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Self-Reported Perceptions of Preparedness among Incoming Ophthalmology Residents

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Abstract

Purpose The purpose of this study was to assess the self-perceived preparedness of incoming postgraduate year 1 (PGY1) and postgraduate year 2 (PGY2) ophthalmology interns/residents to carry out core competencies in ophthalmology.

Methods An online survey was created using the Survey Monkey survey platform and distributed to all ophthalmology resident applicants to the Bascom Palmer Eye Institute from the 2021 to 2022 and 2022 to 2023 application cycles. The survey contained questions pertaining to demographics, prior ophthalmic experience, online resources that were used to prepare for ophthalmology, and self-perceived preparedness to carry out key clinical skills in ophthalmology.

Results A total of 170 responses were obtained (16.1% response rate). Of those, 119 (70%) were incoming PGY1 interns and 51 (30%) were incoming PGY2 residents for the 2022 to 2023 academic year. Most respondents (90.6%, $n = 154$) reported that their ophthalmology residency was affiliated with an integrated ophthalmology intern year. Incoming PGY2s moderately agreed with the statement that they felt as prepared to see patients in ophthalmology as they do in other surgical subspecialties, whereas incoming PGY1s only mildly agreed with that statement ($p = 0.003$). Both incoming PGY1s and PGY2s felt most prepared to obtain histories relating to basic ophthalmic complaints and felt least prepared to read and interpret ophthalmic imaging studies. The most popular online resources used by respondents in order of popularity were EyeGuru (35.2%, $n = 60$), EyeWiki (32.9%, $n = 56$), Tim Root/OphthoBook (26.5%, $n = 45$), American Academy of Ophthalmology (13.5%, $n = 23$), and EyeRounds/University of Iowa (13.5%, $n = 23$).

Conclusion A major challenge in integrating ophthalmic education into the medical school curricula is the gradual shift toward shorter preclinical curricula. However, having a core foundation of ophthalmic knowledge is critical for incoming ophthalmology residents to be able to maximize their specialty-specific training. Integrated ophthalmology intern years likely play a significant role in the increased self-efficacy

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of incoming PGY2s compared with incoming PGY1s. Adopting nontraditional teaching methods like flipped classroom learning, utilizing online medical education resources, and continuing to increase ophthalmology exposure during PGY1 year may better prepare incoming PGY2s to operate independently in ophthalmology settings.

Since the Flexner report recommended standardization of medical education in the United States in the 1900s, medical schools have traditionally been 4-year long programs during which students develop the core competencies required to become a physician.[1,2] During these 4 years, students must learn how to effectively take histories, perform the physical exam, formulate plans of care, interpret laboratories and imaging, and communicate effectively with patients and other providers. While this system prepares students to practice general medicine, students often receive limited exposure to subspecialties such as ophthalmology.[3] As medical schools transition to 3-year curricula, this will likely further limit the amount of subspecialty exposure.[4] This is particularly challenging in ophthalmology which leverages unique exam skills and imaging modalities that are not commonly used in other medical subspecialties. While residency preparation courses during the fourth year of medical school may help medical students make the transition to graduate medical education, most of these are designed for general medicine or surgery rather than surgical subspecialties.[5,6] For these reasons, graduating medical students often do not have the key skills necessary to evaluate and treat ophthalmic patients.

In 2016, the Association of University Professors of Ophthalmology proposed integrating ophthalmology rotations into the first postgraduate year (PGY1) of training. The goal was to make more efficient use of the 4 years of residency training by shifting some of the ophthalmic training to the PGY1 year. This would allow time at the end of residency to be applied toward more advanced training. In addition, this would better prepare residents to begin the specialty-specific second postgraduate year (PGY2) of training. This proposal was adopted by the Accreditation Council for Graduate Medical Education (ACGME) for implementation by July 1, 2021. As of July 1, 2023, all ophthalmology programs were required to have an integrated intern year that includes at least 3 months of ophthalmology rotations to avoid receiving a citation.[7]

The implementation of an integrated intern year with required ophthalmology exposure is a big boon for ophthalmic education and has been noted anecdotally to have significantly improved preparedness of incoming PGY2 residents when starting full-time ophthalmology-specific training. The purpose of this study was to evaluate self-perceived preparedness of incoming PGY1 and PGY2 residents to carry out core competencies in ophthalmology.

Methods

The research adhered to the tenets of the Declaration of Helsinki. Institutional Review Board (IRB) approval was obtained from the IRB at the University of Miami School of Medicine. An online survey was created using the Survey Monkey (SVMK Inc; San Mateo, CA) survey platform (►**Supplementary File S1**, available in the online version). The survey contained questions collecting demographic information including incoming training level for the next academic year, geographic regions of training, and the amount of ophthalmology didactics accrued during medical school and PGY1 year. Respondents were asked to rate a series of statements on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither agree/disagree, 4 = agree, 5 = strongly agree). They were asked whether they felt like they had an adequate amount of exposure to ophthalmology relative to their training level as well as asked to assess their self-perceived preparedness. These preparedness questions pertained to: (1) basic history taking, knowledge, and management; (2) exam skills; and (3) imaging interpretation. To assess the self-directed learning, users were asked which, if any, online ophthalmology education resources they used.

The survey was sent to all ophthalmology resident applicants who applied to the Bascom Palmer Eye Institute during the 2021 to 2022 (incoming PGY2 residents at the time of survey) and 2022 to 2023 (incoming PGY1 residents at the time of survey) application cycles. Participation was voluntary, no compensation was provided, and informed consent was obtained from every respondent. The survey was open between June 6, 2022, and July 10, 2022. For the purposes of this survey, an "integrated" intern year refers to a PGY1 year of training that is intended to have at least 3 months of ophthalmology training. Statistical analysis was performed using SPSS v28.0.0.0 (IBM, Armonk, NY) and $p < 0.05$ was considered statistically significant. Pearson's correlation coefficients were calculated to evaluate if prior ophthalmology-related experiences or online resources that respondents used had any correlation to self-perceived preparedness.

Results

Survey responses were obtained from 170 respondents (16.1% response rate). A total of 119 (70%) were incoming PGY1s and 51 (30%) were incoming PGY2s for the 2022 to 2023 academic year. The demographics of the respondents are detailed in ►**Table 1**. All respondents (100%) were matched to a United States ophthalmology program and most (90.6%, $n = 154$) were associated with an integrated intern year. Medical schools attended by respondents were fairly equally distributed between Northeast (23.5%, $n = 40$), Midwest (25.3%, $n = 43$), and South Atlantic (24.7%, $n = 42$) regions as defined in the survey (Supplementary File S1,

Table 1 Demographics and ophthalmology experiences of respondents

Year in training	PGY1	119 (70.0%)
	PGY2	51 (30.0%)
Matched to U.S. ophthalmology residency		170 (100%)
Region of medical school	Midwest	43 (25.3%)
	Northeast	40 (23.5%)
	South Atlantic	42 (24.7%))
	South Central	25 (14.7%)
	Pacific	14 (8.2%)
	Mountain	6 (3.5%)
Region of intern year	Midwest	44 (25.9%)
	Northeast	40 (23.5%)
	South Atlantic	39 (22.9%)
	South Central	27 (15.9%)
	Pacific	17 (10.0%)
	Mountain	3 (1.8%)
Have participated/will participate in an integrated intern year		154 (90.6%)
Hours of formal ophthalmology lectures or didactics during medical school		6–10 h (median)
Weeks of ophthalmology rotations during medical school		9.8 wk (mean)
Ophthalmic surgeries scrubbed for in medical school		6–10 cases (median)
Hours of formal ophthalmology lectures or didactics during PGY1		21–30 h (median)
Weeks of ophthalmology rotations during PGY1		10.65 wk (mean)
Ophthalmic surgeries scrubbed for in PGY1		1–5 cases (median)
Experience as an ophthalmic/optometric technician		22 (12.9%)
Experience in clinical rotations		138 (81.1%)
Experience shadowing		138 (81.1%)
Experience in research		152 (89.4%)
Months of technician experience		0 mo (median)
Days of shadowing experience (in clinic)		6–10 d (median)
Days of shadowing experience (in operating room, unscrubbed)		6–10 d (median)
Months of research experience		14.6 mo (mean)

Abbreviations: PGY1, postgraduate year 1 of training; PGY2, postgraduate year 2 of training.

available in the online version). A minority attended medical school in South Central (14.7%, $n = 25$), Pacific (8.2%, $n = 14$), and Mountain (3.5%, $n = 6$) regions. Of the respondents participating in an integrated intern year, most (83.1%, $n = 128$) were in the same region as their medical school.

In terms of general exposure to ophthalmology prior to PGY1 year, the majority of respondents reported experience in clinical rotations (99.4%, $n = 169$), research (89.4%, $n = 152$), or other shadowing outside of rotations (81.2%, $n = 138$) during medical school. A minority (12.9%, $n = 22$) had prior experience as an ophthalmic/optometric technician. Respondents participated in an average of 9.8 weeks (standard deviation 4.7 weeks) of clinical ophthalmology rotations. Respondents with research experience participated in research for an average of 14.6 months (standard deviation 17.8 months) of either part-time or full-time research. Respondents with other shadowing experiences in ophthalmology clinic did so for a median of 6 to 10 days. There was a bimodal distribution of surgical ophthalmic exposure during medical school. Most respondents reported they scrubbed in on either 1 to 10 surgeries (50%, $n = 85$) or > 21 surgeries (26.5%, $n = 45$). In terms of formal ophthalmology education during medical school, 28.2% ($n = 48$) reported having 11 or more hours of lectures or didactics, 24.1% ($n = 41$) reported having 6 to 10 hours, and the remaining (47.7%, $n = 81$) reported having 5 or fewer hours.

In the free response question asking users which online resources they used, the five most endorsed resources were EyeGuru (35.2%, $n = 60$), EyeWiki (32.9%, $n = 56$), Tim Root/OphthoBook (26.5%, $n = 45$), American Academy of Ophthalmology (13.5%, $n = 23$), and EyeRounds/University of Iowa (13.5%, $n = 23$). Use of EyeGuru was more positively

Table 2 Correlation between likelihood of agreeing to preparedness statements and the most commonly used online resources cited by users in a free response question

	EyeGuru (60 responses)	EyeWiki (56 responses)	OphthoBook (45 responses)	AAO (23 responses)	EyeRounds (23 responses)
I feel as prepared to see patients with supervision in ophthalmology as I do in other surgical subspecialties	0.076	−0.055	0.154[a]	0.145	0.074
I feel prepared to describe fundamental eye anatomy	0.300[b]	0.041	0.033	0.102	0.207[b]
I feel prepared to obtain a basic history with respect to common ophthalmic complaints	0.114	0.009	0.081	0.063	0.083
I feel prepared to generate a differential diagnosis based on history, exam, and imaging findings	0.127	−0.102	0.031	0.096	0.045
I feel prepared to explain the major indications for the most common ophthalmic surgeries	0.069	−0.007	0.085	0.196[a]	0.095
I feel prepared to manage the most common ophthalmic emergencies seen during emergency room consults	0.044	−0.004	0.003	0.176[a]	−0.045
I feel prepared to identify common ophthalmic exam findings	0.267[b]	−0.032	0.123	0.139	0.092
I feel prepared to conduct an external slit lamp exam	0.248[b]	−0.024	0.079	0.098	0.062
I feel prepared to conduct a funduscopic slit lamp exam with a 90D lens	0.226[b]	0.072	0.029	0.136	0.077
I feel prepared to conduct a dilated retinal exam with an indirect ophthalmoscope	0.303[b]	0.019	0.031	0.212[b]	0.066
I feel prepared to read and interpret OCT imaging results	0.217[b]	0.051	0.010	0.146	0.001
I feel prepared to read and interpret visual field tests	0.140	0.025	0.078	0.082	0.067
I feel prepared to read and interpret fluorescein angiography studies	0.061	−0.038	0.084	0.143	−0.054
I feel prepared to read and interpret ocular ultrasound images	0.159[a]	0.024	0.017	0.105	0.052
I feel prepared to read and interpret corneal topography photos	−0.002	0.022	0.055	0.137	−0.083

Abbreviations: AAO, American Academy of Ophthalmology; OCT, optical coherence tomography.
Note: Values shown are Pearson's correlation coefficients.
[a]Correlation is significant at the $p < 0.05$ level.
[b]Correlation is significant at the $p < 0.01$ level.

correlated with increases in self-efficacy than any other resource that was cited. Out of the 15 preparedness questions in the survey, 7 of the 15 reached statistically significant positive correlations with reported use of EyeGuru (►**Table 2**). In contrast, the four other most cited online resources reached statistically significant positive correlations with preparedness in three or fewer questions each.

Incoming PGY2s were also asked about their exposure to ophthalmology during their PGY1 year. The median range of hours of formal ophthalmology lectures or didactics reported during PGY1 year was 21 to 30 hours. The respondents reported participating in an average of 10.6 weeks (standard deviation 3.8 weeks) of ophthalmology rotations during their PGY1 year. The majority reported scrubbing for 1 to 10 surgeries (56.9%, $n = 29$), although a sizeable portion did not scrub for any surgeries (23.5%, $n = 12$).

When asked if they were as prepared to see patients with supervision in ophthalmology as they did in other surgical subspecialties, PGY1s and PGY2s responded with an average of 3.395 (95% confidence interval [CI] of 3.177–3.613) and

Table 3 Mean responses to preparedness questions from incoming postgraduate year 1 and postgraduate year 2 trainees

	Incoming PGY1 mean responses	Incoming PGY2 mean responses	*p*-Value
I feel as prepared to see patients with supervision in ophthalmology as I do in other surgical subspecialties	3.395	3.941	0.003
I feel prepared to describe fundamental eye anatomy	3.731	4.078	0.014
I feel prepared to obtain a basic history with respect to common ophthalmic complaints	3.849	4.196	0.005
I feel prepared to generate a differential diagnosis based on history, exam, and imaging findings	2.966	3.275	0.035
I feel prepared to explain the major indications for the most common ophthalmic surgeries	3.151	3.275	0.237
I feel prepared to manage the most common ophthalmic emergencies seen during emergency room consults	2.378	2.804	0.006
I feel prepared to identify common ophthalmic exam findings	3.193	3.725	0.002
I feel prepared to conduct an external slit lamp exam	3.613	4.118	< 0.001
I feel prepared to conduct a funduscopic slit lamp exam with a 90D lens	2.849	3.608	< 0.001
I feel prepared to conduct a dilated retinal exam with an indirect ophthalmoscope	2.462	3.314	< 0.001
I feel prepared to read and interpret OCT imaging results	2.538	3.196	< 0.001
I feel prepared to read and interpret visual field tests	2.697	3.216	0.003
I feel prepared to read and interpret fluorescein angiography studies	2.092	2.078	0.466
I feel prepared to read and interpret ocular ultrasound images	2.176	2.608	0.004
I feel prepared to read and interpret corneal topography photos	1.916	1.980	0.348

Abbreviations: OCT, optical coherence tomography; PGY1, postgraduate year 1 of training; PGY2, postgraduate year 2 of training.
Note: Responses graded on a 5-point Likert scale where 1 = strongly disagree, 2 = disagree, 3 = neither agree/disagree, 4 = agree, and 5 = strongly agree. *p*-Values were calculated with a two-tailed *t*-test.

3.941 (95% CI 3.629–4.253) on a 5-point Likert scale, respectively, indicating mild to moderate agreement with that statement (►**Table 3**). Out of all the preparedness questions asked, both incoming PGY1s and PGY2s felt most prepared to obtain basic histories with respect to common ophthalmic complaints (averages of 3.85 and 4.20, respectively). In all but one question, incoming PGY2 residents felt more prepared than incoming PGY1 interns, and 12 of the 15 preparedness questions reached statistically significant increases in self-perceived preparedness from PGY1 to PGY2 year. The three questions that did not reach statistically significant increases after the PGY1 year pertained to reading and interpreting fluorescein angiography and corneal topography studies as well as explaining the major indications for the most common ophthalmic surgeries.

Within the cohort of incoming PGY2s, hours of formal lectures during PGY1 year had the greatest statistically significant positive correlation with overall self-perceived preparedness to see patients with supervision (Pearson's coefficient 0.373, $p = 0.007$) (►**Table 4**). The number of weeks of ophthalmology rotation was also mildly positively correlated (Pearson's coefficient 0.271, $p = 0.055$), although did not reach statistical significance. Of note, there was minimal correlation with the number of hours of lectures or weeks of ophthalmology rotations during medical school (Pearson's coefficients 0.09 and 0.06, respectively).

Discussion

While incoming ophthalmology residents certainly are not expected to be proficient in executing a full ophthalmic encounter at the start of the year, a foundation of fundamental skills and knowledge is necessary to examine patients and learn effectively with the help of supervising physicians. A lack of understanding of basic eye anatomy, terminology, and exam skills limits the ability for supervising physicians to teach more advanced content. Overall, incoming PGY2 residents felt more prepared than incoming PGY1 interns with their ophthalmic knowledge and skills. Out of all of the preparedness questions, respondents felt most prepared to obtain basic histories pertaining to common ophthalmic complaints. This is not surprising as history taking is a key skill that is taught in medical school and translatable across multiple disciplines. In contrast, respondents felt least prepared to read and interpret ophthalmic imaging. This is likely due to the unique nature of these imaging modalities to ophthalmology. Therefore, there is limited exposure during not only medical school, but also during the PGY1 year—especially for more advanced imaging like fluorescein angiography and corneal topography. This represents an opportunity to integrate additional targeted teaching such as imaging-based didactics during the PGY1 year to better prepare residents for PGY2 year.

Table 4 Correlation between likelihood of agreeing with preparedness statements and hours of formal lectures/weeks of ophthalmology rotations in medical school and first postgraduate year of training

	Hours of formal lectures during...		Weeks of ophthalmology rotations during...	
	Medical school	PGY1	Medical school	PGY1
I feel as prepared to see patients with supervision in ophthalmology as I do in other surgical subspecialties	0.094	0.373[b]	0.055	0.271
I feel prepared to describe fundamental eye anatomy	0.119	0.231	0.166[a]	0.413[b]
I feel prepared to obtain a basic history with respect to common ophthalmic complaints	−0.003	0.244	0.003	0.236
I feel prepared to generate a differential diagnosis based on history, exam, and imaging findings	0.081	0.213	0.112	0.185
I feel prepared to explain the major indications for the most common ophthalmic surgeries	−0.015	0.172	0.109	0.161
I feel prepared to manage the most common ophthalmic emergencies seen during emergency room consults	−0.009	0.294[a]	0.118	0.307[a]
I feel prepared to identify common ophthalmic exam findings	0.049	0.200	0.133	0.341[a]
I feel prepared to conduct an external slit lamp exam	0.004	0.240	0.103	0.371[b]
I feel prepared to conduct a funduscopic slit lamp exam with a 90D lens	−0.018	0.247	0.113	0.184
I feel prepared to conduct a dilated retinal exam with an indirect ophthalmoscope	−0.063	0.371[b]	0.131	0.315[a]
I feel prepared to read and interpret OCT imaging results	−0.078	0.249	0.060	0.313[a]
I feel prepared to read and interpret visual field tests	−0.011	0.285[a]	0.052	0.281[a]
I feel prepared to read and interpret fluorescein angiography studies	−0.110	0.018	0.094	−0.024
I feel prepared to read and interpret ocular ultrasound images	−0.034	0.182	0.048	−0.025
I feel prepared to read and interpret corneal topography photos	−0.097	−0.020	0.056	−0.027

Abbreviations: OCT, optical coherence tomography; PGY1, postgraduate year 1 of training.
Note: Values shown are Pearson's correlation coefficients.
[a]Correlation is significant at the $p < 0.05$ level.
[b]Correlation is significant at the $p < 0.01$ level.

It is likely that the integrated ophthalmology intern year plays a big role in the increase in self-perceived preparedness ratings from PGY1 to PGY2 years. Before the implementation of integrated intern years, most PGY1 interns received limited exposure to ophthalmology prior to starting their specialty-specific training. Within the integrated intern year, PGY1s are exposed to both additional formal ophthalmology didactics as well as clinical rotations which allow for experiential learning. The positive correlations with PGY1 lectures and rotations with increases in self-perceived preparedness scores support the utility of these integrated intern years.

Although medical school ophthalmology education was not significantly correlated with self-assessed preparedness, this does not mean that ophthalmology should be cut from medical school curricula due to a lack of efficacy. Rather, this effect is more likely to be due to the inadequate amount of ophthalmology present in existing curricula.[3] This is especially relevant for those medical students who choose not to specialize in ophthalmology. While students pursuing a career in ophthalmology can build their foundational ophthalmic knowledge during PGY1 years, non-ophthalmologists do not have that opportunity. All medical students benefit from a basic ophthalmic education to triage eye complaints and referrals appropriately in their future practices.

One of the challenges of integrating subspecialty education in medical school is the limited number of hours that are available due to the gradual shortening of medical school curricula from 4 years to 3 years combined with the ever-increasing volume of medical knowledge that students are expected to know.[4,8] Finding more efficient ways to teach the same amount of material in a shorter amount of time would help educators maintain subspecialty education while respecting time constraints. Flipped classroom teaching may be one possible solution. In traditional didactics, students attend in person lectures with assigned homework to complete afterwards. However, in the flipped classroom model, students are assigned to watch prerecorded lectures or other content beforehand, then meet to discuss and work on problems/cases in person.[9] When a flipped classroom style ophthalmology curriculum was implemented for second year medical students at the University of Miami, the previous 13-hour traditional curriculum was condensed into 8 hours of time. This 38% decrease in overall course time

ultimately had no effect on final exam scores.[10] Furthermore, most students reported preferring the flipped classroom style to traditional didactics. The ability to convey the same amount of information in a smaller amount of overall time makes the flipped classroom modality of teaching an enticing way to effectively squeeze in basic ophthalmic education into shrinking medical school curricula.

In addition to nontraditional teaching methods like flipped classroom learning, educators also need to be thinking critically about which content to teach. Medical knowledge has been expanding at an exponential rate, and with it comes the need to decide which material is critical for forming the core content that every provider must know.[8] This is relevant for general medicine as well as for medical subspecialties. Developing and teaching a core curriculum at a single institution relies on subject matter experts to create the content. Unfortunately, many medical students interested in ophthalmology are from medical schools without associated ophthalmology programs and therefore lack academic ophthalmologists who are interested in teaching.[11] These gaps exist not only in United States ophthalmology education but in other medical fields on a global scale.[12,13] Online educational resources may be able to help fill this gap.

In this survey, use of online resources was significantly positively correlated with self-reported preparedness in multiple domains. One of the reasons why online resources may be especially beneficial in education is by offering a more diverse set of learning modalities and allowing for more flexibility to accommodate different adult learning styles compared with the traditional lecture formats.[14] Additionally, online resources that allow for self-directed learning also allows users to break up their learning into smaller working units, which is often referred to as "microlearning."[15] Other nontraditional teaching formats such as "bite-sized" learning that break up traditional hour-long lectures into smaller, shorter, didactics have also demonstrated promise in driving increased learner engagement.[16–18] Finally, online resources also provide learners easy access to references and information within clinic as they are seeing patients. In this manner, they allow for point-of-care learning that is unable to be delivered through traditional didactics.[19] As the breadth of content increases and the needs of physicians and patients change, so too should teaching styles change to adapt to these needs.

One major limitation to this study is that the data collected refers only to self-perceived preparedness which may not be correlated to actual performance. As described by Kruger and Dunning in their seminal article in 1999, individuals with the lowest performance often overestimate their abilities while those with the best performance often underestimate their abilities.[20] While this precludes our ability to directly correlate self-efficacy scores in this study with actual ability to carry out clinical tasks, all individuals participating in this survey are in roughly the same stage of training. Therefore, there is likely sufficient validity when performing intragroup comparisons within this sample. Another limitation in this study is the relatively low response rate. This may limit the generalizability of these results or introduce voluntary response bias.

In conclusion, as preclinical medical school curricula shorten with time, subspecialty exposure such as ophthalmology is at the greatest risk of being cut. It is important to critically think about ways to best prepare incoming ophthalmology residents with the unique skills necessary to thrive. Effectively leveraging the integrated PGY1 intern year along with nontraditional teaching methods like flipped classroom learning and online medical education resources may be effective ways help residents gain key ophthalmology knowledge and skills.

Note

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Conflict of Interest

None declared.

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