

# International Medical Graduates in US Orthopedic Residency Programs: A Comprehensive Analysis

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## ABSTRACT

**BACKGROUND:** This study aims to provide insight regarding the different qualities of international medical graduates (IMGs) involved in US orthopedic residency programs.

**METHODS:** Orthopedic residency programs accredited by the ACGME and listed in the AMA database were screened. Data on program size and location, IMG year of training, the geographic region of IMG's medical schools, their research experiences and number of gap years were included.

**RESULTS:** A total of 167(80.3%) orthopedic residency programs were included. A total of 3838 residents were identified, of which 44 (1.15%) were IMGs. The United Kingdom and Ireland had the highest number of matched IMGs with four (9.1%) each. Massachusetts was the state with the highest number of enrolled IMGs. On average, IMGs had 26.3 publications and joined US orthopedic residency 4.66 years following medical school graduation.

**CONCLUSION:** Despite the many hurdles experienced by IMGs, a decent number succeeds in matching into US orthopedic residency programs each year.

**KEYWORDS:** international medical graduate; residency training; orthopedics; geographic distribution; IMG

## INTRODUCTION

International medical graduates (IMGs), or physicians who obtained their medical degrees from countries other than the United States (US), account for 25% of the physician workforce in the US.<sup>1</sup> Over the past several decades, IMGs have played a pivotal role in US healthcare, especially in poor rural areas that are underserved with regards to medical and surgical services and providers.<sup>2</sup> IMGs have shown an increasing interest in seeking to pursue residency training in the US, mainly due to the prestigious reputation of US residency training worldwide, the greater potential to pursue scientific and academic endeavors, and the better living conditions when compared to other developing parts of the world.<sup>3,4</sup> In 2020, the National Residency Matching Program (NRMP) statistics reported that approximately 2580 IMGs

(61.1% of IMG applicants) matched into first year residency positions – the highest match rate for IMGs since 1990.<sup>5</sup>

Orthopedic surgery is one of the most competitive specialties in the US, for both IMGs and graduates of US medical schools.<sup>6</sup> In general, applicants seeking to pursue orthopedic residency are expected to have attained high USMLE scores, demonstrated good research productivity, and/or achieved multiple accolades in order to match into their first-choice orthopedic program.<sup>3,7,8</sup> Matching into orthopedic surgery as an IMG is considered a rare and difficult feat, considering the high academic requirements of the competitive specialty, and the burdensome logistic hurdles imposed by being a graduate from a foreign medical school.<sup>3,7-9</sup>

Exploring the characteristics and geographic distribution of IMGs who matched into orthopedic residency programs may provide valuable insight into the prospects of matching in such a competitive specialty in the US. Accordingly, the purpose of this study is to evaluate publicly available data pertaining to IMG residents in US orthopedic residency programs and describe the demographic, academic and geographic qualities of matched IMGs.

## METHODS

In January 2023 we accessed publicly available data on all orthopedic surgery residency programs accredited by the Accreditation Council for Graduate Medical Education (ACGME) and listed in the American Medical Association (AMA) FREIDA™ residency programs database from 2018 to 2022.<sup>10</sup> Only programs that had information on current residents readily available to the public were included. The individual residency program websites with current data were reviewed to obtain a list of current orthopedic surgery residents; IMGs were identified by analyzing the data available on the residents' profiles. An IMG was defined as any resident who had obtained their medical degree (MD, MD-PhD, MBBS, etc.) from a medical school located outside of the United States.

Data on identified IMGs in orthopedic residency programs was recorded, and this included the size and location of their current US orthopedic residency program, their year of training, the countries from which they received their medical degrees, and the geographic region of their medical schools. A PubMed search was conducted to determine the number

of articles published by IMGs prior to the start of their residency training. We included all articles published up until the year prior to the start of residency training. For example, if an IMG matched in 2021, we included all published articles up until the end of 2020. In addition, we searched the Doximity and LinkedIn accounts of identified IMGs in order to screen whether they attained postgraduate degrees (Doctorate of Philosophy (PhD) or Master's degrees) prior to their enrollment into a US orthopedic residency program.<sup>11,12</sup> We also reported the year of their medical school graduation, and calculated the time difference between their graduation and their acceptance into orthopedic residency in the US.

Statistical analyses were performed using Statistical Package for the Social Sciences for Windows software version 25.0 (IBM SPSS, 2017). Categorical variables were expressed as percentages, and continuous variables were expressed as means, ranges and standard deviations. Significant differences between geographic regions were evaluated using the One-Way analysis of Variance (ANOVA) test. In case of ANOVA significance, Tukey's Multiple Comparison Test was performed to show significant differences among different groups. P values < 0.05 were used to declare significance for all analyses.

## RESULTS

A total of 167 programs (80.3%) out of 208 orthopedic residency programs were included in our study. These programs had a total of 3838 residents, of which 44 (1.15%) were identified as IMGs. The percentage of IMG residents by year was similar throughout the study period, ranging between 0.64% in 2021 and 1.53% in 2022. **Table 1** presents the distribution of IMGs across US orthopedic residency programs by year of training.

IMGs obtained their medical degrees from 22 different countries, with Ireland and the United Kingdom having the highest number with four matched IMGs each over the course of the study period. (**Figure 1**) When categorizing the production of matched IMGs by region, Europe produced the highest percentage of enrolled IMGs with 13 IMGs (29.5%), followed by the Middle East with 11 IMGs (25%) (**Table 2**). When comparing the number of produced IMGs between different geographic regions, no statistically significant differences were found (p=0.73).

IMGs enrolled in US orthopedic residency programs were distributed across 16 different US states. Massachusetts had the highest number of enrolled IMGs with eight, followed by Ohio and New York with five each. (**Figure 2**) Massachusetts also had the highest percentage of IMGs, with 6.3% of all orthopedic residents being IMGs, followed by Missouri and North Carolina at 3.4% each. (**Figure 3**) (*Note: Email corresponding author for Figures.*)

The average matched IMG had a total of 26.3+/-32.86 (median = 11.5 articles) published articles on PubMed, with

**Table 1.** Distribution of international medical graduates (IMGs) in 167 US orthopedic residency programs by postgraduate year (PGY) of training, 2018–2022

PGY Year	PGY-1	PGY-2	PGY-3	PGY-4	PGY-5
Total number of residents	785	780	773	768	776
Number of IMGs	12	5	9	8	10
Percentage of IMGs from total number of residents	1.53	0.64	1.16	1.04	1.29

**Table 2.** Distribution of international medical graduates (IMGs) in 167 US orthopedic residency programs according to the regions of their medical schools. (p=0.73)

Region	Number of IMGs	Percentage (%)
Asia	6	13.6
Europe	13	29.5
Middle East	11	25.0
Central America/Caribbean	8	18.2
Oceania	1	2.3
South America	5	11.4
Total	44	100

a range from zero to 142. On average, IMGs had a 4.66 (+/- 3.78) years gap following their medical school graduation and prior to enrolling into US orthopedic surgery programs, with a range between 0 and 17 years. Information on medical school graduation and additional degrees was available for 36 out of the 44 included IMGs (n=36). Eight IMGs (22.2%) were reported to have attained nine postgraduate degrees at the time of their enrollment into orthopedic residency: four had PhDs, three had Master's degrees, and one IMG had both a PhD and a Master's degree.

## DISCUSSION

Our study showed that IMGs constitute a very small percentage of the total cohort of orthopedic residents in the US. The United Kingdom and Ireland were the countries with the highest numbers of matched IMGs. Eastern states had a higher probability of enrolling IMGs than Western states. On average, enrolled IMGs had around 26 publications (median= 11.5 publications), and joined US orthopedic residency around five years following medical graduation.

A very small portion of US orthopedic residency positions is occupied by IMGs. That is expected given that every country has a particular interest in and obligation to train its citizens, who are more likely to stay and practice there when compared to foreigners. In addition, many program directors may have concerns regarding the logistic implications of enrolling IMGs, who may require visa sponsorships with obligatory renewal hindrances and time duration limits.<sup>13,14</sup> This adds complexities and stress to both IMGs and

residency program directors alike, especially when considering IMGs hailing from politically unstable countries, in which visa renewal may be delayed or terminated due to international diplomatic disputes.<sup>13,14</sup> Challenges for IMGs in more competitive specialties have been documented. One study by Moore et al explored the perceptions of general surgery residency program directors towards accepting IMGs and reported that 20% felt pressured to rank American medical graduates over IMGs, even when the IMGs were more qualified.<sup>15</sup> Regardless, American residency programs remain highly attractive to IMGs due to their excellent reputation in surgical training worldwide, and the vast opportunities provided for research-oriented physicians.

Europe was the region with the highest number of matched IMGs in our study. In particular, the United Kingdom and Ireland were the countries with the highest number of IMGs. Several factors may explain this finding. Numerous research partnerships exist between European countries and the US, and research collaborators may wish to obtain surgical training in the US.<sup>16-18</sup> Orthopedic surgical training in the US is generally shorter than that of European countries, and mean attending physician salaries in the US are higher than those in European countries.<sup>19,20</sup> The majority of IMGs in our study matched in states on the East Coast. Khachfe et al suggested that the geographical proximity of the East Coast to Europe, the Caribbean and South America may play a role in attracting IMGs from those regions.<sup>3</sup> In addition, IMGs are often attracted to metropolitan areas where social and cultural diversity is embraced and institutions that show higher levels of acceptance towards physicians from different backgrounds.<sup>21</sup> Other factors that may explain this finding include presence of international faculty, and availability of visa sponsorship.<sup>3</sup>

Orthopedic surgery is one of the most competitive specialties to match in in the US. Being an IMG introduces additional hurdles that the applicant must overcome in order to secure a training position.<sup>13,14</sup> As a matter of fact, the percentage of IMGs in orthopedic residency programs found in our study is much lower than that of other competitive specialties like general surgery (9%) and neurosurgery (6%).<sup>3,8</sup> These applicants often have to work very hard and build impressive research portfolios in order to strengthen their applications and improve their chances of matching. As such, many IMGs spend years after medical school in pursuit of other academic degrees or postdoctoral research experience in order to improve their chances of matching in a US orthopedic residency program. Some IMGs also opt to complete orthopedic residency training in their home country, before reapplying for training in the US. This contributes to the average IMG having a total of 26 published articles, and eight out of 36 IMGs in our study having at least one additional graduate degree (Master's degree or PhD) at the time of matching. This also explains why the average IMG matched at around five years following their medical school graduation,

with some IMGs matching more than 15 years later.

IMGs are a critical source of health care in the US. Despite the hurdles they must overcome to successfully match into US residency programs, an inspiring number succeed in matching into orthopedic residency programs each year.<sup>22</sup> Many of these IMGs often come from challenging backgrounds in their home countries, and excel in their medical school and research endeavors in order to train in the US.<sup>4,9,13,15,23</sup> They add value to the US postgraduate education system and help instill a sense of cultural diversification into the healthcare force.<sup>23</sup> Many of these IMGs stay in the US following their training and serve the American population, while others return to their home countries and act as ambassadors of the US training system abroad. As such, accepting outstanding IMGs into orthopedic residency programs is a helpful and beneficial endeavor to both the US and the world, and is a testament to the prestige of US orthopedic residency training.

To our knowledge, this is the first study to explore the distribution of IMGs among US orthopedic residency programs and analyze the academic characteristics of these applicants. Nevertheless, several limitations exist. Our cross-sectional study included the 2018–2022 cohort of orthopedic residents, and distribution may have differed in previous years. In addition, not all residency program public websites included data on their residents and not all identified IMGs had public LinkedIn or Doximity accounts. As a result, not all programs and IMGs were included in our analyses. Nevertheless, we were able to include a high percentage of the orthopedic residency programs and retrieve information on the majority of included IMGs. Finally, as it was not possible to comprehensively explore the characteristics of all orthopedic residents in US orthopedic residency programs, we were not able to provide quantitative comparisons between US medical graduates and IMGs.

## CONCLUSION

IMGs constitute a small but important portion of orthopedic residents in the US. Europe has contributed the highest number of matched IMGs in orthopedics in recent years, with the United Kingdom and Ireland being the highest contributing countries. States like Massachusetts, Ohio, and New York enrolled the highest number of IMGs in the US. The average IMG matched into a US orthopedic residency program approximately five years following their medical graduation, with many having at least one graduate degree prior to matching.

Encouraging increased openness towards accepting outstanding IMGs into orthopedic residency programs will increase the cultural diversity within the US health force, attract surgical and research talent from different parts of the world, and serve to empower the role of the US as a beacon of surgical education and training worldwide.

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