



Rates of Internal Hiring of Ophthalmology Faculty from their Institution of Training at Top Academic Medical Centers: A Cross-Sectional Study

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Abstract

Background Throughout graduate and postgraduate education, trainees need to gauge the impact of training location on future institutions of practice.

Objective We assessed rates of internal hiring of ophthalmology faculty at academic institutions from their same institution of training.

Methods This was a cross-sectional study. We included 1,246 clinical ophthalmology faculty at the 13 top-ranked institutions listed in the 2021 U.S. News and World Report. Primary, emeritus, adjunct, and affiliate faculty were included. Publicly available information was collected from institutional websites and other online sources. Statistical analyses were conducted using *t*-tests or Mann–Whitney tests, chi-squared or Fisher's exact tests, and multivariate logistic regression. The main outcome measured was internal hires, defined as faculty who had completed residency and/or fellowship training at their current institution.

Results In total, 47.3% of faculty were internal hires who completed residency or fellowship at the same institution. Among externally trained faculty, 27.7% completed residency and 56.0% completed fellowship at another top 13 programs. Internal hires were more frequently fellowship-trained, had a greater number of publications, and practiced in smaller departments ($p < 0.001$, $p < 0.001$, and $p = 0.002$, respectively). A greater proportion of internal hires held leadership positions ($p = 0.012$). Faculty practicing in the Midwest or West and with more years since residency graduation

Keywords

- Retention
- Training location
- Internal hiring
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- Fellowship
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were less likely (odds ratio [OR], 0.29, 95% confidence interval [CI], 0.18–0.48; OR, 0.49, 95% CI, 0.31–0.78; OR, 0.98, 95% CI, 0.97–0.99, respectively) to be internal hires. Faculty with non-R01 National Institutes of Health funding were more likely to be internal hires (OR, 1.82, 95% CI: 1.12–2.96).

Conclusions Training institution is key to determining the institution of practice. These results may be beneficial for trainees to consider when selecting a training program.

Throughout graduate and postgraduate education, physician trainees may want to determine what impact, if any, their choice of training institution will have on where they practice in the future. Indeed, the American Association of Medical Colleges (AAMC) reported that over half (55.5%) of physicians who graduated from residency between 2010 and 2019 practice in their state of residency training.¹ In addition, several studies have sought to characterize trainee retention in various medical specialties on an institutional level. One such study in the field of radiation oncology found that 40.9% of graduates working in academics were practicing at the same institution as where they completed residency.² Similarly, a study of academic plastic surgeons who graduated within the past 3 years found that 38.6% of recent graduates practice at their institution of residency or fellowship training.³

When examining retention, other important considerations include whether specific factors influence a trainee's likelihood to practice at their location of residency or fellowship. A few studies have sought to characterize trends in retention by gender. For example, the AAMC found a higher percentage of female physicians relative to male physicians practicing in their state of residency training.¹ A similar difference was also found in radiation oncology, where a greater proportion of women (85.1%) worked in a geographic region where they had previously trained as compared to men (68.4%).²

Although some have examined retention in other specialties, there are limited data specific to retention within the field of ophthalmology. In its report on the different medical specialties, the AAMC found that geographic retention rates within ophthalmology were lower than those in many other specialties, with only 36.4% of postgraduate ophthalmologists currently practicing in their state of postgraduate education.⁴ Other research has sought to characterize the impact of training location on the leadership role within ophthalmology, finding that many leaders trained at the top academic institutions for ophthalmology.^{5–7} However, no study has examined rates of internal hiring of faculty after completion of residency or fellowship at the same institution in the field of ophthalmology.

The purpose of the present study was to use publicly available information on faculty ophthalmologists to determine the percentage of faculty that completed residency or fellowship training at the same institution and what factors are associated with being an internal hire.

Methods

Study Sample

This study was qualified as exempt by the Johns Hopkins School of Medicine Institutional Review Board and was conducted in accordance with the Strengthening the Reporting of Observational Studies in Ophthalmology guidelines for cross-sectional studies. This cross-sectional analysis included 1,246 clinical ophthalmology faculty at the 13 top-ranked institutions listed in the 2021 U.S. News and World Report.⁸ The top 13 institutions were chosen to be included because they are the institutions that are ranked in the U.S. News and World Report; there is no definite ranking for other institutions (other top hospitals may be listed as “High Performing in Ophthalmology,” but are not formally ranked). Institutions that were included were the Bascom Palmer Eye Institute (University of Miami Hospital and Clinics), Wills Eye Hospital (Thomas Jefferson University Hospitals), Wilmer Eye Institute (Johns Hopkins Hospital), Mass Eye and Ear (Massachusetts General Hospital), Stein and Doheny Eye Institutes (UCLA Medical Center), Duke University Hospital, University of Iowa Hospitals and Clinics, Kellogg Eye Center (University of Michigan), UCSF Medical Center, Cole Eye Institute (Cleveland Clinic), John A. Moran Eye Center (University of Utah Hospitals and Clinics), New York Eye and Ear Infirmary (Mount Sinai), and Roski Eye Institute (USC). Faculty included were those listed on the websites of the top 13 institutions as ophthalmologists. Primary faculty, emeritus faculty, adjunct, and affiliate faculty were all included. Physicians who were still in training (residents and fellows), faculty who did not complete any residency or fellowship training in ophthalmology, and faculty without a medical doctorate, such as optometrists and research faculty, were excluded. Data collection was performed between June 15 and July 31, 2021.

Data Collection

Data were collected using institutional websites and other online faculty profiles, including LinkedIn, public websites (including Doximity, U.S. News, and Healthgrades), and private practice websites. Gender, graduation year, institution, and location of medical school, residency, and fellowship training were collected. Data were also gathered on current academic rank, leadership roles (department chair, chief of service, fellowship director, residency director, or other leadership such as clinical laboratory directors or medical education deans, for example), subspecializations, and advanced degrees. Subspecialization categories included anterior segment/cornea/refractive surgery, glaucoma,

oculoplastics, medical retina, vitreoretinal surgery, neuro-ophthalmology, pediatrics ophthalmology, ophthalmic oncology, ocular immunology/uveitis, and ophthalmic pathology. Additional data, including the number of first and last author publications and lifetime National Institutes of Health (NIH) funding, were collected using PubMed and the NIH RePorter tool. Department size was calculated using the number of ophthalmology faculty for whom data were collected at each institution. The geographic region of each program was determined based on U.S. Census Bureau-designated regions of the United States. City sizes were determined using the US Census Reporter website.⁹

Statistical Analysis

Internal hires were defined as faculty who had completed residency and/or fellowship training at their current institution. External hires were defined as faculty who had completed neither residency nor fellowship at their current institution. Recent graduates were defined as faculty who had completed residency within 5 years of the time of data collection in 2021. For some analyses, internal hires were subdivided into faculty who were internally trained for residency and faculty who were internally trained for fellowship. Statistical analyses were conducted using t-tests or Mann-Whitney tests, chi-squared or Fisher's exact tests, and multivariable logistic regression. To evaluate the risk of being an internal hire, multivariable logistic regression was adjusted for gender, medical school region, years since residency graduation, advanced degrees, current institution size, current city size, NIH funding, and number of publications. Odds ratios (OR) and 95% confidence intervals (CI) were reported.

Results

Demographic Information

Demographic data were collected on 1,246 clinical ophthalmology faculty (► **Table 1**). Of the 1,246 faculty, 589 (47.3%) were internal hires from residency or fellowship and 657 (52.7%) were external hires. Overall, the majority of faculty were male (64.6% of external hires and 62.1% of internal hires). There was no significant difference in gender ratios between groups ($p=0.36$). Most faculty were currently practicing at institutions in the Northeast (50.7% of external hires and 48.7% of internal hires). The majority of faculty also attended medical school in the Northeast (46.4% of internal hires and 52.1% of external hires). Internal hires were more likely to practice in comparatively smaller departments (78 vs. 121 faculty, $p=0.002$), have graduated residency more recently (20 vs. 23, $p<0.001$), and were more likely to have obtained advanced degrees in addition to a medical doctorate, including a PhD or a non-PhD advanced degree (19.4 vs. 13.4%, $p=0.015$). Internal hires were also more likely to have obtained NIH funding (18.9 vs. 12.6%, $p=0.002$), had a greater median number of publications (7 vs. 3, $p<0.001$), and were more frequently trained in a subspecialty of ophthalmology (84.7 vs. 76.3%, $p<0.001$). In an analysis of only recent graduates, there were no significant differences

between internal hires and external hires (► **Supplementary Table S1**).

Retention by Institution

A median percentage of 53.8% of faculty across all 13 institutions were internal hires. Bascom Palmer had the highest percentage of internal hires at 73.0%, while the Cole Eye Institute had the lowest percentage of internal hires at 20.3% (► **Table 2**). The median proportion of faculty who had completed a residency at their current institution (internal residency training) was 28.6% (range: 11.9 to 40.0%). The median proportion of faculty with internal fellowship training was 38.9% (range: 11.6 to 63.9%). Among faculty who had completed external residency training, a median of 27.7% (range: 7.5 to 45.8%) completed their residency and a median of 56.0% (range: 24.6 to 69.2%) completed their fellowship at one of the other top 13 programs.

Multivariable Regression

Multivariable logistic regression evaluating the risk of being an internal hire was performed and adjusted for gender, medical school region, years since residency graduation, advanced degrees, current institution size, current city size, NIH funding, and number of publications (► **Table 3**). A total of 1,210 faculty had complete information and were included in the multivariable analysis. Faculty currently practicing in the Midwest or West were less likely to be internal hires than faculty currently practicing in the Northeast (reference: Northeast; adjusted OR, 0.29; 95% CI, 0.18–0.48; and adjusted OR, 0.49; 95% CI, 0.30–0.78, respectively). Years since completion of residency were a significant predictor of internal hiring, with a greater number of years since graduation being associated with a lower likelihood of internal hiring (adjusted OR, 0.98; 95% CI, 0.97–0.99). Faculty practicing in larger departments were also less likely to be internal hires (adjusted OR, 1.00; 95% CI, 0.99–1.00). Further, faculty with NIH funding other than an R01 grant were more likely to be internal hires (reference: no funding, adjusted OR, 1.83; 95% CI, 1.12–2.96).

Impact of Leadership Roles on Internal Hiring

Of the 589 internal hires across all 13 institutions, 166 (29.1%) had a leadership position, whereas 137 (22.7%) of external hires had a leadership position ($p=0.012$, ► **Table 4**). Subdividing into leadership roles including chair or chief, fellowship director, or residency director did not yield significant differences between internal and external hires.

Discussion

Our study found that, among the top 13 institutions in ophthalmology, the location of residency or fellowship training in ophthalmology is key to the future location of practice. Indeed, among the 1,246 clinical ophthalmology faculty included in our cohort, 47.3% were internal hires from residency or fellowship. Several factors modulated internal hiring, including department size, subspecialty training, and number of publications. Further, the number of years since

Table 1 Demographic information of clinical ophthalmology faculty at 13 top-ranked institutions

Factor	Level	External hires	Internal hires	p-Value
N		657	589	
Gender	Male	424 (64.6%)	366 (62.1%)	0.36
	Female	232 (35.4%)	223 (37.9%)	
Current institution region	Northeast	332 (50.7%)	287 (48.7%)	<0.001
	South	83 (12.7%)	131 (22.2%)	
	Midwest	102 (15.6%)	60 (10.2%)	
	West	138 (21.1%)	111 (18.8%)	
Medical school region	Northeast	337 (52.1%)	273 (46.4%)	0.052
	South	98 (15.1%)	114 (19.4%)	
	Midwest	97 (15.0%)	82 (13.9%)	
	West	47 (7.3%)	62 (10.5%)	
	Outside United States	68 (10.5%)	57 (9.7%)	
Year since residency graduation in 2021, mean (SD)		23 (13)	20 (13)	<0.001
Advanced degrees	No other advanced degree	569 (86.6%)	475 (80.6%)	0.015
	PhD	39 (5.9%)	55 (9.3%)	
	Non-PhD advanced degrees	49 (7.5%)	59 (10.0%)	
No specialization	No	501 (76.3%)	499 (84.7%)	<0.001
	Yes	156 (23.7%)	90 (15.3%)	
Anterior segment/cornea/refractive surgery	No	537 (81.7%)	465 (78.9%)	0.22
	Yes	120 (18.3%)	124 (21.1%)	
Glaucoma	No	582 (88.6%)	484 (82.2%)	0.002
	Yes	75 (11.4%)	105 (17.8%)	
Oculoplastics	No	614 (93.5%)	541 (91.9%)	0.33
	Yes	43 (6.5%)	48 (8.1%)	
Medical retina	No	618 (94.1%)	543 (92.2%)	0.22
	Yes	39 (5.9%)	46 (7.8%)	
Vitreoretinal surgery	No	569 (86.6%)	508 (86.2%)	0.87
	Yes	88 (13.4%)	81 (13.8%)	
Neuroophthalmology	No	620 (94.4%)	561 (95.2%)	0.52
	Yes	37 (5.6%)	28 (4.8%)	
Pediatric ophthalmology	No	604 (91.9%)	533 (90.5%)	0.42
	Yes	53 (8.1%)	56 (9.5%)	
Ophthalmic oncology	No	646 (98.3%)	579 (98.3%)	1.00
	Yes	11 (1.7%)	10 (1.7%)	
Ocular immunology/uveitis	No	639 (97.3%)	568 (96.4%)	0.42
	Yes	18 (2.7%)	21 (3.6%)	
Ophthalmic pathology	No	648 (98.6%)	580 (98.5%)	0.82
	Yes	9 (1.4%)	9 (1.5%)	
Other specialization	No	651 (99.1%)	581 (98.6%)	0.59
	Yes	6 (0.9%)	8 (1.4%)	
Current department size, median (IQR)		121 (63, 360)	78 (63, 185)	0.005

(Continued)

Table 1 (Continued)

Factor	Level	External hires	Internal hires	p-Value
<i>N</i>		657	589	
City size (thousands), median (IQR)		1584 (381, 8337)	882 (468, 3980)	0.23
NIH funding	No	568 (87.4%)	477 (81.1%)	0.002
	Yes	82 (12.6%)	111 (18.9%)	
Past NIH funding	No	6 (7.3%)	7 (6.3%)	0.78
	Yes	76 (92.7%)	104 (93.7%)	
Past R01 funding	No	33 (43.4%)	61 (58.7%)	0.043
	Yes	43 (56.6%)	43 (41.3%)	
Active NIH funding	No	45 (54.9%)	54 (48.6%)	0.39
	Yes	37 (45.1%)	57 (51.4%)	
Active R01 funding	No	13 (35%)	27 (47%)	0.24
	Yes	24 (65%)	30 (53%)	
Publications, median (IQR)		3 (0, 16)	7 (1, 24)	<0.001

Abbreviations: IQR, interquartile range; NIH, National Institutes of Health; R01, Research Project Grant; SD, standard deviation.

Note: Statistical significance indicated in bold.

residency graduation was a significant predictor of internal hiring, although our study likely was not powered enough to detect significant differences in hiring practices among recent graduates. Interestingly, even for those faculty who were not internal hires from residency or fellowship, a sizeable proportion trained at one of the other top 13 institutions for residency (27.7%) or fellowship (56.0%). Together, our results underscore the strong influence of training institutions on the future location of practice within ophthalmology along with the key role of interinstitutional networks formed by trainees at top programs. Notably, we found that the location of fellowship training had a greater effect than the location of residency training. Applicants to fellowship programs may want to closely consider their desired location of future practice.

Our study found several differences when compared to similar studies both within and outside of ophthalmology. For example, others have reported that gender influences internal hiring, with women being more likely to remain in their geographic area of training.¹ However, our study found no difference between the proportion of women who were internal hires and those who were not. Of note, we did find a greater proportion of male faculty relative to female faculty, a disparity that has been previously documented in the field of ophthalmology.^{5,10} Prior studies have found that gender modulates both intent to pursue subspecialty training and pursuit of specific subspecialties within ophthalmology; however, such an analysis was not within the scope of our present study.^{11,12} In addition, a previous study examining retention within plastic surgery demonstrated that recent graduates may be less likely to be internal hires compared to faculty who did not graduate as recently.³ In our study, we found that, on the contrary, fewer years since completion of residency was a significant predictor of internal hiring. We hypothesize that this may be due to the desire to remain in

each location for a given amount of time as well as the ties that are created to a particular institution being strongest immediately after training.

We also report on several novel findings. Our study found that internal hires were more frequently on faculty at institutions with comparatively smaller department sizes. While the programs we studied are generally larger than most other ophthalmology programs in the United States, the correlation between size and internal hiring may be attributable to stronger faculty connections in smaller departments and potential variations in mentorship and research approaches across departments. Future studies will be needed to determine whether this trend is seen across a wider range of institution sizes. Faculty–trainee connections may also play a role in the greater percentage of internal hires with leadership positions.

Our study has several limitations. First, publicly available online data may not be the most accurate or up-to-date information, and some pertinent information such as training institution may not be listed online, leading to the exclusion of some faculty from multivariable analyses. Because we did not contact faculty as part of this study, we were unable to report on associations between self-identified race and retention. Further studies will need to be conducted to determine the extent to which race may impact internal hiring, as this would be important to the critical need of increasing the diversity of the ophthalmology workforce. Moreover, the use of only publicly available online data limits the types of collectable data; personal information such as marital status, parenthood status, familial ties, where individuals were raised, duration of hire, and research interests, while certainly important to individual retention, is impossible to collect using our methodology. These factors will be important to analyze in future studies. Given our methodology, we are also

Table 2 Internal residency and fellowship training among current ophthalmology faculty, separated by current institution

	Bascom Palmer	Wills	Wilmer	Mass. Eye and Ear	UCLA	Iowa	Duke	Michigan	UCSF	Cole Eye Institute	Mount Sinai	USC	Utah
<i>N</i>	74	185	78	76	61	39	61	63	37	59	360	32	121
Total internal hires	54 (73%)	100 (54%)	42 (54%)	47 (62%)	38 (62%)	20 (51%)	34 (56%)	29 (46%)	21 (57%)	12 (20%)	140 (39%)	13 (41%)	39 (32%)
Retention from residency													
External residency training	55 (74%)	111 (60%)	53 (68%)	48 (63%)	45 (74%)	25 (66%)	47 (77%)	45 (71%)	24 (65%)	52 (88%)	254 (71%)	26 (84%)	82 (78%)
External at top 13 institutions	15 (27%)	21 (19%)	12 (23%)	16 (33%)	10 (22%)	8 (32%)	13 (28%)	16 (36%)	11 (46%)	12 (23%)	19 (8%)	10 (39%)	27 (33%)
Internal residency training	19 (26%)	74 (40%)	25 (32%)	28 (37%)	16 (26%)	13 (34%)	14 (23%)	18 (29%)	13 (35%)	7 (11.9%)	102 (29%)	5 (16%)	23 (22%)
Retention from fellowship													
External fellowship training	26 (36%)	65 (56%)	43 (61%)	31 (44%)	29 (50%)	23 (64%)	29 (51%)	33 (61%)	25 (69%)	38 (88%)	199 (77%)	19 (66%)	41 (65%)
External at top 13 institutions	18 (69%)	26 (40%)	27 (63%)	20 (65%)	16 (55%)	14 (61%)	16 (55%)	19 (58%)	14 (56%)	21 (55%)	49 (25%)	11 (58%)	15 (37%)
Internal fellowship training	46 (64%)	51 (44%)	28 (39%)	40 (56%)	29 (50%)	13 (36%)	28 (49%)	21 (39%)	11 (31%)	5 (12%)	59 (23%)	10 (35%)	22 (35%)

Table 3 Multivariable logistic regression for internal hiring of ophthalmology faculty

	Odds ratio	95% CI	p-Value
Gender			
Female vs. male	0.97	0.76–1.25	0.836
Current institution region			
Northeast	Reference		
South	0.80	0.51–1.25	0.331
Midwest	0.29	0.18–0.48	<0.001
West	0.49	0.31–0.78	0.003
Years since completion of residency	0.98	0.97–0.99	<0.001
Advanced degrees			
No advanced degree	Reference		
PhD	1.32	0.78–2.22	0.298
Non-PhD advanced degrees	1.05	0.67–1.62	0.84
Current department size	1.00	0.99–1.00	0.018
City size (thousands)	1.00	1.00–1.00	0.575
NIH funding			
No	Reference		
Yes, no R01	1.82	1.12–2.96	0.015
Yes, R01	0.90	0.53–1.53	0.706
Publications	1.00	1.00–1.01	0.112

Abbreviations: CI, confidence interval; NIH, National Institutes of Health; R01, Research Project Grant (R01).

Table 4 Retention of ophthalmology faculty by leadership roles

Factor	Level	External hires	Internal hires	p-Value
N		657	589	
Overall leadership	No	467 (77.3%)	405 (70.9%)	0.012
	Yes	137 (22.7%)	166 (29.1%)	
Chair or chief	No	605 (92.1%)	529 (89.8%)	0.16
	Yes	52 (7.9%)	60 (10.2%)	
Fellowship director	No	614 (93.5%)	534 (90.7%)	0.067
	Yes	43 (6.5%)	55 (9.3%)	
Residency director	No	652 (99.2%)	580 (98.5%)	0.20
	Yes	5 (0.8%)	9 (1.5%)	

unable to discern whether trends in internal retention are driven primarily by trainee preference or by institutional selection (e.g., some programs may preferentially accept trainees that are most likely to remain on faculty). Future studies are warranted to further assess this relationship. In addition, limiting our analysis to the top 13 institutions may lead to results that are not generalizable across all academic ophthalmology programs. Indeed, our geographical data are difficult to generalize given that institutions included in our analysis were predetermined by rankings and that many top-ranked ophthalmology programs are generally large programs and, for the most part, located in the Northeast.

Even the comparatively smaller institutions in our study are larger than most ophthalmology programs; results regarding program size may thus not be generalizable across other institutions. The study's cross-sectional nature also limits interpretation given that it does not account for movement from institution to institution over the course of a career and does not allow for determination of length of employment at a given institution.

Future directions for our work include performing longitudinal studies to capture internal hiring trends throughout a career in ophthalmology. Additionally, expanding our dataset to include more institutions would generate results

that are applicable to all ophthalmology trainees, whether or not their goal is to practice at a large academic center. Finally, additional studies may help characterize internal hiring rates across a broader range of specialties.

Conclusions

These findings have several implications for current and future trainees in the field of ophthalmology and, more broadly, for trainees across medical fields. Trainees should be aware that their choice of training institution for residency or fellowship may have a strong impact on where they practice in the future. Accordingly, trainees may want to consider their longer-term goals when selecting a training program.

Prior Abstracts/Poster Presentations

This material was previously presented in poster form at the Association of University Professors of Ophthalmology Annual Meeting in January 2022, the Johns Hopkins Institute for Excellence in Education Conference in March 2022, and the Women in Ophthalmology Summer Symposium in August 2022.

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Conflict of Interest

Dr. Sridhar is a consultant for Alcon, Apellis, Allergan, Dorc, Genentech, Regeneron, and Ocuteira.

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