



Factors Affecting Ophthalmology Trainees to Pursue Vitreoretinal Surgery Fellowship

John R. O'Fee, BS¹ Nadim Rayess, MD² Carolyn K. Pan, MD² Brian C. Toy, MD¹

¹USC Roski Eye Institute, Keck School of Medicine of the University of Southern California, Los Angeles, California

²Byers Eye Institute, Stanford University School of Medicine, Palo Alto, California

Address for correspondence Brian C. Toy, MD, USC Roski Eye Institute, Keck School of Medicine of USC, 1450 San Pablo St., 4th Floor, Los Angeles, CA 90033 (e-mail: brian.toy@med.usc.edu).

J Acad Ophthalmol 2022;14:e110–e119.

Abstract

Objective The aim of this study was to understand the factors that ophthalmology trainees consider in pursuing vitreoretinal surgery (VRS) fellowship training.

Methods This is a prospective observational survey study. Survey invitations were disseminated to postgraduate year 4 (PGY)-4 ophthalmology residents at Accreditation Council for Graduate Medical Education-accredited residency programs and surgical retina fellows at Association of University Professors of Ophthalmology Fellowship Compliance Committee-compliant fellowship programs in the United States. Survey questions on factors related to VRS were administered employing a 5-point Likert scale. Responses from ophthalmology residents pursuing surgical retina were combined with surgical retina fellows' responses and compared with responses from PGY-4 residents not pursuing vitreoretinal surgery.

Results Eighty-one resident surveys were completed. Forty-three fellow surveys were completed. Fifty-seven out of eighty-one (70.4%) residents were not pursuing surgical retina, and a total of 67 trainees (24 residents, 43 fellows) were pursuing surgical retina. The following factors were associated with pursuing VRS training: male gender ($p = 0.031$); having performed retina research during residency ($p \leq 0.001$); enjoying surgical retina procedures ($p \leq 0.001$), enjoying surgical retina patient outcomes ($p \leq 0.001$), and working with vitreoretinal surgeons ($p \leq 0.001$); finding surgical retina prestigious ($p \leq 0.001$); perceiving their residency having a strong record of matching surgical retina ($p = 0.039$); liking the potential financial income from surgical retina ($p \leq 0.001$); and having vitreoretinal mentors during residency ($p = 0.014$). A majority of trainees (31/57, 54.4%) not pursuing surgical retina disagreed or strongly disagreed with enjoying the patient outcomes in surgical retina. A third of female residents not pursuing surgical retina felt having a female surgical retina mentor would have made them more likely to pursue the field.

Conclusion Longer retina rotations, encouraging resident participation in retina research, and increasing mentorship opportunities of female trainees from female retina specialists may increase resident interest in pursuing surgical retina fellowship.

Keywords

- ▶ ACGME
- ▶ surgical retina fellowship
- ▶ vitreoretinal surgery
- ▶ female mentorship

received
April 26, 2021
accepted after revision
October 12, 2021

DOI <https://doi.org/10.1055/s-0041-1741461>.
ISSN 2475-4757.

© 2022. The Author(s).

This is an open access article published by Thieme under the terms of the Creative Commons Attribution-NonDerivative-NonCommercial-License, permitting copying and reproduction so long as the original work is given appropriate credit. Contents may not be used for commercial purposes, or adapted, remixed, transformed or built upon. (<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

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

There is continuing nationwide need for trained vitreoretinal surgery (VRS) specialists.¹⁻³ VRS fellowship provides broad training in vitreoretinal techniques, including repair of rhegmatogenous retinal detachment; macular surgery; procedures for managing retinopathy of prematurity, intraocular inflammation, ocular malignancies; and perhaps most commonly, surgical treatments for proliferative diabetic retinopathy and its sequelae. Trainees who pursue surgical retina fellowship training, which is typically 2 years, face longer training periods than most other 1-year ophthalmology fellowships. Whereas cataract surgery is the focus of intraocular surgery training in residency, trainees pursuing surgical retina choose a new arduous beginning in becoming proficient at posterior segment surgery. In addition, surgical retina fellows experience greater call demands because of more emergent issues that affect the posterior segment, such as retinal tears, detachments, and endophthalmitis. Bakri et al reported which factors surgical retina fellows consider when choosing a specific surgical retina fellowship,⁴ and previous studies have reported factors that may affect ophthalmology residents' decisions to pursue glaucoma and pediatric ophthalmology fellowships.^{5,6} A comprehensive study on factors that may affect trainees' decision to pursue VRS fellowship has not, to our knowledge, been published. Here, we report factors that will help both residency programs and fellow trainees understand the decision to pursue or not pursue surgical retina fellowship.

Methods

Participants

The research adhered to the Declaration of Helsinki and was approved by the University of Southern California Institutional Review Board. Survey participants included third year (postgraduate year 4 [PGY-4]) ophthalmology residents and first or second year (PGY-5 or -6) surgical retina fellows. Program contacts at Accreditation Council for Graduate Medical Education (ACGME)-accredited residency programs and Association of University Professors of Ophthalmology Fellowship Compliance Committee (AUPO FCC)-compliant VRS fellowship programs were identified employing queries of the Fellowship and Residency Electronic Interactive Database, the AUPO FCC Web site (<https://aupofcc.org/>), San Francisco Match, Doximity (Doximity.com), and program Web sites. We emailed program contacts to distribute survey links to potential participants. Because we could not contact potential participants directly, the actual number of participants who had access to the survey was unknown. We did not offer an incentive to complete the survey and did not collect any direct or indirect identifying information. We sent email reminders at 3 weeks, and then the surveys were closed after being open for 8 weeks, from October 20th, 2020 to December 15th, 2020.

Survey Design and Statistical Analysis

Qualtrics (Provo, Utah, Qualtrics.com) served as the survey platform, which has been used in a prior similar study.⁷ Questions were adapted from prior similar surveys of trainees

in other specialties, and responses were limited to a 5-point Likert scale (strongly agree, agree, neutral, disagree, and strongly disagree).⁵⁻⁹ The wording in the fellow and resident surveys was not significantly different, and the list of survey questions can be found in ►Table 1.

Among the 138 surveys started, 124 (89.9%) were completed. Incomplete surveys had no responses to any Likert-scale questions and were excluded from the entire analysis. Residents pursuing surgical retina and current surgical retina fellows were grouped into trainees pursuing VRS training and residents not pursuing surgical retina were grouped into not vitreoretinal surgery (NVRS). Nonparametric Mann-Whitney U-tests were performed employing GraphPad Prism (GraphPad Software, San Diego, CA) to compare ordinal responses between the two groups, and a *p*-value of 0.05 was determined to be significant.

Results

A total of 81 residents completed the survey (►Table 2).¹⁰ Among the residents, 24 (29.6%) were pursuing VRS, and 57 (70.4%) were not pursuing VRS training. A total of 43 VRS fellows completed the survey. There were significantly fewer females pursuing VRS than NVRS (23.9 vs. 42.1%, *p* = 0.031). There were no significant differences in marital status or having children between VRS and NVRS trainees, including when stratified by gender as seen in ►Tables 3 and 4. Of VRS trainees, 46.3% made their decision in PGY-3, while 20.9% chose VRS prior to entering residency.

►Table 5 presents a descriptive summary of the survey responses. A majority of VRS and NVRS trainees agreed or strongly agreed with the following: have sufficient exposure to surgical retina during residency, have adequate retina research opportunities, enjoy surgical retina procedures, enjoy working with vitreoretinal surgeons, regard surgical retina to be a prestigious field, think their residency has a strong record of matching surgical retina, and had opportunities to have surgical retina mentors during residency.

A majority of VRS trainees agreed or strongly agreed with the following: did a significant amount of retina research during residency, like the patient outcomes in surgical retina, and like the potential financial rewards as a retinal surgeon. While most VRS female trainees did not believe a female surgical retina mentor significantly affected their decision to pursue surgical retina, a third of NVRS female trainees agreed or strongly agreed that having a female mentor would have made them more likely to pursue the field.

►Table 6 summarizes the Likert-scale score median and interquartile range for each response. There was a significant difference (*p* < 0.05) in median Likert scores for VRS and NVRS trainees in the following: amount of retina research done during residency (*p* < 0.001), enjoyment from surgical retina procedures (*p* < 0.001), gratification from VRS patient outcomes (*p* < 0.001), enjoyment from working with vitreoretinal surgeons (*p* < 0.001), perception of VRS as prestigious (*p* < 0.001), perception of residency program having a strong record of matching into surgical retina fellowship (*p* = 0.039), preference for financial rewards as a vitreoretinal surgeon (*p* < 0.001), and opportunities to have surgical retina

Table 1 Survey Questions

Resident Questions	Criteria	Fellow Questions	Criteria	Combined questions for analysis
1. Gender a. Male b. Female c. Other		1. Gender a. Male b. Female c. Other		
2. Age (years) a. 25-29 b. 30-34 c. 35 and over		2. Age (years) a. 25-29 b. 30-34 c. 35 and over		
3. I am a. White b. Black c. Latino d. Asian, Native Hawaiian or Pacific Islander e. American Indian or Alaska Native f. Other		3. I am a. White b. Black c. Latino d. Asian, Native Hawaiian or Pacific Islander e. American Indian or Alaska Native f. Other		
4. Marital Status a. Married b. Not married		4. Marital Status a. Married b. Not married		
5. I have children a. Yes b. No		5. I have children a. Yes b. No		
6. I am planning on pursuing vitreoretinal surgery fellowship a. Yes b. No				
7. When did you decide to pursue vitreoretinal surgery fellowship? a. Before residency b. PGY1 c. PGY2 d. PGY3 e. PGY4	IF YES TO &6	6. When did you decide to pursue vitreoretinal surgery fellowship? a. Before residency b. PGY1 c. PGY2 d. PGY3 e. PGY4		
8. I have had sufficient exposure to vitreoretinal surgery during residency to make an informed decision about whether or not to apply a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		7. I had sufficient exposure to vitreoretinal surgery during residency to make an informed decision about whether or not to apply a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		*
9. My residency provides sufficient retina research opportunities a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		8. I had sufficient retina research opportunities a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		*
10. I did a significant amount of retina research during residency a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		9. I did a significant amount of retina research during residency a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		

Table 1 (Continued)

Resident Questions	Criteria	Fellow Questions	Criteria	Combined questions for analysis
11. I plan for my practice as an attending to involve an academic setting a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		10. I plan for my practice as an attending to involve an academic setting a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		
12. I like vitreoretinal surgery procedures a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		11. I like vitreoretinal surgery procedures a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		
13. I like the patient outcomes in vitreoretinal surgery a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		12. I like the patient outcomes in vitreoretinal surgery a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		
14. I enjoy working with vitreoretinal surgeons a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		13. I enjoy working with vitreoretinal surgeons a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		
15. Vitreoretinal surgery is prestigious a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		14. Vitreoretinal surgery is prestigious a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		
16. My residency program has a strong record of matching into vitreoretinal surgery a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		15. My residency program has a strong record of matching into vitreoretinal surgery a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		
17. My financial educational debt concerns me a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		16. My financial educational debt concerns me a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		
18. I like the potential financial rewards as a practicing retina specialist a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		17. I like the potential financial rewards as a practicing retina specialist a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		

(Continued)

Table 1 (Continued)

Resident Questions	Criteria	Fellow Questions	Criteria	Combined questions for analysis
19. I had opportunities to have vitreoretinal surgery mentors during residency a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		18. I had opportunities to have vitreoretinal surgery mentors during residency a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree		
20. Having a female vitreoretinal surgery mentor significantly affected my decision to pursue vitreoretinal surgery training a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree	IF FEMALE TO &1 AND YES TO &6	19. Having a female vitreoretinal surgery mentor significantly affected my decision to pursue vitreoretinal surgery training a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree	IF FEMALE TO &1	
21. Having a female vitreoretinal surgery mentor would have made me more likely to pursue vitreoretinal surgery training a. Strongly agree b. Agree c. Neutral d. Disagree e. Strongly disagree	IF FEMALE TO &1 AND NO TO &6			

*Resident and fellow survey questions with different wording that were combined to form the vitreoretinal surgery trainee group for analysis.

Table 2 Demographics and Characteristics of Respondents

	All (n)=124	VRS n=67 n (%)	NVRS n=57 n (%)	P
Gender				
Male	84	51 (76.1)	33 (57.9)	0.031
Female	40	16 (23.9)	24 (42.1)	
Age (years)				
25-29	24	8 (11.9)	16 (28.1)	0.047
30-34	87	53 (79.1)	34 (59.6)	
35 and over	13	6 (9.0)	7 (12.3)	
Ethnicity				
White	72	37 (55.2)	35 (61.4)	0.487
Latino	8	5 (7.5)	3 (5.3)	0.619
Asian, Native Hawaiian or Pacific Islander	38	21 (31.3)	17 (29.8)	0.855
Other	6	4 (6.0)	2 (3.5)	0.524
Marital Status				
Married	66	35 (52.2)	31 (54.4)	0.811
Not married	58	32 (47.8)	26 (45.6)	
Children				
Yes	36	17 (25.4)	19 (33.3)	0.330
No	88	50 (74.6)	38 (66.7)	
When did you decide to pursue VRS?				
Before residency		14 (20.9)	NA	NA
PGY1		3 (4.5)		
PGY2		15 (22.4)		
PGY3		31 (46.3)		
PGY4		4 (6.0)		

Vitreoretinal surgery (VRS) includes postgraduate year (PGY)-4 residents pursuing VRS fellowship and current VRS fellows. Not VRS (NVRS) includes PGY-4 residents not pursuing VRS. P-values determined using chi-square test on Prism – GraphPad.

Table 3 Demographics and Characteristics of Vitreoretinal Surgery Respondents Gender Subanalyses

	Male n=51 n (%)	Female n=16 n (%)	P
Age (years)			
25-29	6 (11.8)	2 (12.5)	0.910
30-34	40 (78.4)	13 (81.3)	
35 and over	5 (9.8)	1 (6.3)	
Ethnicity			
White	31 (60.8)	6 (37.5)	0.102
Latino	3 (5.9)	2 (12.5)	0.380
Asian, Native Hawaiian or Pacific Islander	13 (25.5)	8 (50)	0.065
Other	4 (7.8)	0 (0)	0.248
Marital Status			
Married	28 (54.9)	7 (43.8)	0.436
Not married	23 (45.1)	9 (56.3)	
Children			
Yes	15 (29.4)	2 (12.5)	0.175
No	36 (70.6)	14 (87.5)	
When did you decide to pursue VRS?			
Before residency	12 (23.5)	2 (12.5)	0.562
PGY1	3 (5.9)	0 (0)	
PGY2	12 (23.5)	3 (18.8)	
PGY3	21 (41.2)	10 (62.5)	
PGY4	3 (5.9)	1 (6.3)	

Vitreoretinal surgery (VRS) includes postgraduate year (PGY)-4 residents pursuing VRS fellowship and current VRS fellows. P-values determined using chi-square test on Prism – GraphPad.

Table 4 Demographics and Characteristics of Not Vitreoretinal Surgery Respondents Gender Subanalyses

	Male n=33 n (%)	Female n=24 n (%)	P
Age (years)			
25-29	11 (33.3)	5 (20.8)	0.572
30-34	18 (54.5)	16 (66.7)	
35 and over	4 (12.1)	3 (12.5)	
Ethnicity			
White	25 (75.8)	10 (41.7)	0.009
Latino	0 (0.0)	3 (12.5)	0.037
Asian, Native Hawaiian or Pacific Islander	6 (18.2)	11 (45.8)	0.024
Other	2 (6.1)	0 (0)	0.220
Marital Status			
Married	20 (60.6)	11 (45.8)	0.269
Not married	13 (39.4)	13 (54.2)	
Children			
Yes	13 (39.4)	6 (25)	0.255
No	20 (60.6)	18 (75)	

Not vitreoretinal surgery includes postgraduate year-4 residents not pursuing vitreoretinal surgery. P-values determined using chi-square test on Prism – GraphPad.

mentors in residency ($p = 0.014$). There were no significant differences in retina mentorship opportunities between males and females pursuing surgical retina ($p = 0.406$) and those not pursuing surgical retina ($p = 0.367$). The following factors were not found to differ significantly between VRS and NVRS trainees: enough exposure to surgical retina during residency ($p = 0.831$), retina research opportunities in residency ($p = 0.778$), intending to practice in an academic setting as an attending ($p = 0.371$), concern for financial

educational debt ($p = 0.438$), and the potential impact of a female surgical retina mentor ($p = 0.588$).

Discussion

Our study aimed to understand which factors might help ophthalmology trainees decide to pursue VRS fellowship. Prior reports found more male ophthalmology residents pursue fellowship training,¹¹ among which surgical retina

Table 5 Likert-scale response rate of participant survey responses

	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)
I have had sufficient exposure to vitreoretinal surgery during residency to make an informed decision about whether or not to apply VRS (n)=67 NVRS (n)=57	36 (53.7) 30 (52.6)	22 (32.8) 19 (33.3)	5 (7.5) 2 (3.5)	4 (6.0) 4 (7.0)	0 (0.0) 2 (3.5)
My residency provides sufficient retina research opportunities VRS (n)=67 NVRS (n)=57	28 (41.8) 25 (43.9)	24 (35.8) 16 (28.1)	9 (13.4) 7 (12.3)	5 (7.5) 7 (12.3)	1 (1.5) 2 (3.5)
I did a significant amount of retina research during residency VRS (n)=67 NVRS (n)=57	14 (20.9) 1 (1.8)	21 (31.3) 5 (8.8)	14 (20.9) 6 (10.5)	16 (23.9) 20 (35.1)	2 (3.0) 25 (43.9)
I plan for my practice as an attending to involve an academic setting VRS (n)=67 NVRS (n)=57	13 (19.4) 6 (10.5)	16 (23.9) 17 (29.8)	23 (34.3) 17 (29.8)	10 (14.9) 13 (22.8)	5 (7.5) 4 (7.0)
I like vitreoretinal surgery procedures VRS (n)=67 NVRS (n)=57	54 (80.6) 6 (10.5)	13 (19.4) 26 (45.6)	0 (0.0) 14 (24.6)	0 (0.0) 9 (15.8)	0 (0.0) 2 (3.5)
I like the patient outcomes in vitreoretinal surgery VRS (n)=67 NVRS (n)=57	14 (20.9) 1 (1.8)	46 (68.7) 7 (12.3)	5 (7.5) 18 (31.6)	2 (3.0) 22 (38.6)	0 (0.0) 9 (15.8)
I enjoy working with vitreoretinal surgeons VRS (n)=67 NVRS (n)=57	44 (65.7) 5 (8.8)	17 (25.4) 27 (47.4)	4 (6.0) 15 (26.3)	1 (1.5) 8 (14.0)	1 (1.5) 2 (3.5)
Vitreoretinal surgery is prestigious VRS (n)=67 NVRS (n)=57	28 (41.8) 11 (19.3)	33 (49.3) 28 (49.1)	6 (9.0) 15 (26.3)	0 (0.0) 2 (3.5)	0 (0.0) 1 (1.8)
My residency program has a strong record of matching into vitreoretinal surgery VRS (n)=67 NVRS (n)=57	40 (59.7) 26 (45.6)	20 (29.9) 15 (26.3)	4 (6.0) 11 (19.3)	3 (4.5) 3 (5.3)	0 (0.0) 2 (3.5)
My financial educational debt concerns me VRS (n)=67 NVRS (n)=57	9 (13.4) 8 (14.0)	14 (20.9) 18 (31.6)	10 (14.9) 8 (14.0)	20 (29.9) 10 (17.5)	14 (20.9) 13 (22.8)
I like the potential financial rewards as a practicing retina specialist VRS (n)=67 NVRS (n)=57	13 (19.4) 8 (14.0)	41 (61.2) 19 (33.3)	12 (17.9) 24 (42.1)	1 (1.5) 3 (5.3)	0 (0.0) 3 (5.3)
I had opportunities to have vitreoretinal surgery mentors during residency VRS (n)=67 NVRS (n)=57	45 (67.2) 25 (43.9)	16 (23.9) 25 (43.9)	4 (6.0) 3 (5.3)	2 (3.0) 3 (5.3)	0 (0.0) 1 (1.8)
Having a female vitreoretinal surgery mentor significantly affected my decision to pursue vitreoretinal surgery training Female VRS (n)=16	4 (25)	1 (6.3)	3 (18.8)	5 (31.3)	3 (18.8)
Having a female vitreoretinal surgery mentor would have made me more likely to pursue vitreoretinal surgery training Female NVRS (n)=24	3 (12.5)	5 (20.8)	7 (29.2)	8 (33.3)	1 (4.2)

Vitreoretinal surgery (VRS) includes PGY-4 residents pursuing VRS fellowship and current VRS fellows. Not vitreoretinal surgery (NVRS) includes PGY-4 residents not pursuing VRS. Resident survey questions presented here, fellow equivalents found in ► **Table 1**.

had the lowest proportion of women with 19% as of 2018.¹² Our study found this trend among the current generation of ophthalmology trainees, with significantly more males than females pursuing VRS. Surgical retina specialists generally have more emergencies than their other subspecialty col-

leagues. This may contribute to a more difficult work-life balance, which is more commonly cited by women than men as a reason not to pursue a specialty.¹³ As mentorship can play a key role in career development,¹⁴ we hypothesized that female trainees with female surgical retina mentors

Table 6 Summary of participant survey responses

	VRS (n = 67) Median (IQR)	NVRS (n = 57) Median (IQR)	p-Value
I have had sufficient exposure to VRS during residency to make an informed decision about whether or not to apply	5 (4, 5)	5 (4, 5)	0.831
My residency provides sufficient retina research opportunities	4 (4, 5)	4 (3, 5)	0.778
I did a significant amount of retina research during residency	4 (2, 4)	2 (1, 2)	<0.001
I plan for my practice as an attending to involve an academic setting	3 (3, 4)	3 (2, 4)	0.371
I like VRS procedures	5 (5, 5)	4 (3, 4)	<0.001
I like the patient outcomes in VRS	4 (4, 4)	2 (2, 3)	<0.001
I enjoy working with vitreoretinal surgeons	5 (4, 5)	4 (3, 4)	<0.001
VRS is prestigious	4 (4, 5)	4 (3, 4)	<0.001
My residency program has a strong record of matching into VRS	5 (4, 5)	4 (3, 5)	0.039
My financial educational debt concerns me	2 (2, 4)	3 (2, 4)	0.438
I like the potential financial rewards as a practicing retina specialist	4 (4, 4)	3 (3, 4)	<0.001
I had opportunities to have VRS mentors during residency	5 (4, 5)	4 (4, 5)	0.014
Having a female VRS mentor significantly affected my decision to pursue VRS training (n = 16)	2.5 (2, 4.25)	NA	0.588
Having a female VRS mentor would have made me more likely to pursue VRS training (n = 24)	NA	3 (2, 4)	

Abbreviation: IQR, interquartile range.

Vitreoretinal surgery (VRS) includes postgraduate year 4 (PGY-4) residents pursuing VRS fellowship and current VRS fellows. Not vitreoretinal surgery (NVRS) includes PGY-4 residents not pursuing VRS. Resident survey questions presented here follow equivalents found in **Table 1**.

would be more likely to pursue VRS training. While we found no statistically significant difference between VRS and NVRS trainees having a female VRS mentor, and no significant difference in retina mentorship opportunities between males and females pursuing surgical retina, 33.3% of NVRS female trainees thought having a female mentor would have made them more likely to pursue the field. While only 31.3% of VRS female trainees agreed that having a female mentor significantly affected their decision, this might be explained by these trainees not having a female surgical retina mentor available who would have affected their decision.

Prior studies found residents pursuing glaucoma fellowship tended to come from residency programs with more full-time glaucoma faculty, which likely allows for more glaucoma mentorship opportunities.⁵ Similarly, nearly all residents pursuing pediatric ophthalmology had a clinical role model in pediatric ophthalmology.⁶ We found VRS trainees reported significantly more opportunities for surgical retina mentorship. Residents pursuing subspecialties besides glaucoma have been reported to be significantly more likely to author a paper during residency, have time allocated for research, and have an interest in academia.⁵ We found the majority of VRS trainees felt they did a significant amount of retina research during residency, though there was no significant difference in retina research opportunities or interest in an academic career between VRS and NVRS trainees.

Enjoyment from retina surgical procedures, patient outcomes, and working with surgical retina colleagues were all

significantly higher for VRS than NVRS trainees. While 56.2% of NVRS trainees reported enjoying working with vitreoretinal surgeons, over 90% of VRS trainees did, which was similar to the reported sentiment on interpersonal interactions for pediatric ophthalmology.⁶ The majority of NVRS trainees did not like the patient outcomes in surgical retina, while the vast majority of VRS trainees did. Though the majority of NVRS trainees enjoyed surgical retina procedures, all VRS trainees strongly agreed or agreed with liking the procedures. This is similar to pediatric ophthalmology, where Hasan et al reported 95.4% of residents pursuing pediatric ophthalmology like strabismus surgery, while 65.3% of residents not pursuing pediatric ophthalmology like strabismus surgery.⁶ Hasan et al also found the majority of residents pursuing either pediatric ophthalmology or another subspecialty felt they had sufficient exposure to pediatric ophthalmology.⁶ There does not appear to be a lack of opportunity for trainees to discover their enjoyment from these aspects of surgical retina as we found no significant difference in exposure to the field between VRS and NVRS trainees.

In comparison to cataract surgery, which generally rapidly improves the patient's vision, surgical retina procedures can have improvements in visual acuity that are less dramatic and only after a longer recovery period. Young surgeons might be discouraged by giving up the cataract surgery skills they already worked to establish during residency for the more metered recovery of vision from surgical retina procedures. Gedde et al postulated residents may be less

interested in glaucoma fellowship because there is no “cure” for glaucoma.⁵ Because of prolonged recovery in surgical retina, a full understanding and appreciation for surgical retina outcomes might be limited by retina rotations being too short for continuity of care from surgery to final recovery. Subspecialty rotations have been reported to be an important reason for trainees in deciding on a fellowship.⁵ Thus, longer continuous rotations in retina might allow trainees to see these outcomes and improve trainee perception of retina rotations.

VRS trainees were significantly more likely to agree that their residency program had a strong history of matching into surgical retina. The perception of a program's record of matching trainees into surgical retina might discourage some trainees from pursuing surgical retina. Residency programs could benefit these trainees by identifying them and actively providing assistance and resources to help them feel competitive for the match process. While opportunities in medical school to learn about ophthalmology are generally limited, over 20% of trainees made their decision to pursue surgical retina prior to starting residency. Medical students interested in retina might want to consider a program's record of matching residents to surgical retina fellowship into their residency decision-making. A future prospective study of subspecialty interest among medical students who match ophthalmology may help identify both factors associated with initial subspecialty interest and the stability of initial subspecialty interest over the course of residency. This would help identify potential future trends in the subspecialist work force.

Similar to Gedde et al we found the plurality of trainees who decide to pursue retina fellowship training do so in their PGY-3 year.^{5,11} There was no significant difference regarding concern for financial education debt between VRS and NVRS trainees, which was similar to trainees pursuing and those not pursuing glaucoma fellowship.⁵ More VRS trainees than NVRS trainees did like the financial rewards as a practicing retina specialist.

Our study had several limitations. We compared the grouped responses of current VRS fellows and PGY-4 residents pursuing surgical retina to PGY-4 residents who are not pursuing surgical retina. Including ophthalmology fellows pursuing other subspecialty training would have better controlled for confounding factors that may have differed between resident and fellow trainees. Another limitation is current fellows' responses to the survey questions might have been affected by their time as fellows that could make their responses less comparable to the current residents pursuing VRS. A limitation common to many survey-based studies is low response rate. Because we were unable to distribute surveys directly to participants, the actual number of participants who received a survey is unknown, so reliable response rates cannot be determined. There were 502 PGY-4 ophthalmology residents in ACGME-accredited ophthalmology programs in 2019 to 2020. Assuming all residents had the opportunity to respond to the survey, the response rate would be 16.1%. There were 142 VRS fellows in AUPO-FCC-compliant fellowship programs in 2019 to 2020.¹⁵ Assuming

all fellows had the opportunity to respond to the survey, the response rate would be 30.3%. While the low response rate is similar to other prior studies,^{6,16,17} the low number of responses, especially for residents, may have prevented us from having a high enough power to uncover statistical significance for some questions, such as the effect of having a female mentor on specialty choice. Our findings nevertheless did recapitulate those of other studies.^{5,6,11} In addition, the proportion of residents pursuing surgical retina in our study (29.6%) was similar to a prior study (22.3%),⁵ and these are consistent with the proportion of filled fellowship positions in 2019 (35.7%, included both medical and surgical retina).¹⁸

While there does not appear to be an issue with recruiting trainees to VRS fellowship positions now, there will continue to be a need for specialists who can care for the increasing number of patients requiring retinal treatment in the coming years. Encouraging resident participation in retina research, providing surgical retina mentors who are committed to encouraging trainees to enter the field, highlighting to trainees the joy of surgical retina procedures and patient outcomes, and highlighting past trainees' success with entering the field might help maintain and increase the number of trainees interested in surgical retina.

Meeting Presentations

Material in this manuscript was presented at the Women in Ophthalmology 2021 Summer Symposium at Amelia Island, Florida in August 26 to 29, 2021.

Funding

No financial support was received.

Conflict of Interest

None declared.

References

- Zhang X, Saaddine JB, Chou CF, et al. Prevalence of diabetic retinopathy in the United States, 2005-2008. *JAMA* 2010;304(06):649-656
- Ludwig CA, Chen TA, Hernandez-Boussard T, Moshfeghi AA, Moshfeghi DM. The epidemiology of retinopathy of prematurity in the United States. *Ophthalmic Surg Lasers Imaging Retina* 2017;48(07):553-562
- Ali FS, Stein JD, Blachley TS, Ackley S, Stewart JM. Incidence of and risk factors for developing idiopathic macular hole among a diverse group of patients throughout the United States. *JAMA Ophthalmol* 2017;135(04):299-305
- Bakri SJ, Alniemi ST, Chan RV. Experiences of vitreoretinal surgery fellows in the United States. *Retina* 2013;33(02):392-396
- Gedde SJ, Budenz DL, Haft P, Lee Y, Quigley HA. Factors affecting the decision to pursue glaucoma fellowship training. *J Glaucoma* 2007;16(01):81-87
- Hasan SJ, Castanes MS, Coats DK. A survey of ophthalmology residents' attitudes toward pediatric ophthalmology. *J Pediatr Ophthalmol Strabismus* 2009;46(01):25-29
- Becker MA, Bradley MV, Montalvo C, et al. Factors affecting psychiatry resident decision to pursue consultation-liaison psychiatry or other subspecialty fellowship training. *Psychosomatics* 2021;62(01):38-45

- 8 Palisoul M, Greenwade M, Massad LS, et al. Factors influencing residents' interest in gynecologic oncology fellowship. *Gynecol Oncol Rep* 2019;30:100504
- 9 Chung KC, Lau FH, Kotsis SV, Kim HM. Factors influencing residents' decisions to pursue a career in hand surgery: a national survey. *J Hand Surg Am* 2004;29(04):738-747
- 10 Accreditation Council for Graduate Medical Education. Data Resource Book, Academic Year 2019-2020. <https://www.acgme.org/About-Us/Publications-and-Resources/Graduate-Medical-Education-Data-Resource-Book> Accessed October 24, 2021
- 11 Gedde SJ, Budenz DL, Haft P, Tielsch JM, Lee Y, Quigley HA. Factors influencing career choices among graduating ophthalmology residents. *Ophthalmology* 2005;112(07):1247-1254
- 12 Personal communication with George Williams. MD. American Academy of Ophthalmology, 2018. per <https://retinatoday.com/articles/2020-mar/closing-the-gender-gap-in-retina>. Accessed October 24, 2021
- 13 Goldacre MJ, Goldacre R, Lambert TW. Doctors who considered but did not pursue specific clinical specialties as careers: questionnaire surveys. *J R Soc Med* 2012;105(04):166-176
- 14 Noble J. Factors influencing career choice in ophthalmology. *Can J Ophthalmol* 2006;41(05):596-599
- 15 Personal Communication with Kathy Mitchell. AUPO FCC Manager, February 1st, 2021
- 16 Akshay S, Thomas TR, Hwang T. Improving the transition to ophthalmology residency: a survey of first-year ophthalmology residents. *J Clin Acad Ophthalmol* 2016;8(01):e10-e8
- 17 Solomon AM, Patel VR, Francis CE. Factors affecting ophthalmology resident choice to pursue neuro-ophthalmology fellowship training. *J Neuroophthalmol* 2021
- 18 Statistics - Ophthalmology Fellowship Match Available at. https://sfmatch.org/PDFFilesDisplay/Ophthalmology_Fellowship_Stats_2019.pdf Accessed January 20, 2021. Accessed October 24, 2021