

Original Research

Factors Influencing Fellowship Training Among Ophthalmology Residents: A Pilot Study

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Abstract

Objective

There has been an increase in ophthalmology fellowship training programs and applicants. The current ophthalmology literature lacks any recent study examining factors influencing residents' decisions to pursue subspecialty fellowship training.

Methods

An anonymous, 16-item survey was distributed to residents from a convenience sample of ophthalmology residency programs by their program directors or administrators.

Results

A total of 72 residents and 9 interns from 9 distinct programs completed the survey. Eighty-two percent of respondents reported they have either applied or will apply for a fellowship position. Gender and race showed no significant association with fellowship application. Respondents perceived that obtaining a fellowship position would be easier (61%) than obtaining an ophthalmology residency. The desire for additional clinical and surgical training were the 2 primary factors for the pursuit of fellowship training. Half of those pursuing fellowship training (49%) indicated they still desired to practice comprehensive ophthalmology. None of the respondents indicated they wished to practice in a rural area.

Conclusion

The data collected in this pilot study elicited factors and variable associations that provide a sound basis for informing revisions and improvements to the data collection tool for a follow-up prospective, longitudinal study involving all ACGME ophthalmology training programs. The results indicate some of the essential factors associated with the pursuit of fellowship training by the current generation of residents. The results also highlight potential trends related to residents' views of their training and desired practice patterns.

Keywords

fellowship training; survey; graduate medical education; internship and residency; ophthalmology; surgical specialties

Introduction

There has been an increase in ophthalmology fellowship training programs and applicants in the United States (US).¹ This trend is not unique to ophthalmology and has been observed in many other surgical specialties. While the ophthalmology literature lacks studies on the rationale behind this expansion, other specialties have published numerous reports on the subject. The majority of these studies

have focused on the perceived financial gains of being fellowship trained, with many concluding that fellowship training does not necessarily equate to increased income.²⁻⁵ However, there are many other potential factors that could prompt a resident to pursue fellowship training. One such factor of interest would be the residents' perception that they were not receiving adequate clinical or surgical exposure in the current residency training model.⁶

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The ophthalmology literature is limited in the number of recent studies examining factors influencing residents' decision to seek subspecialty training with the last report being published in 2005 using 2003 data.⁷ A 2022 study by Solomon et al⁸ only focused on trends in ophthalmology residents applying to neuro-ophthalmology fellowships. Other previous studies either surveyed fellowship preceptors as to their fellow candidate selection criteria or only surveyed graduating residents.⁶⁻⁹ By performing a cross-sectional survey of all ophthalmology interns and residents, a higher acuity of data would be available to analyze for views toward fellowship training and any differences due to training year. With the steady increase in ophthalmology residents seeking subspecialty training, an up-to-date analysis is needed to determine the current causal factors.

An anonymous survey was developed in 2003 and published in 2005 by Gedde et al⁶, to identify factors influencing career choices among graduating ophthalmology residents was appropriate for that era. However, an updated survey is needed to address the current healthcare environment, current Accreditation Council for Graduate Medical Education (ACGME) residency program requirements, and the opinions of a new generation of resident physicians. This pilot study seeks to use a representative sample population to identify factors affecting fellowship choices of US ophthalmology residents and to further refine the Gedde et al⁶ data collection instrument. Ideally, a finalized version of this survey would be administered yearly over a full 4-year training cycle in order to identify how residents' perceptions on fellowship training evolve, if they do. This is an extremely vital topic, as the results may be used to suggest potential changes to the current ophthalmology residency and fellowship training systems. Additionally, the results may provide further insight as to the factors influencing the increased percentage of ophthalmology residents pursuing fellowship training and workforce distribution.

Methods

The study met Institutional Review Board exempt status according to Title 45 of the Code of Federal Regulations (45 CFR 46.101(b)(4)). The program directors of ophthalmology

residency programs known to the authors were invited as a representative convenience sample, which included programs of different sizes and locations, to volunteer their program participation in this pilot study. Selection criteria were primarily based upon the number of residents in the program and willingness to participate.

A 16-item survey (**Appendix 1**) based on the previously-validated Gedde instrument,⁶ was developed by updating the previously published survey with variables reflecting the current healthcare environment, as well the priorities, goals, and viewpoints of the newer generation of residents currently in training. This was established by stakeholder analysis with ophthalmology residents pertaining to the views and goals of the Millennial generation.

The survey was sent via email to the participating residency program directors and disseminated to the residents via the program directors or administrators in January 2020. The completed surveys were returned to the authors by the residents, program director, or administrator in the same month via email. Data from the completed surveys were then entered into an Excel (Microsoft, Redmond, WA) database and subsequently transferred to the statistical software.

Statistical analysis was conducted using SPSS, version 23 (IBM Corporation, Somers, New York). All statistical testing was two-tailed and conducted at the 0.05 alpha (type-1 error) level. Associations between items were analyzed using Goodman-Kruskal lambda (a measure of the strength of the relationship between two nominal variables) and Goodman-Kruskal tau (based on random category assignment, it measures association for cross-tabulations of 2 or fewer nominal level variables). Chi-square testing was used to test for the significance in frequencies between groups. The questions on the survey instrument, not related to demographic information, were tested for validity using the Pearson Product Moment Coefficient, which measures the strength of the linear association between variables. The use of multiple comparison correction was not indicated for the analysis conducted.

Table 1. Respondent Demographics

Gender						
	n					
Male	43					
Female	37					
Decline	1					
Race						
	n					
Other	5					
Indian	8					
Hispanic	6					
Caucasian	44					
American Indian	1					
African American	3					
Asian	13					
Decline to respond	1					
		Training year				
Program size	n	Intern	1st	2nd	3rd	Total
Small	3	0	6	7	6	19
Medium	3	4	5	2	3	14
Large	3	5	14	13	16	48
Totals	9	9	25	22	25	81

Results

A total of 72 residents and 9 ophthalmology program-linked interns from 9 distinct programs completed the survey between January 1-31, 2020, with a response rate of 85%. The 9 participating programs included: Mayo Clinic, Krieger Eye Institute, Vanderbilt University Medical Center/Vanderbilt Eye Institute, Ohio State University, Doctor's Hospital/Ohio University, Thomas Jefferson University/Wills Eye Hospital, University of North Carolina, University of Kentucky, and Albany Medical College. The respondents' demographics are summarized in **Table 1**.

For data analysis purposes, the interns and residents were grouped based on the program size of residents per year: small (1-3 residents), medium (4-5 residents), and large (6 or more residents). There were 3 programs in each group, which produced a resident/intern distribution of 19 (24%) small, 14 (17%) medium, and 48 (59%) large program residents.

Responses for the preferred practice US region were similar between the northeast (28%) and south (31%), followed by the midwest (21%)

and west (19%). Most respondents indicated that they preferred either large (population > 500 000) (38%) or small (population 200 000 - 499 999) cities (38%), followed by towns (population 50 000 - 199 000) (12%) and suburban areas (population 5000 - 49 999) (10%), as their desired practice environment. No respondents selected the rural (population < 5 000) option. Almost half (48%) denoted their preferred practice structure as a combined private and academic setting (**Table 2**).

Most respondents (89%) indicated that obtaining a fellowship position would be either easier (61%) or the same difficulty (28%) as obtaining an ophthalmology residency. Eighty-two percent of respondents reported they have either applied or will apply for a fellowship position. Interestingly, 100% of interns surveyed indicated they planned on applying for a fellowship, but third-year residents had the lowest percentage (74%) of applicants/intended applicants. The percentage decrease between the third-year residents to interns was not statistically significant ($\chi^2 = 1.938$, $P = .585$). The effect of a co-resident applying for a fellowship was either primarily neutral (84%) or positive (15%) based on self-rating (**Table 3**).

Table 2. Practice Preference Variables (Percentages are calculated from all respondents.)

Practice region	
West	19%
South	31%
Northeast	28%
Midwest	21%
East	1%
Practice setting population	
Undecided	1%
Town	12%
Suburb	10%
Small city	38%
Large city	38%
Rural	0%
Practice structure	
Private	24%
Academic	11%
Combination	48%
Not sure	17%

Those who indicated they have or would be applying for a fellowship selected retina (32%) as their primary fellowship choice, followed by cornea (21%), oculoplastics (16%), glaucoma (11%), and pediatrics (10%) (**Table 4**).

Respondents were asked to rank a series of 12 statements on how influential each item was in their decision to apply for a fellowship

(**Table 5**). The top 3 most frequently selected items were: 1) I wanted additional surgical training; 2) I wanted additional clinical training; 3) Increased job market competitiveness. The 3 lowest ranked items were: 10) Was uncertain of what I wanted to do following residency completion; 11) Other residents I know were doing fellowships; 12) Did not have employment secured for graduation.

Table 3. Variables Pertaining to Fellowship Application (Percentages are calculated from all respondents for fellowship application and difficulty. The effect of a co-resident applying percentage is calculated from only those who indicated they have or will apply to a fellowship program.)

Fellowship application	Intern (PGY-1)	PGY-2	PGY-3	PGY-4	Overall
Intend to or have applied	100%	88%	81%	74%	82%
No intention	0%	12%	19%	26%	18%
Difficulty obtaining fellowship compared to residency					
No difference	28%				
Harder	10%				
Easier	61%				
Don't know	1%				
Co-resident applying effect					
No effect	84%				
More likely to apply	15%				
Less likely to apply	1%				

Table 4. Variables Pertaining to Fellowship Application (Percentages are calculated from all respondents for fellowship application and difficulty. The effect of a co-resident applying percentage is calculated from only those who indicated they have or will apply to a fellowship program.)

Program Type	Percent
Retina	32%
Cornea	21%
Oculoplastics	16%
Glaucoma	11%
Pediatrics	10%
Medical retina	3%
Uveitis	1.5%
Refractive	1.5%
Oncology	1.5%
Neuro	1.5%
Unsure	1.5%

The lack of a formal matching process for a fellowship program was either viewed as not affecting an applicant's decision (50%) or making them less likely (44%) to apply. Regarding those who had applied to a fellowship program prior to completing the survey, the vast majority (88%) applied to a program or programs with a formal matching process. A small number of respondents indicated they planned on pursuing training in more than one subspecialty (8%), with 16% unsure if they would pursue more than one (Table 6).

Most of those who intended to complete a

fellowship indicated they planned on practicing comprehensive ophthalmology along with a subspecialty (49%), while 18% planned on only practicing within their chosen subspecialty (Table 7).

The association between different variables was examined to identify trends or statistical significance. Regarding fellowship application, gender had nearly no association, and race was weakly associated, with neither being statistically significant. Program size had a weak association that was not statistically significant. The training year of the respondent had

Table 5. Reasons for Applying to Fellowship Program (Ranks are based on the rank order frequency the particular item was selected by respondents who indicated they have or will apply to a fellowship program.)

Rank	Item
1	I wanted additional surgical training
2	I wanted additional clinical training
3	Increased job market competitiveness
4	Increased earning potential
5	Lifestyle of subspecialty
6	Was influenced by a faculty member
7	Was influenced by a current fellow
8	Interest in research
9	Not interested in general ophthalmology practice
10	Was uncertain of what I wanted to do following residency completion
11	Other residents I know were doing fellowships
12	Did not have employment secured for graduation

Table 6. Variables Pertaining to Fellowship Matching Process (Percentages are calculated from only those respondents who indicated they have or will apply to a fellowship program.)

How likely to apply to a fellowship program that did not participate in a formal matching process	
More likely	6%
Less likely	44%
No effect	50%
Applied to program with formal matching process	
Yes	23%
No	1.5%
Both	1.5%
Not yet applied	74%
Plan to complete more than one fellowship	
Yes	8%
No	76%
Unsure	16%

no significant relationship (**Table 8**). However, the training year of the resident did have a statistically significant but weak association with desired practice type ($\lambda = 0.205, P = .009$). The location of the residency program had a moderate, statistically significant association with desired practice region ($\lambda = 0.357, P = .001$). The program size had weak associations with desired practice population ($\lambda = 0.040, P = .669$) and structure ($\lambda = 0.098, P = .201$), with no statistical significance.

Discussion

The purpose of this pilot study was to query a representative sample of residents from programs of varying sizes and locations to identify factors affecting fellowship choices of US ophthalmology residents. The data presented in this report represents the most current and detailed effort to quantify and analyze factors that influence ophthalmology residents' decisions to pursue fellowship training. The percentage of ophthalmology residents seeking fellowship training has increased significantly over the past 15 years with an almost 20% increase from the last published survey, and has doubled from the reported rate of 40%

in 1990.^{7,10} Similarly, the available number of subspecialty fellowships has seen an increase of 12% over an even shorter five-year period.¹ This trend has also been seen among ophthalmology residents trained outside of the US where 81% indicated they planned on pursuing a fellowship, and 24% planned on doing so in North America.¹¹

The finding in this study that 82% of the respondents planned on pursuing a subspecialty ophthalmology fellowship was not surprising based on previous data (**Table 3**).^{6,10,11} However, there were certain variables and data trends that stood out in this sample population. The first was that a majority of the respondents indicated that obtaining a fellowship position would be easier (61%) than obtaining an ophthalmology residency (**Table 3**). This finding may warrant a deeper investigation as to why most respondents hold this view. They may believe that the expansion of fellowship positions makes obtaining a slot less competitive, or perhaps their training program reputation, Ophthalmic Knowledge Assessment Program (OKAP) scores, and attending recommendation letters set them apart from other applicants.

Table 7. Desired Practice Pattern of Those Pursuing Fellowship Training (Percentages are calculated from only those respondents who indicated they have or will apply to a fellowship program.)

Subspecialty only	18%
Subspecialty and comprehensive	49%
Dependent on job opportunity	18%
Not sure	15%

Table 8. Association of Demographic Variables to Fellowship Application

	Lambda	Tau	P value
Gender		0.011	.363
Race	0.071		.314
Program size	0.031		.763
Training year	0.057		.314

The next iteration of the survey instrument in a future study could be modified in an attempt to elicit a more detailed rationale for this outcome.

The result that nearly half of the respondents who planned on pursuing fellowship training still desired to practice comprehensive ophthalmology was unexpected. When factoring in the two primary reasons indicated for pursuing fellowship training, (I wanted additional surgical training; I wanted additional clinical training) it raises the question of whether some residents feel they are not receiving adequate clinical and surgical training in comprehensive matters during residency or if they are seeking additional, advanced training in the desired subspecialty. This relationship is difficult to establish as the survey did not specify between comprehensive and subspecialty training. The wording of these items would be altered on future surveys to achieve improved granularity for analysis.

Another variable that stood out to the authors was that the desire to pursue fellowship training decreased with the training year (**Table 3**). While the decrease in the percentage from intern to third-year resident was not statistically significant (3rd yr - 74%, 2nd yr - 81%, 1st yr - 88%, intern - 100%, $\chi^2 = 1.938$, $P = .585$), the trend is suggestive, and significance may be achieved with a larger sample. Despite a limited sample size, the fact that 100% of the ophthalmology residency program-linked interns stated they intended to pursue a fellowship less than a year into their training may suggest that current applicants are pursuing ophthalmology training to primarily subspecialize. This concept is supported by the fact that none of the interns (0%) stated they planned on practicing comprehensive ophthalmology and a subspecialty compared to 49% of the residents surveyed (resident year versus subspecialty practice, $\chi^2 = 27.519$, $P = .001$). However, this trend could also indicate that while new entrants to programs

may desire to subspecialize, they alter their career plans throughout training.

Interestingly, this sample population's top 5 subspecialty fellowship choices remained relatively unchanged from a 2003 survey, with only ophthalmology and glaucoma exchanging positions (**Table 4**).⁷ This trend was further substantiated by the 2017 American Academy of Ophthalmology (AAO) biennial survey, which included responses from 296 members currently in US-based residency training.¹² The subspecialties of retina and cornea were the clear primary and secondary choices in all surveys, with glaucoma being the third choice in the 2003 and AAO surveys. The 5% difference between ophthalmology and glaucoma in our data set may be skewed due to the small sample size.

Multiple agencies have projected an overall shortage of ophthalmologists by the year 2025. However, the bigger issue may be the distribution of subspecialist physicians.¹³⁻¹⁶ The latter was reflected in the data as most respondents indicated a desire to practice in larger metropolitan areas, and only a small minority indicated they wished to practice in a town or suburban area (**Table 2**). Respondents further informed this result by indicating increased job market competitiveness as the third highest factor in pursuing fellowship training. However, because nearly half of the respondents indicated they intended to practice comprehensive ophthalmology along with their subspecialty, recruiting such individuals to areas of need would fill both comprehensive and subspecialist care voids with a single physician.

A comprehensive follow-up to this pilot study should be conducted with a partner organization, such as the American University Professors of Ophthalmology (AUPO), in order to obtain the highest possible response rate to achieve the most accurate analysis possible. The authors believe it would be beneficial to administer the survey every year in the 4-year

residency training cycle, from intern to the third year of residency, to identify factors that may change as the individual progresses in their training. This practice may also provide data as to how the various structures of the intern year might affect the desire for post-residency training.

Strengths

This study has several strengths. First, this survey was the first in the last 15-plus years that assessed these views among ophthalmology residents. Second, this survey highlights the priorities and goals of the current generation of ophthalmology residents. Third, despite the small sample size, the survey represents a diverse group of programs in size and location. Finally, as this study was conducted immediately prior to the COVID-19 pandemic, the results may provide a unique benchmark for similar studies during or after the pandemic.

Weakness

This pilot study has limitations. None of the programs from the western portion of the US were surveyed. A follow-up study is needed to establish a larger validity by including this geographic region. Similarly, the respondents' preferred practice region and population settings indicate a trend from this pilot study with a limited cohort, which may not be representative of the nationwide preferences in a larger cohort. Another weakness was the unintentional omission of the "Ocular Pathology" option as a fellowship choice. While there was an "other" option where participants could write a response, it should be incorporated in subsequent surveys even with the limited number of such fellowships. Lastly, questions regarding educational debt from the Gedde et al. instrument were not included in this instrument, which potentially negated increased income as a factor in pursuing fellowship training, even though multiple studies have shown fellowship training does equate to increased income.

Conclusion

The data trends elicited in this pilot study provide insights into potential improvements and refinements to the survey instrument. These trends coupled with conducting a prospective, longitudinal study including all ACGME ophthalmology residency training programs will allow for further exploration of factors

identified in this report and negate any effects of regional bias in the pilot sample. The larger sample size will also provide new interactions and significance among variables not encountered in the pilot study. It will allow for logistic regression analyses of variables to determine those most strongly associated with residents pursuing fellowship training. These factors may suggest modifications to the current ophthalmology residency and fellowship training systems. Additionally, the results may provide further insight into physician workforce distribution issues.

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Appendix 1

Survey

The following anonymous survey pertains to your thoughts about ophthalmology fellowship training. If no answer reflects your choice, please select the option that most closely approximates your status or plans.

1. What year resident are you?
 - a. Intern
 - b. 1st year Ophthalmology resident
 - c. 2nd year Ophthalmology resident
 - d. 3rd year Ophthalmology resident

2. Number of residents in your program including yourself (fill in blank): _____

3. What is your gender?
 - a. Male
 - b. Female

4. What is your race?
 - a. Caucasian
 - b. African American
 - c. Hispanic
 - d. Asian
 - e. Indian
 - f. Pacific Islander
 - g. American Indian
 - h. Other

5. What is your desired region to practice after residency or fellowship?
 - a. Northeast
 - b. West
 - c. Midwest
 - d. South

6. What is your target population for your future practice?
 - a. Large city (population > 500,000)
 - b. Small city (population 200,000 – 499,999)
 - c. Town (50,000 – 199,000)
 - d. Suburban area (5,000 – 49,999)
 - e. Rural area (< 5,000)
 - f. undecided

7. What is your desired practice structure following residency or fellowship?
 - a. Academic
 - b. Private/employed
 - c. Combination of 1&2
 - d. I am not sure

8. Do you feel obtaining an ophthalmology fellowship position is easier or harder than obtaining an ophthalmology residency position?

- a. Easier
- b. Harder
- c. No difference

9. Have you applied to a fellowship?

- a. Yes
- b. I have not applied, but will apply
- c. I have no intention of applying to a fellowship at this time (**Stop here**)

10. Would a co-resident(s) applying for a fellowship make you more or less likely to apply to a fellowship?

- a. More likely
- b. Less likely
- c. Would not affect my decision

11. Indicate the type(s) of fellowship programs that you have applied to or are planning to apply.

Check all that apply - **circle primary choice**

- Plastics
- Pediatrics
- Cornea
- Retina
- Medical Retina
- Glaucoma
- Neuro
- Uveitis
- Oncology
- Pathology
- Anterior Segment
- Other: _____

12. Rank the following reasons for applying to a fellowship program from most important (1) to least important (12).

- I wanted additional surgical training _____
- I wanted additional clinical training _____
- Increased job market competitiveness _____
- Increased earning potential _____
- Did not have employment secured for graduation _____
- Not interested in general ophthalmology practice _____
- Other residents I know were doing fellowships _____
- Was uncertain of what I wanted to do following residency completion _____
- Was influenced by a faculty member _____
- Was influenced by a current fellow _____
- Lifestyle of subspecialty _____
- Interest in research _____

13. Would you be more or less likely to apply to a fellowship program that did not participate in a formal matching process, such as SF match?

- a. More likely
- b. Less likely
- c. Would not affect decision

14. If you have applied to a fellowship program, did it have a formal matching process?

- a. Yes
- b. No
- c. Applied to programs that had both formal and non-formal matching
- d. I have not yet applied to any programs

15. If you complete a fellowship in your chosen subspecialty, would you prefer to only practice within that subspecialty or would you also practice comprehensive ophthalmology?

- a. Only subspecialty
- b. Subspecialty and comprehensive
- c. I'm not sure
- d. Would depend on job opportunities?

16. Do you plan on completing more than 1 fellowship?

- a. Yes
- b. No
- c. Unsure