- Porter SE, Razi AE, Ramsey TB. Novel strategies to improve resident selection by improving cultural fit: AOA critical issues. *J Bone Joint Surg.* 2017;99(22):e120.
- 2020 AACOMAS Applicant Matriculant Profile Summary Report. American Association of Colleges of Osteopathic Medicine (AACOM); 2022. https://www.aacom.org/docs/default-source/data-and-trends/2020-aacom-as-applicant-matriculant-profile-summary-report.pdf?sfvrsn=d870497_22. Accessed June 20, 2022.
- 2021 Facts: Applicants and Matriculants Data. Association of American Medical Colleges (AAMC); 2022. <https://www.aamc.org/data-reports/students-residents/interactive-data/2021-facts-applicants-and-matriculants-data>. Accessed June 20, 2022.
- Wang JC, Pillutla P, Tello N, Gabrilksa R, Aranke M, Bibb T, Watkins PD, Cordero J. Competitiveness of otolaryngology residency applicants without a home program. *Ann Otol Rhinol Laryngol.* 2020;129(5):462-8.
- Baghchechi M, Oviedo P, McLean P, Dean R, Dobke M. Disparity in opportunities: is it harder to match into plastic surgery residency without a home plastic surgery division? *Ann Plast Surg.* 2021;87(4):384-8.
- Valley B, Camp C, Grawe B. Non-cognitive factors predicting success in orthopedic surgery residency. *Orthop Rev (Pavia).* 2018;10(3):7559.