



Factors Influencing Choice of Medical Specialty among Ophthalmology and Non-Ophthalmology Residency Applicants

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J Acad Ophthalmol 2021;13:e129–e137.

Abstract

Objective The study aimed to investigate factors influencing choice of specialty among ophthalmology and non-ophthalmology residency applicants.

Patients and Methods Anonymous, web-based surveys were distributed through REDCap to the 2019 to 2020 residency applicants to the Penn State Department of Ophthalmology and, as a control group, Penn State medical students applying to non-ophthalmology residencies for the 2019 to 2020 cycle. The primary outcome was factors that influenced specialty choice among ophthalmology versus non-ophthalmology applicants. Secondary outcomes include hours of exposure to applicants' selected specialty in the medical school preclinical curriculum, and proportion of ophthalmology versus non-ophthalmology applicants who decided on, or developed a strong interest in, their specialty prior to clinical rotations.

Results Surveys were completed by 203/441 (46.0%) ophthalmology and 85/139 (61.1%) non-ophthalmology applicants. Fewer than 20 hours of exposure to an applicant's selected specialty were provided in the medical school preclinical curriculum for 86.7% of ophthalmology and 42.4% of non-ophthalmology applicants ($p < 0.001$). Ophthalmology applicants decided on, or developed a strong interest in, their selected specialty before clinical rotations at a similar rate to non-ophthalmology applicants (60.6 vs. 58.8%, respectively). Factors influencing specialty choice cited most commonly by ophthalmology applicants include professional satisfaction (94.1%), performing surgeries/procedures (92.6%), personal fit with specialty (91.1%), work-life balance (91.1%), and ability to see patients in a clinic setting (90.6%), compared to personal fit with specialty (95.3%), clinical rotation in selected specialty (95.3%), professional satisfaction (91.8%), intellectual stimulation (89.4%), and subinternship or away rotation (89.4%) among non-ophthalmology applicants.

Keywords

- ▶ ophthalmology applicant
- ▶ residency applicant
- ▶ specialty selection
- ▶ motivators
- ▶ exposure

received
October 6, 2020
accepted after revision
December 15, 2020

DOI <https://doi.org/10.1055/s-0041-1728644>.
ISSN 2475-4757.

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Thieme Medical Publishers, Inc., 333 Seventh Avenue, 18th Floor, New York, NY 10001, USA

Conclusion Professional satisfaction and personal fit with specialty were among the most commonly cited factors influencing specialty choice for both groups. Other factors cited most frequently by ophthalmology applicants include performing surgeries/procedures, work-life balance, and ability to see patients in a clinic setting. Despite limited ophthalmology exposure in medical school preclinical curricula, ophthalmology applicants decided on, or developed a strong interest in, their selected specialty before clinical rotations at a rate similar to non-ophthalmology applicants.

In 2019, residency applicants to ophthalmology comprised 1.69% of the total applicant pool applying to any residency program in the United States.^{1,2} Acceptance into ophthalmology residency is competitive, with 74.6% of ophthalmology residency applicants in 2019 matching successfully compared to 79.6% for all specialties, despite ophthalmology applicants having a higher average United States Medical Licensing Examination Step 1 score.^{1,2} There are multiple publications reporting why ophthalmology may be an attractive career choice.³⁻⁶ A 2020 national survey of physicians in any specialty found that ophthalmologists have high job satisfaction, with nearly 95% of ophthalmologists reporting they would choose ophthalmology as their specialty again if given the opportunity.³ The survey also reported that ophthalmologists spend the least amount of time of any specialty surveyed on paperwork and administration, which would allow more time to be spent on patient care.³ Further, while poor lifestyle quality is frequently identified as a disincentive for students pursuing surgery,^{7,8} a survey of medical students at a single institution found that none of the 84 respondents identified this as a deterrent to pursuing ophthalmology.⁴ Two studies on medical student career choice also identified that students commonly associate ophthalmology as a specialty with a controllable and favorable lifestyle.^{5,6}

There is limited published information on why medical students in the United States decide to pursue ophthalmology. There are published studies that investigate why medical students in the United States pursue other specialties, including surgical subspecialties,⁷⁻¹⁰ and studies reporting why medical students in countries outside the United States apply to ophthalmology.¹¹⁻¹³ To our knowledge and based on a computerized search of the PubMed database, there is only one published study which investigates why medical students in the United States apply to ophthalmology; however, the generalizability of this study to current applicants is limited due to the survey being conducted 30 years ago.¹⁴ There is also one published study that evaluates how medical students perceive ophthalmology as a career; however, the population surveyed in that study consists of medical students who did not plan on applying to ophthalmology.⁴

Several studies have demonstrated that increased exposure to a specialty in medical school increases the likelihood that a student will apply to that specialty,^{4,10,15,16} with lack of exposure to ophthalmology being cited as a leading cause of medical students not applying to ophthalmology.^{4,16} Recent studies conclude that ophthalmology content in required medical school curricula has decreased,¹⁷⁻¹⁹ particularly required clinical rotations, which decreased from 68% of surveyed medical

schools in 2000 to 16% (15/95) in 2018.^{18,19} Despite the decrease in required clerkships, the proportion of U.S. medical schools with required preclinical ophthalmology exposure has remained constant in 2018 (88/95, 92.6%) compared to 2014 (104/109, 95.4%).^{18,19} These findings may be concerning, as evidence suggests that even a 1-day ophthalmology experience during the clinical years can increase ophthalmology knowledge and clinical skills.²⁰ Many primary care providers, such as those in internal medicine, report low confidence in performing ophthalmic examinations and treating ocular complaints, which can comprise up to 5% of their visits, and a strong majority (380/412, 92.2%) reported that they received fewer than 10 hours of ophthalmology education in residency.²¹ Published studies on ophthalmology exposure in medical school have only surveyed leaders in medical education and not medical students or ophthalmology residency applicants.^{16,17,19}

The purpose of our study is to investigate factors influencing choice of specialty among ophthalmology and non-ophthalmology residency applicants.

Patients and Methods

The study was approved by the Penn State Institutional Review Board and conducted in accordance with the Declaration of Helsinki. Two surveys were constructed based on existing literature and discussion with colleagues involved in medical and residency education. The surveys were pre-tested and reviewed by members of the study team, and revised based on feedback received. One survey (► Fig. 1), designed for the 2019 to 2020 residency applicants to the Penn State Department of Ophthalmology, assessed prior exposure to ophthalmology and reasons for pursuing ophthalmology. A second survey (► Fig. 2), designed for medical students in the graduating class of 2020 at the Penn State College of Medicine who did not apply for ophthalmology residency, differed from the first survey in that wording was revised to reflect the respondent's selected specialty instead of ophthalmology. The non-ophthalmology applicants served as a control group to compare differences between ophthalmology and non-ophthalmology applicants with respect to exposure to their selected specialty and reasons for specialty selection.

The surveys were constructed by using the secure online application REDCap hosted at Penn State College of Medicine.²² A REDCap-generated email was used to distribute the surveys in January 2020. Nonresponders were identified anonymously by using the REDCap system and were sent reminder emails, with the last reminder email sent in May 2020.

- What is your age?
- What is your gender?
- How do you self-identify?
 - American Indian or Alaska Native
 - Asian
 - Black
 - Hispanic or Latino
 - Pacific Islander or Native Hawaiian
 - White
 - Other
 - Choose not to identify or N/A
- When did you develop a strong interest in, or decide to pursue, your medical specialty?
 - Before medical school
 - During medical school before clinical rotations
 - During or after medical school clinical rotations
- How much education in ophthalmology did you receive as part of your medical school’s official preclinical curriculum?

How did the following factors influence your decision to pursue ophthalmology? Please choose “Not Applicable” if you did not have that exposure or factor.

	Not Applicable	Strong Negative Influence	Negative Influence	No Influence	Positive Influence	Strong Positive Influence
Exposure to ophthalmology prior to medical school						
Exposure to ophthalmology during medical school prior to clinical rotations						
An ophthalmology clinical rotation during medical school						
An ophthalmology sub-internship or an away rotation						
An ophthalmology department affiliated with your medical school						
An ophthalmology faculty mentor						
An ophthalmology interest group at your medical school						
Ophthalmology research experience						
Volunteering or public health experience in ophthalmology						

Fig. 1 Survey distributed to the 2019 to 2020 residency applicants to the Penn State Department of Ophthalmology assessing exposure to ophthalmology and factors influencing decision to pursue ophthalmology.

Family member who is an ophthalmologist						
Family member who is not an ophthalmologist but works in the ocular field (optometrist, orthoptist, technician, etc)						
Personal or family history of ocular disease						
Ability to perform procedures or surgeries						
Ability to see patients in a clinic setting						
Intellectual stimulation/challenging cases						
Professional satisfaction						
Personal fit with the specialty						
Work-life balance						
Salary or earning potential						
Job market						
Prestige or reputation						
Specific patient population or disease(s) treated unique to ophthalmology						

Fig. 1 (Continued)

Comparisons between the two cohorts were made by using STATA version 15.1 for statistical analysis (STATA Corp, College Station, Texas, United States). Student's *t* test was used to assess differences in the continuous variable of respondent age. Pearson's Chi-square test was used to compare frequency/percentage differences for all categorical variables: presence of specialty-specific exposure, whether a respondent stated a factor had a "positive influence" or "strongly positive influence" on pursuing their selected specialty and demographic information. The *p*-values ≤ 0.05 were considered statistically significant.

Results

Surveys were completed by 203/441 (46.0%) ophthalmology and 85/139 (61.1%) non-ophthalmology applicants. Demographic information is summarized in **Table 1**. There was no significant difference between the two groups with respect to age, race and ethnicity, and gender ($p > 0.05$, **Table 1**).

Fewer than 20 hours of exposure to an applicant's selected specialty were provided in the medical school preclinical curriculum for 86.7% of ophthalmology applicants and 42.4% of non-ophthalmology applicants ($p < 0.001$). This exposure includes the education received by an applicant in their medical school's official preclinical curriculum and does not include shadowing, research, or other initiatives from the applicants themselves during the preclinical years. Oph-

thalmology applicants decided on, or developed a strong interest in, their selected specialty before clinical rotations at a rate similar to that of non-ophthalmology applicants (60.6 vs. 58.8%, respectively; $p = 0.780$).

Table 2 compares the exposure of ophthalmology and non-ophthalmology 2019 to 2020 residency applicants to their selected specialty. Exposures to ophthalmology cited most frequently by ophthalmology applicants include a clinical rotation (99.0%), access to an ophthalmology faculty mentor (95.6%), participating in ophthalmology research (95.1%), and a subinternship or away rotation in ophthalmology (89.7%; **Table 2**). Exposures to their selected specialty cited most frequently by non-ophthalmology applicants include a clinical rotation (100%), a residency program of the selected specialty at their medical school (96.5%), and any exposure in their selected specialty before clinical rotations (92.9%; **Table 2**). The exposure experiences that differed significantly between the two groups were the existence of a residency program of the chosen specialty affiliated with the applicant's medical school (86.2% ophthalmology vs. 96.5% non-ophthalmology; $p = 0.010$) and research experience (95.1% ophthalmology vs. 84.7% non-ophthalmology; $p = 0.003$; **Table 2**).

Table 3 compares factors that influenced ophthalmology and non-ophthalmology applicants to pursue their respective specialties. Factors cited most frequently by ophthalmology applicants as having a "positive" or "strongly

- What is your age?
- What is your gender?
- How do you self-identify?
 - American Indian or Alaska Native
 - Asian
 - Black
 - Hispanic or Latino
 - Pacific Islander or Native Hawaiian
 - White
 - Other
 - Choose not to identify or N/A
- Which residency are you applying to?
- When did you develop a strong interest in, or decide to pursue, your medical specialty?
 - Before medical school
 - During medical school before clinical rotations
 - During or after medical school clinical rotations
- How much education in your selected specialty did you receive as part of your medical school’s official preclinical curriculum?
- How did the following factors influence your decision to pursue your chosen medical specialty? Please choose “Not Applicable” if you did not have that exposure or factor.

	Not Applicable	Strong Negative Influence	Negative Influence	No Influence	Positive Influence	Strong Positive Influence
Exposure to your specialty prior to medical school						
Exposure to your specialty during medical school prior to clinical rotations						
A clinical rotation in your specialty during medical school						
A sub-internship or an away rotation in your specialty						
A residency program in your given specialty associated with Penn State						
A faculty mentor in your specialty						
An interest group of your specialty at Penn State						
Research experience in your specialty						
Volunteering or public health experience in your specialty						
Family member who is a physician in your specialty						

Fig. 2 Survey distributed to the graduating class of 2020 at the Penn State College of Medicine assessing exposure to selected specialty and factors influencing decision to pursue selected specialty.

Family member who is not a physician, but works in your selected specialty						
Personal/family history of disease related to your specialty						
Ability to perform procedures or surgeries						
Ability to see patients in a clinic setting						
Intellectual stimulation/challenging cases						
Professional satisfaction						
Personal fit with the specialty						
Work-life balance						
Salary or earning potential						
Job market						
Prestige or reputation						
Specific patient population or disease(s) treated unique to your specialty						

Fig. 2 (Continued)

Table 1 Demographic characteristics of 2019 to 2020 ophthalmology and non-ophthalmology residency applicants

	Ophthalmology applicants (n = 203)	Non-ophthalmology applicants (n = 85)	p-Value
Average age (SD)	26.9 (2.1)	27.3 (2.9)	0.191
Race and ethnicity			0.269
Asian	49 (24.1%)	12 (14.1%)	
Black	10 (4.9%)	3 (3.5%)	
Hispanic	19 (9.4%)	6 (7.1%)	
White	121 (59.6%)	62 (72.9%)	
Other	4 (2.0%)	2 (2.4%)	
Gender			0.447
Male	115 (56.7%)	44 (51.8%)	
Female	88 (43.3%)	41 (48.2%)	

Abbreviation: SD, standard deviation.

positive” influence on choice of specialty include professional satisfaction (94.1%), ability to perform surgeries/procedures (92.6%), personal fit with specialty (91.1%), work-life balance (91.1%), and ability to see patients in a clinic setting (90.6%), compared to personal fit with specialty (95.3%), clinical rotation in selected specialty (95.3%), professional

satisfaction (91.8%), intellectual stimulation (89.4%), and subinternship or away rotation (89.4%) among non-ophthalmology applicants (►Table 3). Influencing factors that differed significantly between the two groups include residency program of chosen specialty affiliated with the applicant’s medical school (70.9% ophthalmology vs. 49.4% non-ophthalmology, $p < 0.001$), faculty mentor in selected specialty (86.7% ophthalmology vs. 72.9% non-ophthalmology, $p = 0.005$), research experience in chosen specialty (69.0% ophthalmology vs. 32.9%, $p < 0.001$), ability to perform surgeries/procedures (92.6% ophthalmology vs. 68.2% non-ophthalmology, $p < 0.001$), seeing patients in a clinic setting (90.6% ophthalmology vs. 67.0% non-ophthalmology, $p < 0.001$), work-life balance (91.1% ophthalmology vs. 76.5% non-ophthalmology, $p < 0.001$), and specialty prestige/reputation (46.8% ophthalmology vs. 31.8% non-ophthalmology, $p = 0.019$; ►Table 3).

Discussion

Professional satisfaction and personal fit with specialty were among the most commonly cited factors influencing specialty choice among both ophthalmology and non-ophthalmology applicants. Other factors cited most frequently by ophthalmology applicants include performing surgeries/procedures, work-life balance, and ability to see patients in a clinic setting. The factors influencing specialty choice cited most commonly by the ophthalmology applicants in the current study are similar to the influencing factors identified in a study of U.S. ophthalmology residency applicants

Table 2 Exposure of 2019 to 2020 ophthalmology and non-ophthalmology residency applicants to their selected specialty

	Ophthalmology applicants (n = 203)	Non-ophthalmology applicants (n = 85)	p-Value
Specialty exposure prior to medical school	153 (75.3%)	71 (83.5%)	0.129
Specialty exposure during medical school prior to clinical rotations	191 (94.0%)	79 (92.9%)	0.714
A clinical rotation in specialty	201 (99.0%)	85 (100%)	0.358
A subinternship or away rotation in specialty	182 (89.7%)	77 (90.6%)	0.810
Residency program of specialty at medical school	175 (86.2%)	82 (96.5%)	0.010
Faculty mentor in specialty	194 (95.6%)	77 (90.6%)	0.102
Specialty-specific interest group	177 (87.2%)	77 (90.6%)	0.415
Research experience in specialty	193 (95.1%)	72 (84.7%)	0.003
Volunteering/public health experience in specialty	146 (71.9%)	70 (82.3%)	0.062
Family member who is a physician in specialty	48 (23.6%)	23 (27.1%)	0.540
Family member (nonphysician) who works in specialty	54 (26.6%)	19 (22.4%)	0.450
Personal/family history of disease unique to specialty	93 (45.8%)	47 (55.3%)	0.142

Table 3 Comparison of 2019 to 2020 ophthalmology and non-ophthalmology residency applicants with respect to factors influencing specialty choice

	Ophthalmology applicants (n = 203)	Non-ophthalmology applicants (n = 85)	p-Value
Specialty exposure prior to medical school	121 (59.6%)	57 (67.0%)	0.235
Specialty exposure during medical school prior to clinical rotations	114 (56.2%)	51 (60.0%)	0.548
A clinical rotation in specialty	181 (89.2%)	81 (95.3%)	0.098
A subinternship or away rotation in specialty	176 (86.7%)	76 (89.4%)	0.526
Residency program of specialty at medical school	144 (70.9%)	42 (49.4%)	<0.001
Faculty mentor in specialty	176 (86.7%)	62 (72.9%)	0.005
Specialty-specific interest group	68 (33.5%)	23 (27.1%)	0.284
Research experience in specialty	140 (69.0%)	28 (32.9%)	<0.001
Volunteering/public health experience in specialty	93 (45.8%)	41 (41.2%)	0.707
Family member who is a physician in specialty	21 (10.3%)	11 (12.9%)	0.523
Family member (nonphysician) who works in specialty	13 (6.4%)	2 (2.4%)	0.158
Personal/family history of disease unique to specialty	31 (15.3%)	17 (20.0%)	0.326
Ability to perform surgeries/procedures	188 (92.6%)	58 (68.2%)	<0.001
See patients in a clinic setting	184 (90.6%)	57 (67.0%)	<0.001
Intellectual stimulation/challenging cases	173 (85.2%)	76 (89.4%)	0.343
Professional satisfaction	191 (94.1%)	78 (91.8%)	0.469
Personal fit with the specialty	185 (91.1%)	81 (95.3%)	0.225
Work-life balance	185 (91.1%)	65 (76.5%)	<0.001
Salary or earning potential	157 (77.3%)	59 (69.4%)	0.156
Job market	127 (62.6%)	58 (68.2%)	0.360
Prestige or reputation	95 (46.8%)	27 (31.8%)	0.019
Specific patient population or disease	140 (69.0%)	65 (76.5%)	0.200

performed approximately 30 years ago in which the most frequently cited factors were performing surgery, patient contact, life-style, and ophthalmology elective experience.¹⁴ The motivating factors identified in our study are also similar to those identified in a survey of ophthalmologists in Brazil, which found that the most frequently reported motivating factors were surgical procedures, flexible hours, personal satisfaction, and compensation.¹³

Exposure of medical students to ophthalmology, particularly through preclinical didactics and required clinical rotations in ophthalmology, has decreased in the past decades.¹⁷⁻¹⁹ Factors motivating U.S. medical students to pursue an ophthalmology residency remain largely unstudied. To our knowledge and based on a computerized search of the PubMed database, the current study is the largest to survey ophthalmology residency applicants regarding their exposure to ophthalmology in medical school and the factors that influenced them to pursue a career in ophthalmology.

The results of our study indicate that while 94.0% of ophthalmology applicants received some exposure to ophthalmology in their medical school's preclinical curriculum, a large majority (86.7%) received fewer than 20 hours of preclinical ophthalmology education (►Table 2). This is consistent with previous reports that demonstrate little exposure to, and a decrease in, ophthalmology education during the preclinical years of medical school.^{4,17-19,21} Compared to non-ophthalmology applicants, the ophthalmology cohort had a similar prevalence of receiving any preclinical exposure to their selected specialty (94.0% ophthalmology vs. 92.9% non-ophthalmology, $p = 0.714$; ►Table 2), but a noticeably greater proportion of ophthalmology applicants received fewer than 20 hours of exposure to their selected specialty in their medical school's curriculum (86.7% ophthalmology vs. 42.4% non-ophthalmology, $p < 0.001$). While preclinical exposure is linked to a higher likelihood of applying to ophthalmology,^{4,11,16} a study by Hsiao and Tatham reported that the duration of preclinical ophthalmology education was not associated with the proportion of students entering ophthalmology.¹¹ This is consistent with our study results, which found that ophthalmology applicants decided on, or developed a strong interest in, their selected specialty before clinical rotations at a similar rate to non-ophthalmology applicants (60.6 vs. 58.8%, respectively; $p = 0.780$). Further, our study identified no significant difference between ophthalmology versus non-ophthalmology applicants with respect to many other exposures, such as subinternship or away rotations, interest groups, mentorship opportunities, etc., in their selected specialty. These findings suggest that although ophthalmology education in medical school required curricula has decreased over time, the decreased exposure has not resulted in a disproportionately low interest in ophthalmology compared to interest in other specialties, and that those students who do develop an interest in ophthalmology have comparable access to specialty-specific exposures outside of the required medical school curriculum. Of note, 6.0% of ophthalmology applicants did not have any preclinical exposure to ophthalmology, which highlights a potential area for improvement in medi-

cal education (►Table 2). An interesting finding in both cohorts was the high rate of having a family member in the applicant's specialty (23.6% ophthalmology vs. 27.1% non-ophthalmology, $p = 0.540$), as well as premedical school exposure to the applicant's selected specialty (75.3% ophthalmology vs. 83.5% non-ophthalmology, $p = 0.129$; ►Table 2). This supports existing literature that increased and early exposure affects an applicant's choice of specialty^{4,11,16} and highlights the significance of personal background on specialty selection.

Ophthalmology applicants, compared to non-ophthalmology applicants, were less likely to have a residency program affiliated with their medical school (86.2 vs. 96.5%, $p = 0.010$; ►Table 2) but were more likely to cite the presence of that program to be a motivating factor for pursuing their specialty (70.9 vs. 49.4%, $p < 0.001$; ►Table 3). This may be due to all medical schools having departments of common specialties (such as internal medicine and pediatrics) and fewer programs having a department for a specific surgical subspecialty like ophthalmology, and highlights the opportunities afforded by the presence of a residency program and its affiliated ophthalmology department, such as access to ophthalmology mentors and research opportunities, which were both significant motivating factors for ophthalmology applicants (►Table 3). Presence of an ophthalmology program has been reported previously to be associated with a greater proportion of ophthalmology residency applicants from that medical school matching, and can mitigate the apprehension of applying to a competitive specialty like ophthalmology.¹⁶ Our study findings highlight the opportunities that ophthalmology departments provide to medical students, and are consistent with reports from other recent studies regarding the substantial impact of such departments on medical student interest and success in pursuing a career in ophthalmology.^{11,16}

Our study has several limitations. The response rate is limited, although the 61.1% response rate among non-ophthalmology applicants at our institution compares favorably to existing literature surveying medical students at a single institution (35.5–78.1%),^{2,4,10} and the 46.0% response rate of ophthalmology applicants compares favorably with recently published surveys of ophthalmology applicants (36.4–58.3%).²³⁻²⁵ As with any survey study, there is potential response bias. Further, ophthalmology residency applicants to Penn State may not be representative of all ophthalmology residency applicants in the United States, and the experiences and motivating factors of Penn State medical students may not be representative of those of medical students at other medical schools. While this limits the generalizability of our study to the entire applicant pool, the results of our study are intriguing and warrant further research in larger cohorts.

In conclusion, professional satisfaction and personal fit with specialty were among the most commonly cited factors influencing specialty choice among both ophthalmology and non-ophthalmology applicants. Other factors cited most frequently by ophthalmology applicants include performing

surgeries/procedures, work-life balance, and ability to see patients in a clinic setting. Despite limited ophthalmology exposure in medical school preclinical curricula, ophthalmology applicants decided on, or developed a strong interest in, their selected specialty before clinical rotations at a rate similar to non-ophthalmology applicants.

Funding

None.

Conflict of Interest

None declared.

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