Depression Among Incoming Ophthalmology Trainees

Karthik Reddy, BS, [*,†] Jaqueline Stoutin, MD, [†] Zhuo Zhao, MS, [‡] Anjali R. Shah, MD, [†] Srijan Sen, MD, PhD, [‡] and Amy D. Zhang, MD [†]

[*]University of Michigan Medical School, Ann Arbor, Michigan; [†]Department of Ophthalmology, Kellogg Eye Center, University of Michigan, Ann Arbor, Michigan; and [‡]Department of Psychiatry, University of Michigan, Ann Arbor, Michigan

OBJECTIVE: Early medical training affects the mental health of residents. New-onset depression during internship persists beyond training and affects attrition, career satisfaction, and physician suicide. This study investigated depression rates among interns entering ophthalmology training and the relationship to work-related factors.

DESIGN: Prospective, multicenter cohort study. Interns were recruited since 2015 and participated in longitudinal assessments before and during their internship. Exposures included time in residency (measured at 3, 6, 9, and 12 months of intern year), work hours, and sleep hours.

SETTING: This study was conducted at several institutional academic tertiary care centers located within the United States.

PARTICIPANTS: A population-based sample of 98 ophthalmology residents from the Intern Health Study (IHS) from July 2015 to June 2023 who reported their status in ophthalmology residency were included in this study.

MAIN OUTCOME MEASURES: Validated measures of depression [Patient Health Questionnaire-9 (PHQ-9)] at preinternship and 3, 6, 9, and 12 months of residency before the start of dedicated ophthalmology training. Outcomes included the proportion of ophthalmology-entering interns with major depression (PHQ-9 score $\geq$ 10), changes in mean PHQ-9 scores, and the relationship between PHQ-9 scores and mean work and sleep hours.

RESULTS: Of the 98 ophthalmology-bound interns (41 [41.8%] with self-reported depression at any timepoint prior to enrollment) included in the study, 3 (3.1%) had major depression on baseline assessment (PHQ-9 $\geq$ 10). 32 (32.7%) experienced major depression during the internship period. Approximately one-quarter of interns experienced depression in the month prior to starting dedicated ophthalmology training (postgraduate year 2, PGY-2).

Preinternship mean PHQ-9 score (2.7 [95% CI, 1.6-3.8]) was significantly less than scores at 3 months (5.9 [95% CI, 4.6-7.2]), 6 months (6.1 [95% CI, 4.6-7.6]), 9 months (5.6 [95% CI, 4.3-6.9]), and 12 months (6.0 [95% CI, 4.4-7.5]). History of depression was not significantly predictive of PHQ-9 scores ($p = 0.66$). Every additional hour of sleep was predictive of a 1.6-point decrease on the PHQ-9 ($p < 0.001$).

CONCLUSIONS: In this prospective multicenter study, there is a rise in depressive symptoms during internship, and these symptoms persist throughout the year. Nearly one-quarter of residents were depressed in the month prior to entering dedicated ophthalmology training (PGY-2). These findings highlight the need to address the mental health of early ophthalmology trainees. (J Surg Ed 83:103834. © 2025 The Authors. Published by Elsevier Inc. on behalf of Association of Program Directors in Surgery. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/))

KEY WORDS: ophthalmology, depression, burnout, resident mental health, ophthalmology training, residency training

INTRODUCTION

The mental health of medical interns has been a growing concern in recent years. Depression may lead to decreased productivity, earlier retirement, absenteeism,

The contents of this manuscript have not been published previously, nor are they under consideration by another publication. An abstract consisting of preliminary analyses was accepted for poster presentation at the 2025 Association of University Professors of Ophthalmology Educating the Educators Meeting (January 29, 2025).

Correspondence: Inquiries to Amy D Zhang, MD, 1000 Wall St, Rm 215 Kellogg Tower, Ann Arbor, MI; e-mail: amydz@med.umich.edu

https://doi.org/10.1016/j.jsurg.2025.103834

and reduced patient satisfaction.[1,2] There is a gap in our understanding of mental health during various phases of ophthalmology training, including standalone internship years and combined internship years.

Most ophthalmology residents in the United States report issues related to depression, burnout, or suicide affecting their residency programs.[3] However, only 26% of ophthalmology residency directors report that their programs have faced similar issues.[3,4] This may underlie why the majority of ophthalmology residencies have not established wellness programs.[3,4] Another factor may be the fragmented training pathway—many ophthalmology residents spend their intern year in medicine or other specialties, which can hinder their integration and sense of belonging within the program.

New-onset depression in early training periods can persist for many years into a medical career.[5] Physician burnout and depression can affect career satisfaction, worsen suicide rates, and increase patient dissatisfaction and physician attrition.[1,2,6,7] Given a looming ophthalmologist shortage,[8] there is a need to characterize the mental health of ophthalmology trainees.

In this study, we aimed to assess scores of the 9-item Patient Health Questionnaire (PHQ-9) across ophthalmology interns. The goal of this study was to quantify the severity of depressive symptoms across internships and their relationship to known factors.[5,9,10] We hypothesized that interns entering ophthalmology would experience increased depressive symptoms during their intern year compared to their baseline, and the severity of symptoms would be associated to work and sleep hours.

METHODS

Study Design

The University of MI Institutional Review Board reviewed this study and approved exempt status. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline. The study adhered to the tenets of the Declaration of Helsinki.

The Intern Health Study (IHS) is a multi-institutional cohort study that has assessed the mental health and associated factors of medical interns in the United States. A subset of the overall cohort, consisting of self-reported ophthalmology interns from 2015 to 2023 across various institutions and internship types (i.e., surgical, medical, or combined), was included. In 2017, the ACGME established requirements for programs to transition to combined intern years, resulting in a gradual increase in the number of combined programs throughout the study period.

Participant Recruitment

Graduating medical students at partner institutions were sent recruitment emails to participate in the IHS. These institutions were anonymized to protect the privacy of residents. Further, the IHS did not have interns entering ophthalmology explicitly specify whether they had undergone a surgical or medical internship (10 spontaneously specified medicine in free text, one spontaneously specified general surgery). Ophthalmology interns were not enrolled during the start of the COVID-19 pandemic (2019-2020, in 2021 only 1 intern was recruited); therefore, the present analyses include only nonpandemic cohorts. Participants received financial compensation between $50 and $125, depending on the year of participation. Participants in the IHS study were enrolled before the start of their residency training program and given a set of assessments. Informed consent was obtained from all participants. Subsequently, participants received follow-up assessments throughout their internship year, in September, December, March, and June. Participants were given 1 month to complete each assessment.

Study Instrument

The study instrument included self-reported demographic factors, lifestyle factors, measures of depression and mental health, as well as other questions on the baseline assessment administered before the start of the internship year (first postgraduate year, PGY-1). A representation of the Intern Health Study instrument by year is provided in Supplement Table 1.

Our analysis on the subset of ophthalmology interns included self-reported demographic data (age, gender, self-reported race/ethnicity, and relationship status), mental health status (previously diagnosed depression, neuroticism [measured by NEO Personality Inventory]), measures of depression (assessed by PHQ-9), and measures of lifestyle factors (work and sleep hours). The PHQ-9 and NEO Personality Inventory were selected for their high sensitivity and specificity in detecting depression and neuroticism, respectively. PHQ-9 scores range from 0 to 27, stratifying depression severity as follows: 0 to 4, minimal; 5 to 9, mild; 10 to 14, moderate; 15 to 19, moderately severe; and 20 to 27, severe.

Statistical Analysis

All statistical analyses were conducted in SPSS (IBM SPSS Statistics for Macintosh, Version 29.0). Figures were generated using GraphPad Prism (GraphPad Prism version 9.5.1 for Macintosh). Descriptive statistics were calculated with standard deviations.

A linear mixed model was fitted using an unstructured covariance matrix and the Restricted Maximum

Likelihood (REML) method to compare the baseline mean of the PHQ-9 to subsequent means. Estimated marginal means with 95% confidence intervals were calculated for preinternship PHQ-9 scores and every assessment. The effects of baseline factors and factors during the intern year were calculated. Bonferroni adjustments were made. The model was adjusted for demographic characteristics, cohort year, baseline neuroticism scores, personal history of depression, average work hours, and average sleep hours.

RESULTS

Ninety-eight interns entering ophthalmology were included in this study, from an original 268 invited to participate (36.6%). This was less than the overall participation rate among all interns (49.0%) in the IHS. Data collected during the preinternship period, which was defined as the 3 months prior to the start of internship, was considered baseline data. The mean age (SD) of the cohort was 26.9 (1.7) years. Forty-four (44.4%) participants reported having a significant other. Fifteen (15.2%) participants were considered underrepresented in medicine. Forty-one (41.8%) participants of the cohort self-reported a history of depression at any time prior to enrollment in the study. However, only 3 (3.1%) interns met criteria for major depression during the preinternship period based on PHQ-9, criteria from Kroenke et al. (PHQ-9 $\geq$ 10).[11] The average baseline PHQ score before the start of the internship was 2.8 (2.9). Additional assessed factors during the internship period included sleep and work hours. The average sleep duration was 6.6 (0.8) hours, while the average work duration was 59.5 (13.9) hours, across the internship. Characteristics of this cohort are summarized in Table 1.

Subsequently, there were 32 (32.7%) interns who experienced major depression at least at one time point of their internship by PHQ-9 scores. The frequency of major depression (PHQ-9 score$\geq$ 10) at each assessment is shown in Figure 1.

Depressive symptoms were significantly increased at the three-month assessment compared to preinternship symptoms (β =3.2, 95% CI, 2.2-4.3; $p < 0.001$). Depressive symptoms remained persistently elevated throughout the internship year, compared to preinternship, with no significant difference between assessments at 3, 6, 9, and 12 months (Fig. 2).

Table 2 shows significant and nonsignificant predictors of depressive symptoms. Increased average sleep was associated with a decrease in PHQ-9 scores by 1.6 points for every additional sleep hour (95% CI, −2.5 to −0.8; $p < 0.001$), indicating a significant reduction in depressive symptoms. Increased baseline neuroticism, as assessed by scaled neuroticism scores on NEO Personality Inventory during the preinternship period, was predictive of increased depressive symptoms ($\beta = 0.21$; 95% CI, 0.14-0.27; $p < 0.001$). A personal history of preresidency depression was not a significant predictor of depressive symptoms during internship (Table 2).

TABLE 1. Characteristics of the Ophthalmology Intern Cohort

Characteristic	Total, n (%)
Age, mean (SD), y	26.93 (1.66)
Gender	
Female	39 (39.4%)
Male	58 (58.6%)
Race and ethnicity	
Asian	36 (36.4%)
Black or African American	5 (5.1%)
Hispanic or Latinx	1 (1.0%)
White	46 (46.5%)
Other or unknown	9.1 (9.1%)
Married or partnered	44 (44.4%)
Average Sleep, mean (SD), h	6.58 (0.80)
Average Work, mean (SD), h	59.50 (13.88)
Neuroticism, mean (SD)	22.72 (7.62)
PHQ Baseline, mean (SD)	2.80 (2.94)
Depression History	41 (41.4%)
Treated for depression	25 (25.5%)
% using therapy	29 (29.6%)
Year	
2015	20 (20.2%)
2016	13 (13.1%)
2017	17 (17.2%)
2018	16 (16.2%)
2021	1 (1.0%)
2022	17 (17.2%)
2023	14 (14.1%)

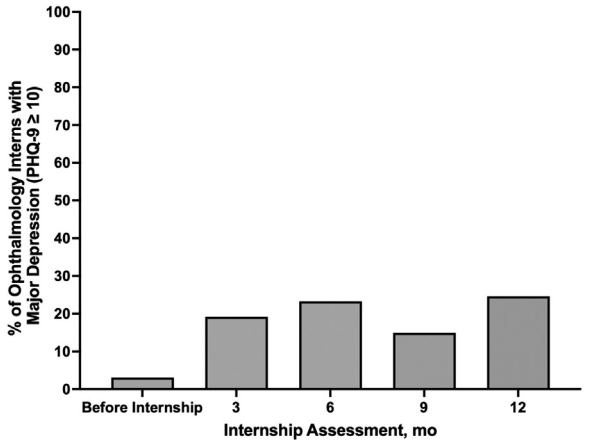

FIGURE 1. Frequency of major depression (PHQ-9 $\geq$ 10) across internship. This figure shows a bar chart of the frequency of interns who met Patient Health Questionnaire (PHQ-9) criteria for depression at four unique timepoints assessed during the study period.

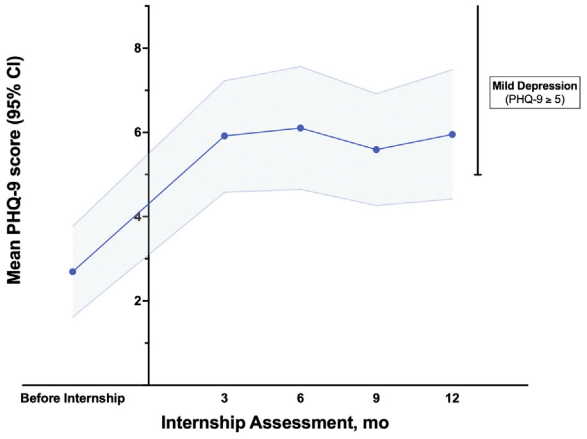

FIGURE 2. Mean PHQ-9 scores across the ophthalmology internship. This figure shows a line denoting the mean of the Patient Health Questionnaire (PHQ-9) for the entire cohort of interns entering ophthalmology training at the four timepoints assessed in the study. The 95% confidence interval is represented in the shaded blue region and allows for comparison across measured timepoints.

DISCUSSION

In this multicenter prospective cohort study, there was a significant increase in depressive symptoms among interns entering ophthalmology when compared to their baseline prior to the start of internship. 32.7% of ophthalmology-bound interns had major depression in at least one assessment. This may be greater than the overall average prevalence of depression (28.8%) observed across all residents.[12]

Our study found that increased sleep was a significant predictor of decreased depressive symptoms, with an increase of 1 hour of sleep associated with approximately a 1.6-point decrease on the PHQ-9. This adds to the growing body of evidence among the general intern population demonstrating the risk of reduced sleep for developing depression.[13,14]

These findings highlight the need for early, proactive mental health interventions—ideally before second-year ophthalmology training (second postgraduate year, PGY-2)—especially since fragmented intern-year rotations may mask the actual burden of trainee distress.[3,4] The impact on sleep hours during ophthalmology residency (compared to intern year) is unknown. Also, little work has been done to assess the impact of sleep on ophthalmology residents' mental health. However, in our findings, adequate sleep emerges as a key predictive factor for lower depressive symptoms in incoming ophthalmology residents.

Other interventions should still be explored for lowering the burden of depressive symptoms among ophthalmology trainees. Prior ophthalmology research has advocated for enhanced training resources, systematic depression screening, and the development of

TABLE 2. Significant and Nonsignificant Predictors of Depressive Symptoms[a]

Factor	Estimate[b]	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Assessment (vs Preinternship PHQ-9 [c])							
3 Month PHQ-9	3.223	0.525	75.459	6.144	<**0.001***	2.178	4.268
6 Month PHQ-9	3.411	0.597	85.423	5.711	<**0.001***	2.224	4.599
9 Month PHQ-9	2.897	0.523	70.562	5.536	<**0.001***	1.854	3.941
12 Month PHQ-9	3.259	0.659	71.987	4.944	<**0.001***	1.945	4.573
Work-related Factors							
Average Sleep	−1.642	0.413	74.468	−3.972	<**0.001***	−2.465	−0.818
Average Work	0.005	0.024	74.089	.195	.846	−0.043	.053
Demographic and Baseline Factors							
Year	−0.106	0.087	74.237	−1.212	0.229	−0.280	0.068
Age	0.126	0.170	72.758	0.742	0.461	−0.212	0.464
Depression History	0.254	0.569	74.301	0.447	0.656	−0.879	1.388
Neuroticism	0.205	0.034	73.761	6.102	<**0.001***	0.138	0.272
Ethnicity (vs White[c])							
Black	−0.876	1.199	73.982	−0.730	0.468	−3.265	1.514
Latino/Hispanic	−1.077	2.238	69.603	−0.481	0.632	−5.541	3.386
Asian	0.109	0.573	74.161	0.190	0.850	−1.033	1.252
Other[†]	2.328	0.947	73.627	2.458	**0.016**	0.441	4.215

The significance at the bolded and asterisk mark has the table of margin of significance at the 0.05 level.
[a]Dependent Variable: PHQ-9 Score.
[b]Change in predicted PHQ-9 score.
[c]This parameter is set to zero because it is redundant.
*Correlation is significant at the 0.05 level.
[†]Represents interns who didn't disclose race, selected mixed, selected Middle Eastern

coping skills to bolster resident well-being.[4] Further clarifying how depressive symptoms evolve in relation to specialty-specific factors and transitional career stages is essential for implementing these interventions.

Limitations of our study included a smaller sample size than studies done on a broader intern population. Given a marginally lower response rate than the overall intern population (36.6% vs 49.0%), the study may be subject to selection bias, as interns with greater concerns about their mental health may have been more likely to enroll. Using only ophthalmology interns, rather than all ophthalmology residents, limits our assessment of depression across the entire breadth of ophthalmology training. A key limitation is the absence of data from the start of COVID-19, when recruitment of ophthalmology interns was decreased; as a result, we could not evaluate pandemic-related changes in depressive symptoms and caution is warranted when generalizing these findings to peak pandemic conditions. We did not ascertain internship track (surgical, internal medicine, transitional), precluding stratified analyses or adjustment for this factor. Because internship type may correlate with workload and other training exposures as well as depressive symptoms, its omission represents unmeasured (residual) confounding, which could bias associations; the net direction of bias cannot be determined. However, this study elucidates and characterizes the incoming mental health of second postgraduate year (PGY-2) trainees that can inform future work, with nearly one-quarter of incoming PGY-2 trainees meeting criteria for major depression.

While this study helps elucidate potential timepoints and factors of depressive symptom development that may be used for intervention, further work must be done to better understand how depression develops among the entire ophthalmology workforce. The presence of a causal relationship of work-related factors (e.g., sleep and work hours) to depression among ophthalmologists should be assessed. Additionally, given that this study only included those bound for ophthalmology training, future studies should examine trainees across specialties to identify residents at greatest risk of depressive symptoms.

CONCLUSION

This study aimed to provide a more comprehensive understanding of mental health among ophthalmology interns. Incoming ophthalmology trainees experience significantly increased depressive symptoms with subsequent persistence throughout the intern year. Depression among incoming ophthalmology trainees may be modestly higher than mean rates across all residents. Decreased sleep hours seem to have a significant association with worsened depressive symptoms. Nearly one-quarter of residents experience depression in the month prior to starting dedicated ophthalmology training (PGY-2).

DATA AVAILABILITY

The data utilized in this work are available upon reasonable request from the corresponding author.

FUNDING SOURCES

Data utilized in this study was supported by grant R01-MH101459 from the National Institutes of Health for the development and maintenance of the Intern Health Study (Dr. Sen).

ROLE OF THE FUNDER/SPONSOR

The funders had no role in the design and conduct of the study, data collection, management, analysis, or interpretation; nor in the preparation, review, or approval of the manuscript; nor in the decision to submit the manuscript for publication.

REFERENCES

1. Dyrbye LN, Shanafelt TD. Physician burnout: a potential threat to successful health care reform. *JAMA*. 2011;305(19):2009–2010.
2. Siedsma M, Emlet L. Physician burnout: can we make a difference together? *Crit Care*. 2015;19:1–3.
3. Tran EM, Scott IU, Clark MA, Greenberg PB. Resident wellness in US ophthalmic graduate medical education: the resident perspective. *JAMA Ophthalmol*. 2018;136(6):695–701.
4. Tran EM, Scott IU, Clark MA, Greenberg PB. Assessing and promoting the wellness of United States ophthalmology residents: a survey of program directors. *J Surg Educ*. 2018;75(1):95–103.
5. Kim E, Sinco BR, Zhao J, et al. Duration of new-onset depressive symptoms during medical residency. *JAMA Netw Open*. 2024;7(6):e2418082.
6. Halbesleben JR, Rathert C. Linking physician burnout and patient outcomes: exploring the dyadic relationship between physicians and patients. *Health Care Manag Rev*. 2008;33(1):29–39.

7. Patel RS, Bachu R, Adikey A, Malik M, Shah M. Factors related to physician burnout and its consequences: a review. *Behav Sci*. 2018;8(11):98.

8. Berkowitz ST, Finn AP, Parikh R, Kuriyan AE, Patel S. Ophthalmology workforce projections in the United States, 2020 to 2035. *Ophthalmology*. 2024;131(2):133–139.

9. Hughes T, Waljee JF, Sen S, Bohnert A. New onset depression among surgical interns: an alarming challenge for the surgical workforce. *J Am Coll Surg*. 2021;233(5):e166–e167.

10. Sen S, Kranzler HR, Krystal JH, et al. A prospective cohort study investigating factors associated with depression during medical internship. *Arch Gen Psychiatry*. 2010;67(6):557–565.

11. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16(9):606–613.

12. Mata DA, Ramos MA, Bansal N, et al. Prevalence of depression and depressive symptoms among resident physicians: a systematic review and meta-analysis. *Jama*. 2015;314(22):2373–2383.

13. Fang Y, Forger DB, Frank E, Sen S, Goldstein C. Day-to-day variability in sleep parameters and depression risk: a prospective cohort study of training physicians. *NPJ Digit Med*. 2021;4(1):28.

14. Kalmbach DA, Arnedt JT, Song PX, Guille C, Sen S. Sleep disturbance and short sleep as risk factors for depression and perceived medical errors in first-year residents. *Sleep*. 2017;40(3):zsw073.

SUPPLEMENTARY INFORMATION

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.jsurg.2025.103834.