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# A 5-Year Analysis of the Integrated Plastic Surgery Residency Match: The Most Competitive Specialty?

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## ABSTRACT

**Introduction:** The National Residency Matching Program is becoming more competitive across all medical specialties. The match rate for surgical specialties is considerably lower than the overall match rate each year. For those wishing to match into integrated plastic surgery, the magnitude of difficulty is in question.

**Materials and methods:** Public data from 2016 to 2020 on the number of residency programs, number of residency positions, number of applicants, United States Medical Licensing Examination (USMLE) scores, and research experiences were collected for dermatology, categorical general surgery, neurological surgery, ophthalmology, orthopedic surgery, otolaryngology, integrated plastic surgery, integrated thoracic surgery, urology, and integrated vascular surgery.

**Results:** In the 2020 Match, integrated plastic surgery had only 82 programs and 180 positions, and over the 2016–2020 Matches, the growth of integrated plastic surgery was a mere 6.9 positions per year. For matched 2020 applicants, integrated plastic surgery had the highest USMLE Step 1 score (249), highest USMLE Step 2 score (tied at 256), and second highest number of abstracts/presentations/publications (19.1).

**Conclusions:** The limited availability of residency spots in integrated plastic surgery, in conjunction with the quality of the applicant pool, makes it one of the most competitive matches. Candidates should understand this context before applying as to not risk going unmatched.

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## Introduction

Merriam-Webster's dictionary defines competition as "the effort of two or more parties acting independently to secure the business of a third party by offering the most favorable terms." For all medical specialties, the National Resident

Matching Program (NRMP) is becoming increasingly competitive, as match rates are trending down for fourth-year students of allopathic and osteopathic medical schools in the United States.<sup>1</sup> This leaves thousands of graduating doctors without jobs, rendering their degrees less purposeful.<sup>2,3</sup>

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The match rate specifically for surgical specialties in the NRMP is roughly 20 percentage points lower than the overall match rate every year.<sup>4</sup> There is currently no universal taxonomy to compare applicants across these specialties, especially when program directors weigh certain factors differently.<sup>5</sup> Nevertheless, applicants to surgical residencies tend to have the most competitive applications in terms of standardized board scores, research production, and honor society status.<sup>6</sup> Differences between the applicant pools of surgical candidates have yet to be analyzed.<sup>7</sup>

To become a plastic surgeon, physicians must complete one of the two pathways. The older, traditional pathway is the independent track. The match for this track is currently administered through the San Francisco Match and accepts those who have completed training in any other categorical surgery residency (usually general surgery) before embarking on a 3-y training program in plastic surgery. The newer pathway, in existence since 1995, is the integrated track. Via participation in the NRMP, it allows matching directly into plastic surgery from medical school and represents 6 y (or more with research) of training. While both pathways offer full training curricula that produce equivalently successful surgeons,<sup>8,9</sup> there is a growing trend toward the integrated model.<sup>10</sup> Other surgical specialties, namely thoracic<sup>11</sup> and vascular<sup>12</sup> surgery, are now following this blueprint as well.

We hypothesized that integrated plastic surgery is the most competitive surgical specialty to match into and present a novel analysis of match difficulty that compares all surgical specialties.

## Materials and Methods

Information on surgical residency programs was collected from publicly reported data between 2016 and 2020 from the Accreditation Council of Graduate Medical Education,<sup>13</sup> Association of American Medical Colleges,<sup>14</sup> NRMP,<sup>15,16</sup> San Francisco Match,<sup>17</sup> and American Urological Association.<sup>18</sup> Data included the number of programs, number of positions offered, number of applicants, average United States Medical Licensing Examination (USMLE) Step 1 and 2 Clinical Knowledge (CK) scores, average number of abstracts/presentations/publications, average number of research experiences, average number of volunteer experiences, and average number of work experiences for senior students of US medical schools. Specialties examined included dermatology, general surgery (categorical), neurological surgery, ophthalmology, orthopedic surgery, otolaryngology, plastic surgery (integrated), thoracic surgery (integrated), urology, and vascular surgery (integrated). USMLE Step 1 scores were not available for thoracic surgery and urology. USMLE Step 2 CK scores, research production, and experiences were not available for ophthalmology, thoracic surgery, and urology.

Simple linear regression was used to compare program characteristics for residencies, and the mean difference was used to compare applicant characteristics. Statistical analyses were performed with Prism version 9.0.2 (GraphPad, San Diego, CA).

## Results

Residency program numbers were categorized by absolute value for the 2020 Match (Table 1) and also by growth for the 2016–2020 Matches (Table 2). In the 2020 Match, integrated plastic surgery had 82 programs and 180 positions, ahead of only integrated vascular surgery (75 positions among 64 programs) and integrated thoracic surgery (38 among 30). Over the 2016–2020 Matches, integrated plastic surgery's growth in positions per year was among the slowest (6.9).

In the 2020 Match, integrated plastic surgery had the highest average USMLE Step 1 score for matched applicants (249), in addition to the smallest point difference between matched and unmatched applicants (4) (Fig. 1). Integrated plastic surgery was tied for the highest average USMLE Step 2 CK score for matched applicants (256), in addition to the second smallest point difference between matched and unmatched applicants (6) (Fig. 2). In terms of research, integrated plastic surgery had the second highest average number of abstracts/presentations/publications for matched applicants (19.1) (Fig. 3).

With regard to experiences, integrated plastic surgery had the third highest average number of research experiences for matched applicants at 5.9 (versus 6.1 for neurological surgery and otolaryngology and 5.4 for orthopedic surgery), in addition to the second smallest difference in the number of these experiences between matched and unmatched applicants at 0 (versus  $-0.3$  for orthopedic surgery and 0.6 for general surgery and otolaryngology); it had the highest average number of volunteer experiences for matched applicants at 3.7 (versus 3.6 for general surgery, neurological surgery, and orthopedic surgery and 3.3 for integrated vascular surgery) with a difference of 1.3 experiences between matched and unmatched applicants (versus  $-1.4$  for otolaryngology,  $-0.4$  for integrated vascular surgery, and 0.1 for general surgery); and it had the second highest average number of work experiences for matched applicants at 8.7 (versus 10.1 for dermatology and 8.6 for otolaryngology) with no difference in the number of these experiences between matched and unmatched applicants (versus  $-0.4$  for neurological surgery,  $-0.2$  for orthopedic surgery, and  $-0.1$  for dermatology and otolaryngology).

## Discussion

This report serves to analyze the competitiveness of matching into each surgical specialty in its respective match process. The most recent published data show that, in 2020, integrated plastic surgery had considerably fewer programs and positions compared to other specialties in this group. Integrated thoracic surgery<sup>19</sup> and integrated vascular surgery<sup>20</sup> are indeed smaller than integrated plastic surgery with respect to program sizes, but because of how recently they adopted the integrated model and considering the lack of growth since their inceptions, this is expected for now. Moreover, from 2016 to 2020, the growth of integrated plastic surgery positions was among the slowest. With hundreds of applicants, this indicates that program sizes have not caught up to demand by

**Table 1 – Residency program numbers in the 2020 Match.**

2020 Match—residency program numbers		Positions		Applicants	
Programs					
1. Thoracic surgery	30	1. Thoracic surgery	38	1. General surgery	4178
2. Vascular surgery	64	2. Vascular surgery	75	2. Orthopedic surgery	1699
3. Plastic surgery	82	3. Plastic surgery	180	3. Dermatology	1259
4. Neurological surgery	118	4. Neurological surgery	232	4. Ophthalmology	737
5. Ophthalmology	124	5. Otolaryngology	350	5. Otolaryngology	736
Otolaryngology		6. Urology	354	6. Neurological surgery	492
7. Dermatology	144	7. Ophthalmology	496	7. Urology	484
8. Urology	145	8. Dermatology	509	8. Vascular surgery	472
9. Orthopedic surgery	197	9. Orthopedic surgery	849	9. Plastic surgery	358
10. General surgery	330	10. General surgery	1536	10. Thoracic surgery	175
Positions/Program		Applicants/Position			
1. Vascular surgery	1.2	1. Vascular surgery			6.3
2. Thoracic surgery	1.3	2. Thoracic surgery			4.6
3. Neurological surgery	2.0	3. General surgery			2.7
4. Plastic surgery	2.2	4. Dermatology			2.5
5. Urology	2.4	5. Neurological surgery			2.12
6. Otolaryngology	2.8	6. Otolaryngology			2.10
7. Dermatology	3.5	7. Orthopedic surgery			2.00
8. Ophthalmology	4.0	8. Plastic surgery			1.99
9. Orthopedic surgery	4.3	9. Ophthalmology			1.5
10. General surgery	4.7	10. Urology			1.4

**Table 2 – Residency program growth over the 2016-2020 Matches.**

Programs		Positions		Applicants	
1. Thoracic surgery	0.6	1. Thoracic surgery	0.0	1. Orthopedic surgery	88.3
2. Ophthalmology	2.3	2. Vascular surgery	4.4	2. Vascular surgery	65.6
3. Neurological surgery	2.5	3. Neurological surgery	4.6	3. Dermatology	51.3
4. Urology	2.8	4. Plastic surgery	6.9	4. Otolaryngology	14.8
5. Plastic surgery	3.1	5. Ophthalmology	7.1	5. Urology	-1.1
6. Vascular surgery	3.3	6. Otolaryngology	11.5	6. Ophthalmology	-2.8
7. Otolaryngology	4.9	7. Urology	13.8	7. General surgery	-22.4
8. Dermatology	6.2	8. Dermatology	20.6	8. Thoracic surgery	-35.3
9. Orthopedic surgery	8.7	9. Orthopedic surgery	29.2	9. Neurological surgery	-41.1
10. General surgery	18.3	10. General surgery	74.1	10. Plastic surgery	-56.5
Positions/Program		Applicants/Position			
1. Ophthalmology	-0.05	1. Vascular surgery			0.67
2. General surgery	-0.04	2. Orthopedic surgery			0.04
3. Thoracic surgery	-0.03	3. Dermatology			-0.00
4. Otolaryngology	-0.020	4. Otolaryngology			-0.03
5. Ophthalmology	-0.018	5. Ophthalmology			-0.03
6. Dermatology	-0.01	6. Urology			-0.07
7. Neurological surgery	-0.003	7. General surgery			-0.18
8. Plastic surgery	0.002	8. Neurological surgery			-0.23
9. Vascular surgery	0.01	9. Plastic surgery			-0.45
10. Urology	0.05	10. Thoracic surgery			-0.95

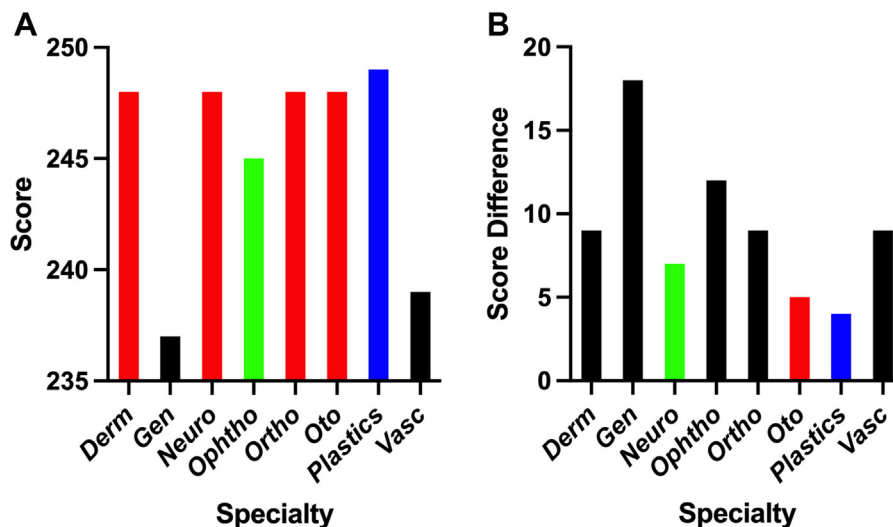


Fig. 1 – (A) USMLE Step 1 scores of matched senior students of US medical schools in the 2020 Match for surgical specialties and (B) differences in scores between matched and unmatched seniors (blue = first, red = second, green = third, black = fourth to seventh).

the applicants, and the minimal number of available spots equates to immense competition.

Due to the objective nature of USMLE, they have traditionally been the most significant factor in differentiating applicants and predicting success.<sup>21,22</sup> Step 1, which will be changing to pass-fail scoring in January 2022, had been the most notorious determinant of matching.<sup>23–26</sup> Now, other factors will likely play larger roles, namely, Step 2 CK scores and applicant familiarity.<sup>23,24,26,27</sup> Whether delving into the past with Step 1 or looking ahead to the future with Step 2 CK, applicants who match into integrated plastic surgery have most recently (and historically) had the highest scores on each exam. The specialty also had the closest difference between those who match and those who do not for Step 1 and the

second closest for Step 2 CK, which might imply that when using these objective measures, it is harder for program directors to separate applicants.

Surgical program directors often cite research as an important factor in selecting applicants to interview.<sup>5</sup> It is well-documented that those who match have more total abstracts, presentations, and publications than those who go unmatched,<sup>28–31</sup> with research fellowships giving applicants an edge.<sup>32</sup> However, it should be noted that reapplication after initially failing to match into plastic surgery may result in worse outcomes, such as the number of interviews offered.<sup>33</sup>

The number of an applicant's experiences in research, volunteerism, and work was shown to be of low importance in matching, as the average unmatched candidate had more

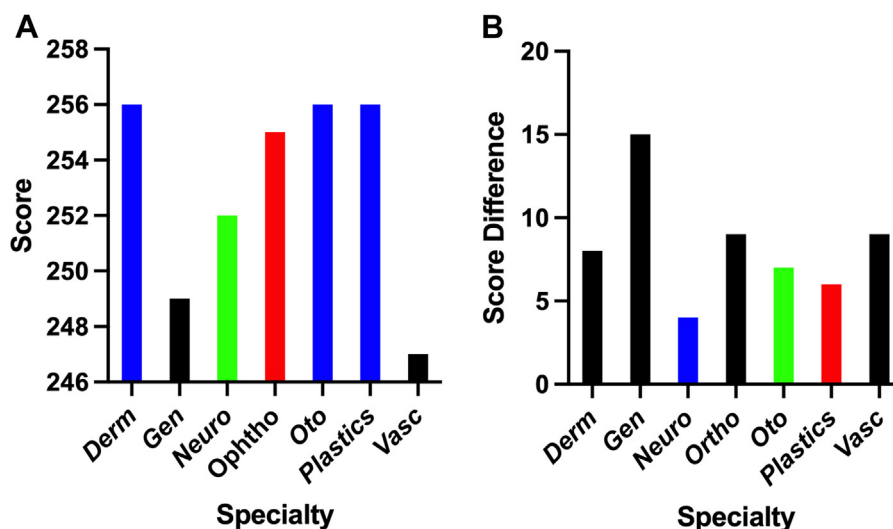
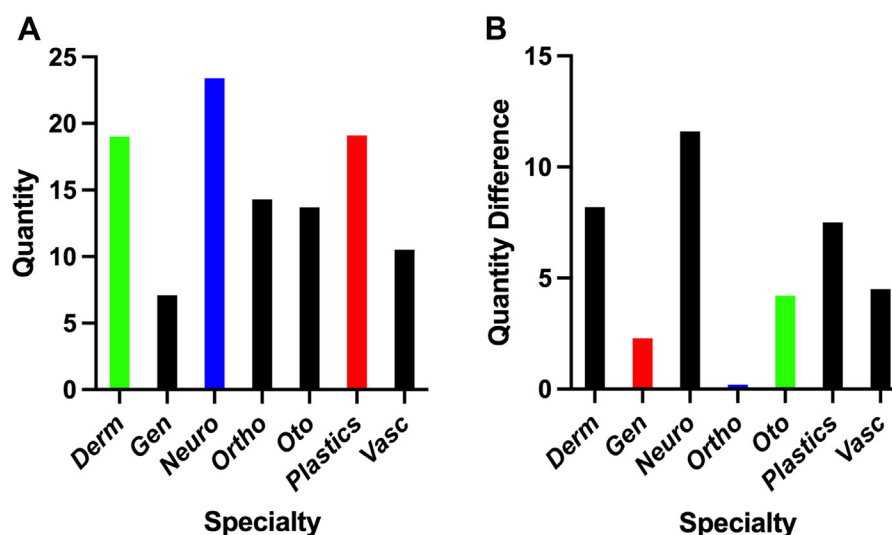


Fig. 2 – (A) USMLE Step 2 CK scores of matched senior students of US medical schools in the 2020 Match for surgical specialties and (B) differences in scores between matched and unmatched seniors (blue = first, red = second, green = third, black = fourth to seventh).



**Fig. 3 – (A) Number of abstracts/presentations/publications of matched senior students of US medical schools in the 2020 Match for surgical specialties and (B) differences in numbers between matched and unmatched seniors (blue = first, red = second, green = third, black = fourth to seventh).**

respective experience than the average matched candidate in the top specialties. This is not surprising considering that volunteer and work experience numbers did not reach statistical significance in a prior study.<sup>34</sup>

This study is limited by missing applicant characteristic data for some aspects of ophthalmology, integrated thoracic surgery, and urology. All applicant data are also optionally self-reported, which could result in unincorporated candidates and incorrect information, and only averages are accessible with respect to descriptive statistics. Without a weighted scoring system, there is no proper way to conclude one specialty as being more difficult to match into than another, and hence, comparisons must be relative. Furthermore, there are many other factors not accounted for in this study, particularly related to holistic review, that are paramount in residency selection by program directors. As for match rates, actual percentages in 2020 for integrated plastic

surgery and the other studied specialties are given in Table 3.<sup>14,16,17,18</sup> It is reasonable to contend that integrated plastic surgery is not comparably competitive with its 50% match rate, which is higher than many of the other surgical specialties, but this rate does not necessarily correlate with competitiveness. One could argue that the competitive factors looked at above inherently generate self-selection and therefore a higher yield of matched applicants.

### Conclusions

Although match data are made public, no one source combines it across surgical specialties to analyze the difficulty of becoming a surgeon. With the current study, prospective applicants can better understand their chances of matching into their preferred specialties. As for plastic surgery, it is evident that matching into an integrated program is very difficult,

**Table 3 – Total applicants, positions available, and match rates for surgery in 2020.**

Specialty	Total applicants	Positions available	Match rate
Dermatology	1259	509	40%
General surgery	4178	1536	37%
Neurological surgery	492	232	47%
Ophthalmology	737	496	67%
Orthopedic surgery	1699	849	50%
Otolaryngology	736	350	48%
Plastic surgery	358	180	50%
Thoracic surgery	175	38	22%
Urology	484	354	73%
Vascular surgery	472	75	16%

based on the limited availability of programs and positions, as well as the slow growth and the quality of applicants' objective measures. If our study is to emphasize one thing other than the competitive nature of securing a residency in integrated plastic surgery, it is that there are many qualified applicants every year who go unmatched. Additionally, while competition is important to ensuring that positions are filled with competent to-be residents, it should not create an environment that pins peers against one another. With a shortage of surgeons,<sup>35</sup> including those who specialize in plastic surgery,<sup>36</sup> it would be in the best interest of accrediting bodies to expand residency programs in size and to more locations to help care for patients with plastic and reconstructive needs.

## Author Contributions

All authors contributed to (1) the conception and design of the study, acquisition of data, or analysis and interpretation of data, (2) drafting the article or revising it critically for important intellectual content, and (3) the final approval of the version to be submitted.

## Disclosure

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