



AOA Critical Issues in Education

Declining Rate of International Medical Graduates Matching Into Orthopedic Surgery Residency Programs in the United States

A 17-Year Analysis

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Introduction: International medical graduates (IMGs) continue to play an important role in the US health care system, but little is known about their trends of matching into highly competitive residencies such as orthopedic surgery. The purpose of this study was to analyze temporal trends of IMG applicants matching into US orthopedic residency programs between 2008 and 2024 and compare them with US allopathic (MD) and osteopathic (DO) graduates.

Methods: Orthopedic residency specific data for years 2008 to 2024 was obtained from the National Resident Match Program and Electronic Residency Application Service. Variables collected included total number of programs, total positions offered, number of applicants (MD, DO, and IMG), positions filled, and fill rate for each group. Trends were examined using simple linear regression modeling.

Results: The number of orthopedic residency programs increased from 160 (2008) to 218 (2024), with total positions increasing from 636 (2008) to 916 (2024). The IMG fill rate decreased from 2.99% in 2008 to 0.87% in 2024 ($p < 0.01$ for linear trend; $\beta -0.069$). This corresponds to an absolute number decrease of 19 IMGs in 2008 to 8 in 2024. More specifically, the proportion of US IMGs decreased from 0.94% to 0.66%, and the proportion of non-US IMGs decreased from 2.04% to 0.21%. Over the 17-year study period, a total of 105 US IMGs and 110 non-US IMGs matched into

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orthopedic surgery. The US MD applicant fill rate decreased significantly from 96.5% to 85.0% ($p < 0.001$; $\beta -0.944$). The DO applicant fill rate increased significantly from 0.31% to 13.97% ($p < 0.0001$; $\beta 0.990$).

Conclusion: The declining rate of IMGs matching into orthopedic residency programs in the United States underscores the growing challenges faced by IMGs in accessing training in this competitive specialty. The notable increase in DO graduates securing orthopedic residency positions likely reflects the integration of a unified accreditation system for MD and DO residency programs established in 2020.

Level of Evidence: Retrospective Cohort Study; IV

Introduction

International medical graduates (IMGs) are physicians who have received their medical school education outside the United States and Canada. This group encompasses US citizens who studied medicine abroad (US IMGs) and foreign citizens who earned their medical degrees abroad (non-US IMGs).

The positive contributions of IMGs to the US health care system are well-documented. These individuals continue to play a crucial role in meeting the workforce demands of a growing patient population, often practicing in underserved areas and communities^{1,2}. In addition, IMGs bring unique perspectives that enhance workplace diversity¹⁻³.

Over the past few decades, there has been a consistent increase in the presence of IMGs practicing in the United States². The representation of IMGs is disproportionately greater in nonsurgical specialties such as internal medicine, neurology, psychiatry, and pediatrics². Within orthopedic surgery, one study reported that IMGs comprise about 6% of the active practicing workforce in the United States². Despite the contributions of IMGs to the field of orthopedic surgery, there are limited data regarding temporal trends of IMGs matching into this competitive specialty. While some specialties, such as radiology, have seen substantial increases in IMG fill rates over the years, others such as urology have experienced declines²⁻⁷. Understanding these trends is particularly important, since orthopedic surgery remains one of the most competitive, yet least diverse specialties of medicine⁸.

The goals of this study was to analyze trends in matching of IMGs into orthopedic surgery residency programs in the United States and to compare these trends to matching of US allopathic (MD) and osteopathic (DO) graduates.

Methods

Data Collection

Residency match data from 2008 to 2024 were collected from the “Results and Data” documents available through the National Residency Match Program (NRMP) website and archives^{6,9-24}. This study was exempt from Institutional Review Board approval, since the data used were publicly available and deidentified. Variables included the number of participating orthopedic residency programs, available positions, and filled positions for each match year. The overall match rate was calculated as the proportion of filled positions to available positions. In addition, fill rates were determined for specific applicant groups: allopathic (US MD seniors/graduates), osteopathic (US DO seniors/graduates), US IMGs, and non-US IMGs.

This data set was supplemented by data pertaining to the number of applicants from the Electronic Residency Application Service (ERAS). The ERAS data are maintained by the American Association of Medical Colleges.

Statistical Analysis

All data were collected using Excel Microsoft 365 (Microsoft), and statistical analysis was performed using Python programming language. Yearly trends in the US MD, DO, and IMG fill rates were analyzed using simple linear regression, and p values < 0.05 were considered statistically significant.

Results

Overall Trends

The number of orthopedic residency programs participating in the NRMP match increased from 160 (2008) to 218 (2024), with an overall increase from 636 (2008) to 916 (2024) positions. The overall match rate for orthopedic positions (proportion of positions filled to positions available) stayed essentially constant, from 99.4% to 100%.

Match Rate for US MDs, DOs, and IMGs

The proportion of US IMGs matching into orthopedic surgery residency decreased from 0.94% (6/636) in 2008 to 0.66% (6/916) in 2024, while the proportion of non-US IMGs decreased from 2.04% (13/636) in 2008 to 0.21% (2/916) in 2024. The overall IMG fill rate decreased from 2.99% in 2008 to 0.87% in 2024 ($p < 0.01$; (β) -0.069 ; Fig. 1). The total number of IMGs matched decreased from 19 to 8 (β : 0.21; Intercept: 14.54; Fig. 2). Over the study period, a total of 105 US IMGs and 110 non-US IMGs matched into orthopedic surgery.

The proportion of positions filled by US MDs significantly declined from 96.5% (614/636) in 2008 to 85.0% (779/916) in 2024 ($p < 0.001$; $\beta -0.944$) (Fig. 3). The proportion of positions filled by DO seniors and graduates significantly increased from 0.31% (2/636) in 2008 to 13.97% (128/916) in 2024 ($p < 0.0001$; $\beta 0.990$) (Fig. 3). From 2008 to 2024, the number of IMGs, MDs, and DOs went from 19 to 8, 592 to 726, and 2 to 128, respectively (Table 1). The match compositions of IMGs, MDs, and DOs in orthopedic surgery residency each year from 2008 to 2024 is depicted in Figure 4.

Discussion

Orthopedic Surgery remains one of the most competitive yet least diverse specialties⁸. Little is known regarding trends in

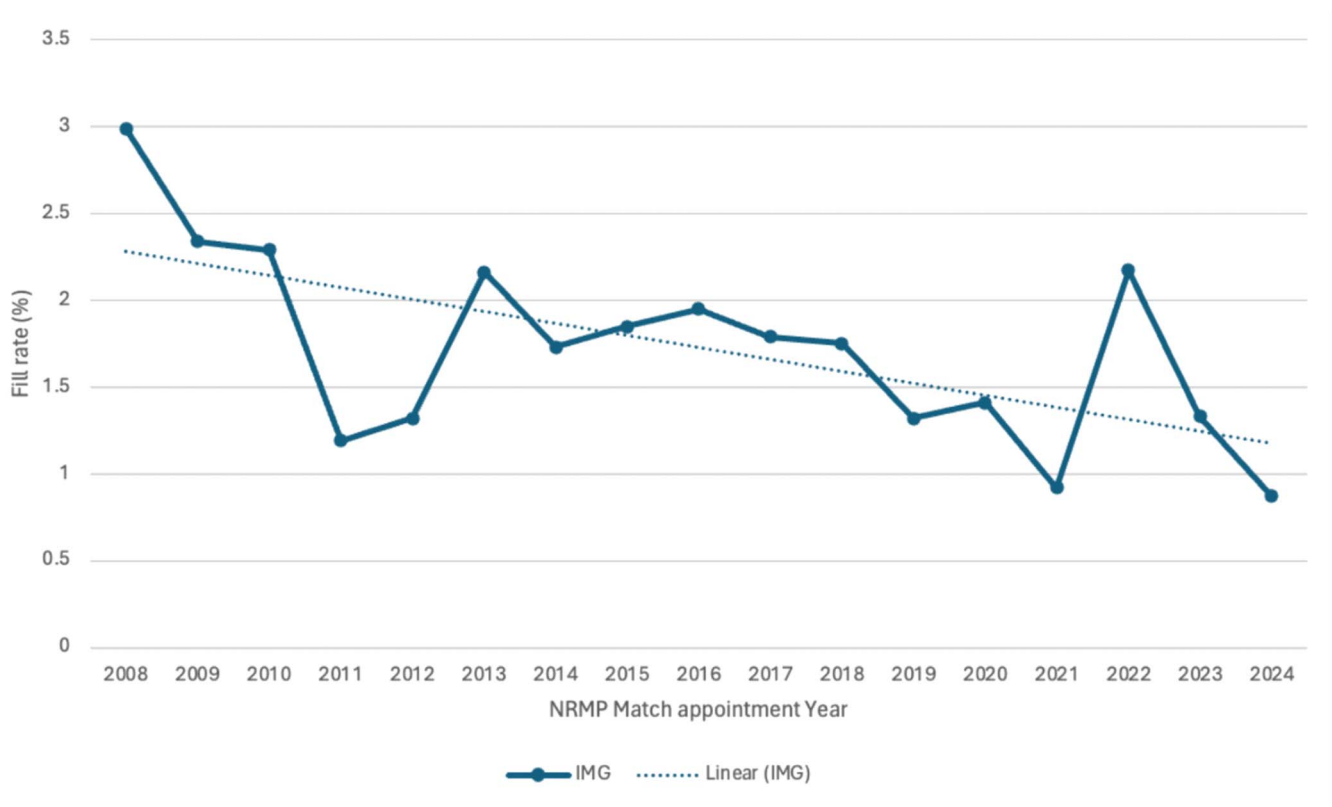


Fig. 1
IMG fill rate in US orthopedic surgery residency programs from 2008 to 2024.

the residency match composition of IMGs. The purpose of this study was to analyze temporal trends of IMG applicants matching into US Orthopedic Residency programs between 2008 and 2024 and to compare them with US allopathic and osteopathic graduates. Our study found a decline in the proportion of IMGs matching into orthopedic residency programs in the United States, from 2.99% in 2008 to 0.87% in 2024. This decline was driven by decreasing fill rates for both US IMGs (from 0.94% to 0.66%) and non-US IMGs (from 2.04% to 0.21%).

The proportion of IMGs matching into orthopedic residencies does not reflect the trends observed across all US residency programs. In 2024, a notable increase was seen in the number of IMGs obtaining first-year positions in Graduate Medical Education (GME) programs, totaling 9,405 IMG candidates and comprising 25% of all matched applicants²⁵. This represented a 7.8% increase from the previous year²⁵. However, specialty-specific analyses reveal varied trends in IMG fill rates. For instance, within family medicine, IMGs accounted for 31% of first-year residency positions in 2024, showcasing a sustained upward trend². Similar patterns were observed in pediatrics, where the number of matched IMGs increased by 31% from 2015 to 2020, reaching 134 placements²⁹. On the contrary, surgical disciplines exhibit varying patterns. While general surgery experienced a modest 0.5% increase in IMG fill rates annually over the last 2 decades, urology saw a significant decline, from 27% in 1978 to only 5% in 2013³. These disparities highlight the influence of specialty-specific factors on

IMG match compositions, warranting further investigation into program selection criteria.

The increased representation of IMGs in primary care positions within the US health care system may be attributed to several factors. IMGs may receive training that emphasizes primary care practice as a result of health care priorities in their home countries, which may increase their candidacy for such disciplines²⁶. Moreover, IMGs may be more willing to practice in economically disadvantaged and densely populated areas with low physician density, fulfilling critical

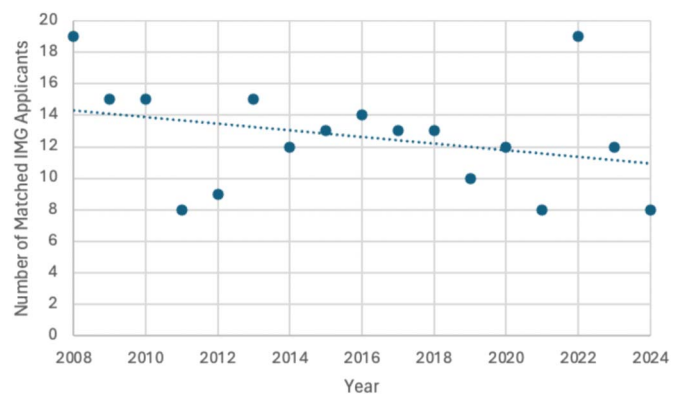


Fig. 2
Number of IMG Matches in US orthopedic surgery residency programs from 2008 to 2024.

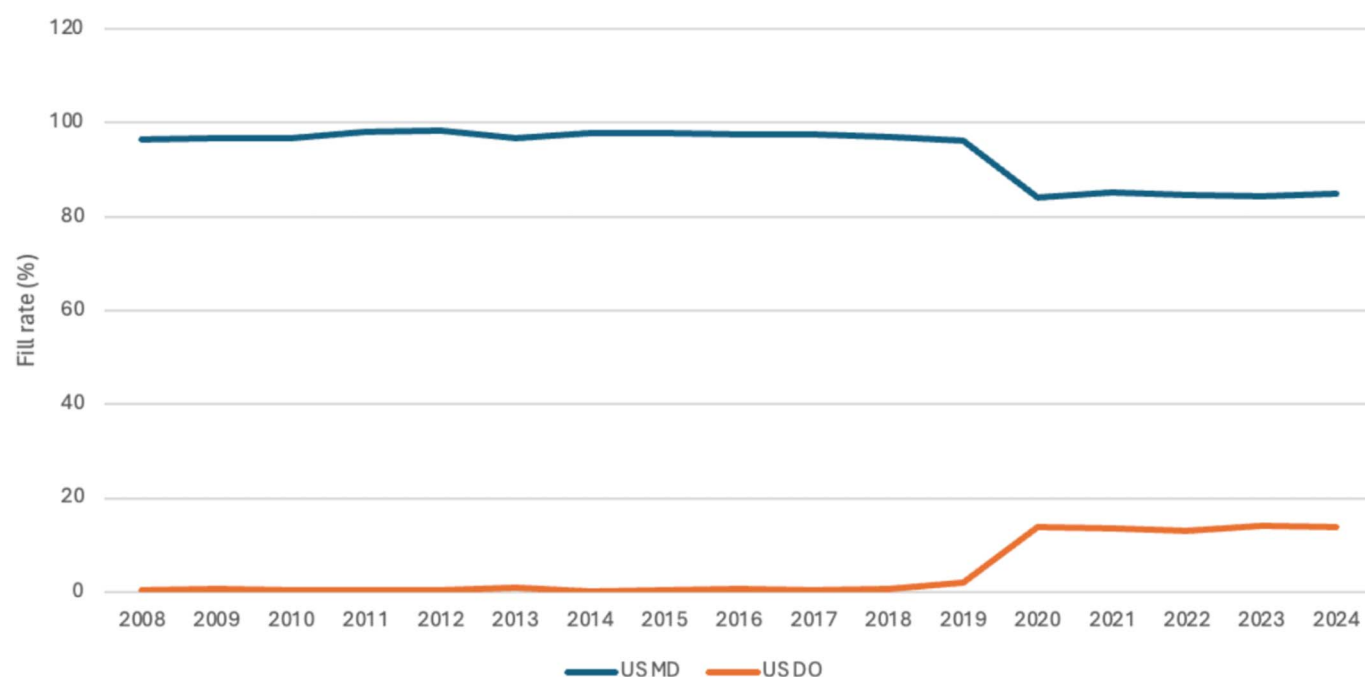


Fig. 3
MD versus DO fill rate in US orthopedic surgery residency programs from 2008 to 2024.

gaps in health care access and meeting community health needs^{26,27}.

In addition, IMGs may encounter greater opportunities to secure residency positions in primary care specialties compared with more competitive fields, owing to both institutional support and workforce demands²⁶⁻²⁸. For instance, in internal medicine,

there were 9,916 candidates vying for 9,725 spots, with 3.9% of positions going unfilled in 2023²⁴. A significant portion of the applicants to this specialty were IMGs (39.3%)^{24,25}. By contrast, in orthopedic surgery during the same year, there were 1,425 candidates for 899 spots, with a 100% fill rate and a significantly higher number of US MDs applying compared with internal medicine²⁴.

TABLE I Total Number of Matched Candidates to US Orthopedic Surgery Residency Programs From 2008 to 2024

Year	No. of Programs	Total Positions Offered	US MD	US Senior	US DO	US IMG	Non US IMG	Overall "Match Rate"
2008	160	636	592	22	2	6	13	99.8
2009	157	641	587	33	5	3	12	99.8
2010	159	656	598	37	3	3	12	99.5
2011	158	670	621	37	2	4	4	99.7
2012	161	682	641	30	2	3	6	100
2013	163	693	636	34	6	9	6	99.9
2014	162	695	649	31	1	5	7	99.7
2015	161	703	663	24	3	10	3	100
2016	163	717	650	49	4	6	8	100
2017	165	727	668	42	3	7	6	99.9
2018	171	742	691	29	5	10	3	99.5
2019	175	755	693	34	15	7	3	99.6
2020	203	849	686	28	118	5	7	99.4
2021	208	868	699	40	119	5	3	99.8
2022	210	875	705	36	115	8	11	100
2023	218	899	690	69	126	8	4	100
2024	218	916	726	53	128	6	2	99.9

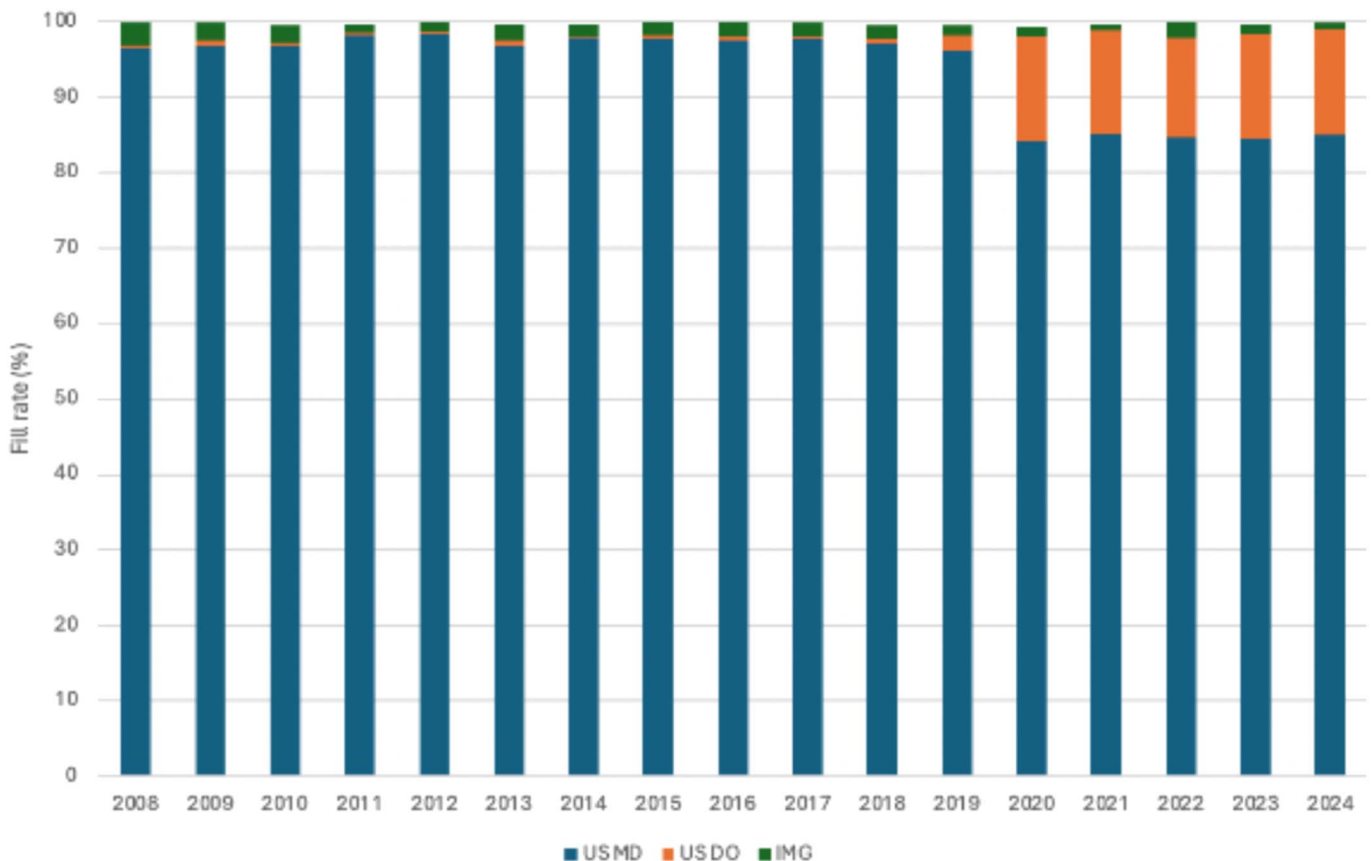


Fig. 4
Match composition for US orthopedic surgery residency programs from 2008 to 2024.

The decrease in IMG fill rates within orthopedic surgery residencies in recent years may also be partly attributed to the merger of the American Osteopathic Association and the Accreditation Council for Graduate Medical Education in 2020. The aim of this merger was to establish a unified accreditation system for MD and DO residency programs. Our analysis reveals a significant increase in the fill rate for DO candidates, rising from 2% in 2019 to 12% in 2020. This increase aligns with a corresponding decline in MD fill rates during the same period. While the trend in IMG fill rates displays more variability over this time frame, the overall direction remains negative, indicating potential challenges for IMG applicants. It is important to note that although the surge in DO fill rates within US orthopedic residency programs is evident, the NRMP does not specify whether these DO graduates matched into MD or DO programs.

It is important to note that additional factors, unique to non-US IMG applicants, such as the J1 and H1B visa requirements, may also impose burdens on the application process. IMGs on J1 visas face strict requirements, including a mandatory 2-year return to their home country following residency. Obtaining a waiver to serve in medically underserved parts of the United States is one pathway to negate this requirement³⁰. Alternative pathways to receive a waiver include receiving a Non Objection Statement from one's home country

government, providing documentation that one would be persecuted based on race, religion, or political opinion on return to their home country, proof that one's departure would cause exceptional hardship to their US citizen or permanent resident spouse or child or obtaining a waiver through the Conrad State 30 Program³⁰. However, given the substantial fill rates of IMGs into primary care disciplines, one should not assume that these requirements are the primary factors for lower fill rates in orthopedic surgery specifically^{25,31-33}. Rather, this trend may be partly related to IMGs prioritizing opportunities to work within less desirable locations with higher need for primary care to avoid the home requirement.

Yet another factor could be the significant travel restrictions placed during the initial period of the COVID pandemic. While there was a general decline in orthopedic fill rates for IMGs throughout the study period, there was a substantial dip in 2021, which prompts consideration of the effects of these travel restrictions. This residual effect from 2020 onward may also explain the decline in residency placements for non-US IMGs in recent years, particularly in 2023 and 2024. Although difficult to prove, significant travel restrictions imposed during the early stages of the COVID-19 pandemic likely affected the residency application processes for non-US IMGs. This is especially relevant given that many IMGs typically engage in research

fellowships within the United States³⁴. These opportunities not only enhance applicant credentials but also facilitate crucial networking and skill development. The pandemic likely disrupted obtainment of these positions, potentially curtailing in-person research opportunities or diverting institutional resources away from nonessential endeavors, such as research, ultimately affecting IMG candidacy.

While IMGs matching into orthopedic surgery often present lower board scores compared with their US MD and DO counterparts, they demonstrate higher research involvement and hold a greater number of advanced degrees³⁴⁻³⁸. However, IMGs may face limited opportunities for audition rotations in the United States, which can hinder their ability to acquire interview invitations and letters of recommendation from reputable faculty^{38,39}.

There are several limitations to our study. First, the NRMP does not distinguish between non-US IMGs who are legal permanent residents and foreign nationals who enter the United States for GME training. Therefore, the non-US IMG group is not entirely representative of visa-requiring IMGs as legal permanent residents do not require visas to enter the United States. The visa-requiring non-US IMGs are a subset of this group, and it is unknown what the breakdown in representation is. It is also important to acknowledge that while NRMP provides information on IMGs who matched successfully, they do not disclose the total number of IMGs participating in the match process. Finally, the data obtained from the NRMP report archives do not consider applicants who accepted unfilled positions out of the Match process (pre-Match or off-cycle positions). That number, however, is presumed to be small due to the NRMPs "all-in" policy for residency programs established in 2011⁴⁰. This policy compels programs participating in the Main Residency Match to attempt to fill all positions through the Match itself.

Conclusion

The declining rate of IMGs matching into orthopedic residency programs in the United States underscores the growing

challenges faced by this group of applicants in securing placement in this competitive specialty. The notable increase in DO graduates securing orthopedic residency positions likely reflects the integration of a unified accreditation system for MD and DO residency programs established in 2020. ■

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