

# Patient Concerns Regarding Suspended Ophthalmic Care Due to COVID-19

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**Purpose:** The temporary cessation and profound changes in ophthalmic care delivery that occurred as a result of the coronavirus disease 2019 (COVID-19) pandemic have yet to be fully understood. Our objective is to assess patients' self-reported impact of health care lockdown measures on their fears and anxieties during the crisis period of the COVID-19 pandemic in New York City.

**Methods:** We conducted a digital, self-reported, patient care survey distributed by an e-mail at Columbia University's Department of Ophthalmology outpatient faculty practice. Inclusion criteria were age greater than or equal to 18 years, a diagnosis of either retinal disease or glaucoma, and a canceled or rescheduled ophthalmology established patient appointment during the acute phase of the COVID-19 pandemic in New York City. Patients without an e-mail address listed in their electronic medical records were excluded. The survey occurred between March 2, 2020, to May 30, 2020. Primary measures were survey responses to assess key areas of patient anxiety or concern during the pandemic including the safety of care delivery in a COVID pandemic, difficulties contacting or being seen by their ophthalmologist, concern of vision loss or disease progression, and concern over missed or access to treatments. Secondary measures were correlating survey response to factors such as visual acuity, intraocular pressure, diagnosis, disease severity, follow-up urgency, recent treatments, and diagnostic testing data.

**Results:** Of the 2594 surveys sent out, 510 (19.66%) were completed. Over 95% of patients were at least as concerned as in normal circumstances about their ocular health during the peak of the pandemic. Overall, 76% of respondents were more concerned than normal that they could not be seen by their ophthalmologist soon enough. Increased concern over ocular health, disease progression, and access to care all showed positive correlations ( $P < 0.05$ ) with worse disease severity as measured with testing such as visual fields and optical coherence tomography. In addition, 55% of patients were afraid of contracting COVID-19 during an office visit.

**Conclusion and Relevance:** We found a majority of our patients were concerned about limitations in access to ophthalmic care and were fearful of disease progression. In addition, we found a number of

demographic and clinical factors that correlated with increased anxiety in our patients.

**Key Words:** COVID-19, patient anxiety, cessation of ophthalmic care, patient survey

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## INTRODUCTION/PURPOSE

The severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2) pandemic has profoundly—and likely permanently—altered the delivery of health care worldwide. It has deeply impacted the psychosocial well-being of both health care providers and patients alike. Preliminary research during the pandemic has found anxiety in up to 12.5% in health care workers in China.<sup>1</sup> Increasing the ophthalmic community's anxieties were reports from China that ophthalmologists were at increased risk of contracting coronavirus disease 2019 (COVID-19) due to lack of personal protective equipment and proximity to patients' faces during the examination,<sup>2,3</sup> which was later confirmed among ophthalmology trainees in the greater New York area.<sup>4</sup> This parallels patient concerns, who come into close proximity to providers and diagnostic equipment. Naturally, many questions around how to safely provide ophthalmic care during the COVID-19 pandemic have emerged.<sup>5</sup>

Across the broader medical community, numerous guidelines and recommendations for the delivery of care have been published by local, national, and global leadership groups.<sup>6,7</sup> In ophthalmology, the clinical and surgical care of patients abruptly changed during the current crisis and will continue to evolve as the pandemic subsides into a “new normal” that has yet to be fully elucidated.

As a tertiary care center at the initial United States' epicenter of the COVID-19 pandemic in New York City, Columbia University's Department of Ophthalmology was quick to shut down elective surgery and routine clinic visits in early March through May of 2020.<sup>4</sup> This was part of our department's “Phase I” response to the pandemic and was geared at keeping ophthalmology patients and providers safe while shifting resources such as ventilators, personal protective equipment, and health care providers to the areas in critical need—the intensive care units and emergency rooms. This required the ophthalmology department to cancel all elective eye surgeries, only permitting immediate vision-threatening cases to proceed. In addition, all routine clinic visits were canceled, with only urgent and emergent clinic visits being scheduled. This resulted in the cancellation

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of 4819 clinic visits over 3 months and many surgeries within our ophthalmology department alone.

As the prevalence of COVID-19 cases eased, modified clinical practice reemerged. Immediately before reopening our practices, we initiated a patient survey to better understand how our patients viewed the cessation and resumption of care in the environment of an ongoing global pandemic. Being a large tertiary care center, many of our glaucoma and retina patients need close monitoring for visually significant conditions that impact the quality of life. Many of these patients—often with multiple co-morbidities—grapple with the concern of contracting COVID-19 versus their high disease burden and fear of losing vision. As of this writing, we are not aware of any scientific reporting of ophthalmic patients' anxieties and concerns in the COVID-19 era.

Our purpose was to assess patients' self-reported impact of health care lockdown measures on their fears and anxieties during the critical period of the COVID-19 pandemic in our hospital. We aimed to uncover how our patients perceived the massive cancellations, rescheduling efforts, and disruption of ophthalmic care that occurred as a result of the COVID-19 pandemic in New York City.

## METHODS

Approval for this survey was obtained from the Columbia University Institutional Review Board and adhered to the tenets of the Declaration of Helsinki and the Health Insurance Portability and Accountability Act (HIPAA). Our study was designed as a digital, self-reported, patient care survey distributed by e-mail. E-mail communication of the digital survey was used for efficient response time and tracking ability.<sup>8</sup> This was critically important as we attempted to capture “real-time” patient sentiments during the COVID-19 pandemic. A retrospective chart review was performed on subjects who responded with a complete survey response. The study data was collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at Columbia University.<sup>9,10</sup> REDCap is a secure, HIPAA-compliant, web-based software platform designed to support data capture for research studies.

The inclusion criteria for our study was age greater than or equal to 18 years, a diagnosis of either retinal disease or glaucoma, and a canceled or rescheduled ophthalmology established patient appointment during the acute phase of the COVID-19 pandemic in New York City (March 2, 2020, to May 30, 2020). Patients without an e-mail address listed in their electronic medical records were excluded. The study was administered from March 2, 2020, to May 30, 2020.

The initial patient list generated from our electronic health record contained 4819 patient encounters that were either canceled or rescheduled during the aforementioned dates. From these encounters, 3716 individual patients were identified and 2594 had unique e-mail addresses available. These 2594 glaucoma or retina patients were then sent an introductory email describing our study and asking them to electronically consent and participate with an embedded link to our survey hosted on REDCap. The first e-mail was sent to all 2594 patients on May 8, 2020. An identical follow-up e-mail was sent on May 11, 2020, to those who did not respond or who submitted an incomplete survey response. A previous study has demonstrated that a “reminder” email can increase the response rate by up to 25%.<sup>8</sup> Data collection was closed 10 days after the initial

email as a significant increase in response rate was unlikely after that time period.<sup>8</sup>

The goal of this survey was to address specific concerns around ophthalmic care during the COVID-19 pandemic. Given no such validated surveys existed, we created our own questionnaire following consensus among the retina and glaucoma faculty (Fig. 1) to assess key areas of patient anxiety or concern during the pandemic as it relates to their eye care. Broad categories included: safety of care delivery in a COVID pandemic, difficulties contacting or being seen by their ophthalmologist, concern of vision loss or disease progression, and concern over missed or access to treatments. There were also specific glaucoma and retina questions that were only completed by the patients followed in that subspecialty clinic.

The survey was emailed to 2594 email addresses, from which 617 (23.79%) patients responded. Of the returned surveys, 107 of these survey responses were incomplete and 26 were from patients who did not have a corresponding existing medical record (ie, had not yet been seen in our practices), leaving 484 (18.66%) evaluable patient responses (Fig. 2). The electronic medical record was reviewed and the following data was extracted: visual acuity (VA), intraocular pressure (IOP), diagnosis, follow-up urgency, recent treatments, and diagnostic testing data.

This diagnostic data was used as a proxy for disease severity and included last Humphrey Visual Field (VF) 24-2 mean deviation (MD) (Humphrey Field Analyzer; Carl Zeiss Meditec Inc.), last VF severity based on the Center for Medicare Services criteria (CMS),<sup>11</sup> last average optical coherence tomography (OCT) retinal nerve fiber layer (RNFL), and last average OCT combined macular retinal ganglion cell (RGC) plus inner plexiform layer thickness (Cirrus 5000; Carl Zeiss Meditec Inc.). For the glaucoma subset, the “worse” eye was defined as the eye with higher severity of VF damage as defined by CMS criteria.<sup>11</sup> If both eyes' VFs were categorized as the same CMS severity class, then the eye with the more negative MD was defined as the worse eye. These various factors were analyzed for correlations to survey responses.

Data analysis of the survey response and patient's chart information was conducted using STATA software (version 14.2; STATA Corp., College Station, TX). Categorical variables are described as percentages and continuous variables as mean  $\pm$  SD if normally distributed or median and range if not. The relationship between predictors and ordinal outcomes was tested with ordered logistic regression. Statistical significance was defined at  $P$ -value  $<5\%$ .

## RESULTS

Of the 484 patients with complete survey responses, the median age was 72 years, 57% were women, and 70% were white. Patient demographics are described in Table 1. Among those who did not respond to the survey, the median age was 71 ( $P=0.759$ ), 56% were women ( $P=0.100$ ), and 57% were white ( $P<0.001$ ).

### Descriptive Measures

In summary (questions 1 to 4), 47% of patients were “much more” or “more” concerned about maintaining their ocular health during the pandemic than under normal circumstances, while only 3% were “somewhat less concerned” and 1% were “much less” concerned. Overall, 36% of subjects described themselves as “much more” or “somewhat more”

Columbia Ophthalmology COVID-19 Patient Survey


Your eye doctor would like you to complete this voluntary survey. This survey is part of a research study to understand how the COVID-19 virus pandemic virus has impacted everyone. This survey is designed to assess the impact of the COVID-19 virus pandemic on our patients and their vision.

The survey will take approximately 5-10 minutes to complete.

Please enter your first and last name and date of birth. Then sign the form that you are willing to answer the survey questions. The questions will appear at that point. Please proceed to answer them.

First name:  
Last name:  
Please enter your date of birth (MM-DD-YY):

- During this COVID-19 pandemic, how concerned are you about keeping your eyes healthy?  
Much less concerned than usual    Somewhat less concerned than usual    The same as usual  
Somewhat more concerned than usual    Much more concerned than usual
- During this COVID-19 pandemic, how concerned are you about losing vision?  
Much less concerned than usual    Somewhat less concerned than usual    The same as usual  
Somewhat more concerned than usual    Much more concerned than usual
- During this COVID-19 pandemic, how concerned are you about seeing your eye doctor for an appropriately timed check up?  
Much less concerned than usual    Somewhat less concerned than usual    The same as usual  
Somewhat more concerned than usual    Much more concerned than usual
- During this COVID-19 pandemic, how concerned are you about being able to contact your eye doctor if needed?  
Much less concerned than usual    Somewhat less concerned than usual    The same as usual  
Somewhat more concerned than usual    Much more concerned than usual
- How serious do you perceive your ocular condition to be?  
Not significant/minimal  
Mildly significant  
Moderately significant  
Severe/extremely significant
- Do you think your vision has gotten worse since you last saw your eye doctor?  
Yes    No
- Are you afraid that you will get COVID-19 by coming in to see your eye doctor? (if no, you'll skip to question 9)  
Yes    No
- If you are afraid that you will get COVID-19 by coming in, how much do each of the following concern you?  
  - Travelling to see the doctor  
No concern    Minimal concern    Moderate concern    Significant concern
  - Touching clinical surfaces  
No concern    Minimal concern    Moderate concern    Significant concern



- Being in close contact with the doctor or other staff members  
No concern    Minimal concern    Moderate concern    Significant concern
- Being in close contact with other patients  
No concern    Minimal concern    Moderate concern    Significant concern

9. Do you think your ocular condition is important enough to be seen by your eye doctor despite the current risk of COVID-19 exposure?  
Yes    No

10. Which of the following are you being cared for?  
Glaucoma or risk for glaucoma  
Retina or uveitis issues  
Both  
Neither

Glaucoma specific questions:

- Are you currently on glaucoma eye drops? (if yes, two questions will appear. Otherwise continue to question 4)  
Yes    No
- If yes, how many different bottles?  
1    2    3    4    5
- Are you concerned that you will run out of your eye drops during this time?  
Not concerned    A little concerned    Somewhat concerned    Very concerned
- Are you concerned that your glaucoma will progress during this time?  
Not concerned    A little concerned    Somewhat concerned    Very concerned
- We understand this stressful situation can affect our ability to take our medications. Have you had a harder time administering or remembering to take your drops during this time?  
Yes    No

Retina Specific questions:

- Are you concerned that your retinal condition will worsen during this time?  
Not concerned    A little concerned    Somewhat concerned    Very concerned
- Are you concerned that you won't get treatments such as injections often enough during this time?  
Not concerned    A little concerned    Somewhat concerned    Very concerned
- Are you concerned that you will not be seen for a retinal emergency during this time?  
Not concerned    A little concerned    Somewhat concerned    Very concerned


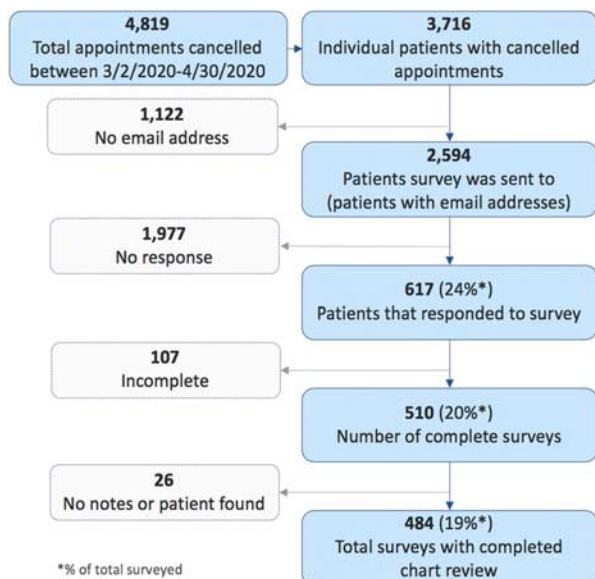


FIGURE 1. Survey questions: a sample survey showing all questions asked during the electronic survey.

concerned about *losing vision* during the pandemic, while 61% had the same level as in normal circumstances. A clear majority (76%) of patients were concerned about the inability to see their ophthalmologist. Interestingly, 18% and 40% of respondents were “much more” or “somewhat more,” respectively, concerned during the pandemic that they would not be able to contact their doctor if needed, but 38% remained

their usual level of concern. Only 2% were “somewhat less” and 2% were “much less” concerned.

When asked how severe the patients perceived their condition to be, 6.6% reported it to be “not significant,” 20.1% “mild,” 55.6% “moderate,” 17.7% “severe” or extremely significant. In all, 29.7% of patients felt their vision got worse since they last saw their eye doctor.



**FIGURE 2.** Recruitment flow chart: chart showing recruitment and survey response numbers. Figure 2 can be viewed in color online at [www.glaucomajournal.com](http://www.glaucomajournal.com).

Overall, 55% of patients were concerned they would get COVID by coming in to see their eye doctor. Yet, 57% of all respondents felt their ocular condition was important enough to risk COVID exposure and still come into the office to be seen. Of the 55% concerned they would contract COVID, the following played a role in their anxiety: traveling to see the doctor (38% significant, 29% moderate, 14% minimal, and 19% no concern); touching clinic surfaces (36% significant, 46% moderate, 17% minimal, 1% no concern); close contact with clinic staff and doctors (36% significant, 47% moderate, 16% minimal, 1% no concern); close contact with other patients (79% significant, 19% moderate, 1% minimal, 1% no concern). While all 4 categories had a vast majority of patients significant or moderately concerned, being in close contact with other patients was significantly higher,

**TABLE 1.** Demographic Factors

	n (%)
Age data	
Median	72
Average (SD)	70
Range	26-97
Self-reported race and ethnicity	
White	359 (70)
Asian or Pacific Islander	20 (4)
Black	18 (4)
Hispanic or Latino	7 (1)
Declined to respond	97 (19)
Other	9 (2)
Sex	
Female	291 (57)
Male	208 (41)
Declined to respond	11 (2)
Condition	
Self-reported as glaucoma patients	247 (49)
Self-reported as retina or uveitis patients	130 (26)
Reported as being followed for both	82 (16)
Reported being followed for neither	50 (10)

with 98% of patients either significantly or moderately concerned.

For the 329 respondents who reported being followed for glaucoma, 239 (75.39%) reported current use of glaucoma eye drops. Of those 239 on drops, 33.0%, 38.5%, 21.3%, 6.7%, and 0.4% were on 1, 2, 3, 4, or 5 drops, respectively. Of these patients, concern about running out of eye drops ranged from 2.9% to 22.8%; 2.93% very concerned, 12.97% somewhat concerned, 21.76% a little concerned, and 62.34% not concerned. Regarding glaucoma progression, concern ranged from 12% to 42%; 12.0% very concerned, 25.9% somewhat concerned, 42.0% a little concerned, and 20.2% not concerned. Last, the glaucoma patients were asked if they have had a more difficult time during the pandemic remembering or administering their eye drops for which 4.1% said yes, and 95.9% said no.

Each of the 212 patients that reported being followed for a retinal disease received 3 retina-related questions. With respect to disease worsening during the pandemic, 16% were very concerned, 33% somewhat concerned, 37% a little concerned, and 14% not concerned. Regarding concern over the inability to access treatments such as injections at the proper time, reported levels of concern were: 14% “very,” 19% “somewhat,” 16% “a little,” and 51% were “not” concerned. When asked about not being able to be seen in a retina emergency, the response was 20% “very,” 24% “somewhat,” 23% “a little,” and 33% “not” concerned (Table 2).

### Correlation Measures

From the 329 patients that self-reported as being followed for glaucoma (including glaucoma suspects and ocular hypertension), we performed a subanalysis on the associations between survey responses and various factors including age, sex, race, recent incisional eye surgery (during the preceding 6 mo), recent clinic procedure (during the preceding 6 mo), last visit highest IOP, urgency of follow-up, last VA, last 24-2 VF MD, last 24-2 VF severity (based on CMS criteria),<sup>11</sup> last average OCT RNFL thickness and last average OCT RGC layer thickness.

Women ( $P=0.046$ ), patients with higher IOP ( $P=0.020$ ), lower average OCT RGC layer thickness for the right eye ( $P=0.007$ ) and left eye ( $P=0.002$ ), and worse VF MD of the better eye ( $P=0.067$ ) were associated with a greater degree of concern about maintaining eye health during the pandemic. Women tended to be more concerned about coming into the office, although this was not statistically significant ( $P=0.097$ ).

Worse VF MD of the better eye ( $P=0.046$ ) and worse eye ( $P=0.047$ ), VF severity of the worse eye ( $P=0.009$ ), lower average RNFL thickness of the right eye ( $P=0.003$ ), and lower average RGC layer thickness of both right ( $P=0.001$ ) and left eye ( $P=0.009$ ) were correlated with greater concern about losing vision.

Regarding rapid access to care, significant correlations were found with VF MD of the better eye ( $P=0.003$ ), RNFL thickness right eye ( $P=0.046$ ), and RGC thickness right eye ( $P=0.014$ ). A trend towards a significant correlation was noted with VF severity of the better eye ( $P=0.056$ ) and VA right eye ( $P=0.055$ ). Similar findings were found related to concerns about being able to contact their doctors with VF MD of the better eye ( $P=0.005$ ), VF severity of the better eye ( $P=0.007$ ), and the worse eye ( $P=0.042$ ).

For the glaucoma subset, patients were generally cognizant of the extent of their glaucoma damage (how serious they perceived their ocular condition to be) and was correlated with VF MD of the better eye ( $P=0.000$ ) and worse eye ( $P=0.000$ ), VF severity of the better eye

TABLE 2. Survey Responses

All Patients						
Question #	Patient Concern About ...	Level of Patient Concern Compared With Normal Prepandemic Circumstances				
		Much Less	Somewhat Less	As	Somewhat More	Much More
1	Keeping eyes healthy	1%	3%	50%	31%	16%
2	Losing vision	1%	2%	61%	24%	12%
3	Being able to see their eye doctor	2%	3%	19%	50%	26%
4	Being able to contact their doctor if needed	2%	2%	38%	40%	18%
Question #	Question Topic	Not Significant	Mild	Moderate	Severe or Extremely Significant	
5	How severe the patients perceived their condition to be	6.63%	20.08%	55.62%	17.67%	
Question #	Question Topic	Yes	No			
6	% Patients that felt their vision got worse since last seeing their eye doctor	29.72%	70.28%			
Question #	Question Topic	Yes	No			
7	% Patients concerned they would get COVID by coming in to see their eye doctor	55%	45%			
Question #	Factor of concern of office visit (if respond yes to Q7)	No Concern	Minimal	Moderate	Significant	
8	Traveling to see the doctor	19%	14%	29%	38%	
	Touching clinic surfaces	1%	17%	46%	36%	
	Close contact with clinic staff and doctors	1%	16%	47%	36%	
	Close contact with other patients	1%	1%	19%	79%	
Question #	Question Topic	Yes	No			
9	% Patients that felt their ocular condition was important enough to risk COVID exposure and still come into the office	57%	43%			
Glaucoma or retina-specific questions						
Question #	Of the 329 respondents that reported being followed for glaucoma ...	Responses				
1	% Currently using glaucoma drops	Yes (75.39%)	No (24.61%)			
2	Of those using drops, number of bottles being used	1 (33.05%)	2 (38.49%)	3 (21.34%)	4 (6.69%)	5 (0.42%)
3	Level of concern about running out of drops	Not concerned (62.34%)	A little concerned (21.76%)	Somewhat concerned (12.97%)	Very concerned (2.93%)	
4	Level of concern their glaucoma would progress	Not concerned (20.19%)	A little concerned (41.96%)	Somewhat concerned (25.87%)	Very concerned (11.99%)	
5	% had a more difficult time remembering or administering their drops	Yes (4.13%)	No (95.87%)			
Question #	Of the 212 respondents that reported being followed for retina or uveitis ...	Responses				
1	Level of concern about their retinal condition worsening	Not concerned (14%)	A little concerned (37%)	Somewhat concerned (33%)	Very concerned (16%)	
2	Level of concern about not getting their treatments such as injections in time	Not concerned (51%)	A little concerned (16%)	Somewhat concerned (19%)	Very concerned (14%)	
3	Level of concern about not being able to be seen in a retinal emergency	Not concerned (33%)	A little concerned (23%)	Somewhat concerned (24%)	Very concerned (20%)	

**TABLE 3.** Correlation Measurers

Significant Correlations	<i>P</i>
Question 1 (Concern About Maintaining Eye Health During the Pandemic)	
Female sex	0.046
Highest IOP	0.02
Average RGC count for right eye	0.007
Average RGC count for left eye	0.002
Increased concern with worse VF MD of the better eye	0.067
Question 2 (Concern about losing vision)	
VF MD of the better eye	0.046
VF MD of the worse eye	0.047
VF severity of the worse eye	0.009
RNFL of the right eye	0.003
RGC of right eye	0.067
RGC of left eye	0.009
Question 3 (Concern about being seen soon enough)	
VF MD of the better eye	0.003
RNFL of the right eye	0.046
RGC of right eye	0.014
VF severity of the better eye	0.056
Visual acuity right eye	0.055
Question 4 (Concern about being able to contact their doctor)	
VF MD of the better eye	0.005
VF severity of the better eye	0.007
VF severity of the worse eye	0.042
Question 5 (How serious they perceived their ocular condition to be)	
VF MD of the better eye	0.000
VF MD of the worse eye	0.000
VF severity of the better eye	0.000
VF severity of the worse eye	0.000
RNFL of the right eye	0.000
RNFL of the left eye	0.004
RGC of right eye	0.000
RGC of left eye	0.000
VA right eye	0.001
VA left eye	0.014
Question 6 (Yes or no: if the patient felt their vision was worse since their last visit)	
Last visit highest IOP	0.012
Question 7 (Yes or no: afraid of contracting COVID-19 by coming into clinic)	
Correlation trend	
Females	0.097
Question 9 (Yes or no: does the patient feel their condition is serious enough to be seen despite COVID exposure risk)	
Race	0.012
VF MD of the better eye	0.037
RNFL of the left eye	0.036
RGC left eye	0.039
VA right eye	0.008
VA left eye	0.010
Recent surgery	0.069
RNFL right eye	0.073
Question 16 (Glaucoma only question #3: Concern about running out of eye drops)	
NA	
Question 17 (Yes or no: does the patient feel their condition is serious enough to be seen despite COVID exposure risk)	
Last visit highest IOP	0.006
Follow-up timeline of 2-6 mo	0.034
Follow-up timeline of <2 mo	0.013
VF MD of the better eye	0.006
VF MD of the worse eye	0.003
VF severity of the better eye	0.008
VF severity of the worse eye	0.014
RNFL of the right eye	0.027
RGC left eye	0.021
Question 18 (Glaucoma only question #5: yes or no, difficulty taking eye drops)	
NA	

COVID indicates coronavirus disease; IOP, intraocular pressure; MD, mean deviation; NA, not available; RGC, retinal ganglion cell; RNFL, retinal nerve fiber layer; VF, visual field.

( $P=0.000$ ) and worse eye ( $P=0.000$ ), RNFL thickness right eye ( $P=0.000$ ) and left eye ( $P=0.004$ ), RGC thickness right eye ( $P=0.000$ ) and left eye ( $P=0.000$ ), as well as VA right ( $P=0.001$ ) and left ( $P=0.014$ ) eye. Interestingly, a sense of progressive damage was correlated to the last visit IOP only ( $P=0.012$ ).

Regarding whether all patients perceived their condition was serious enough to be seen given the risk of COVID exposure, more nonwhite individuals felt they needed to be seen compared with white individuals ( $P=0.012$ ). Other factors that were associated with a greater perceived need to be seen were VF MD of the better eye ( $P=0.037$ ), RNFL thickness left eye ( $P=0.036$ ), RGC thickness left eye ( $P=0.039$ ), VA right eye ( $P=0.008$ ), and VA left eye ( $P=0.010$ ). There was also a trend towards a significant correlation with recent incisional surgery ( $P=0.069$ ).

Glaucoma disease severity was not related to concerns about running out of eye drops or being able to instill them. Concerns about glaucoma progression were related to higher IOP at last visit ( $P=0.006$ ), time since last office visit clinic follow-up timeline of 2 to 6 mo ( $P=0.034$ ) or <2 mo ( $P=0.013$ ), VF MD better eye ( $P=0.006$ ) and worse eye ( $P=0.003$ ), VF severity better eye ( $P=0.008$ ) and worse eye ( $P=0.014$ ), RNFL thickness right eye ( $P=0.027$ ), and RGC thickness left eye ( $P=0.021$ ).

For all of the questions above, the other factors measured for associations that were not listed with a positive correlation did not have a statistically significant correlation. A summary of these measures of associations in the glaucoma subanalysis is summarized in Table 3.

## DISCUSSION

In this study, we investigated the concerns of patients in our ophthalmology practice who endured clinic cancellations and cessation in their ophthalmic care as a result of the COVID-19 pandemic. In summary, we found a majority of patients were concerned about limitations in access to ophthalmic care and were fearful of disease progression. In addition, we found a number of demographic and clinical factors that correlated with increased anxiety in our patients.

Our response rate (19.66%), consistent with other electronic survey response rates,<sup>8</sup> suggests that patients are interested in communicating their concerns or thoughts about the cessation of ophthalmic care during the COVID-19 pandemic. It is important to note the survey was administered in early May, 2020, while the cancellations took place in March through April 2020 when the pandemic first hit New York City and rescheduling began in early May. In May, when the survey was completed, our patients were still entrenched in a city-wide “lockdown” restricting nonessential businesses and with social distancing policies being mandated. Over this March through May period, New York’s pandemic progressed in an exponential growth phase. It is entirely possible given these unique and challenging times our patient’s survey responses have a bias towards increased concerns given other non-health-related anxieties such as unemployment or other difficulties brought on by the pandemic. In addition, being a tertiary care center with high rates of severe disease, there may be selection bias as those with more severe disease may be more prone to participate in the survey.

We also know from our data that we care for an aging population, as the median age of respondents was 72. This group of patients by age alone are considered at higher risk for increased morbidity and mortality from COVID-19.<sup>12</sup> Given

these facts, it is plausible that our aging retina and glaucoma patients would have increased concern around their general health at this time. Here we show they also have increased concern regarding their ophthalmic care during the pandemic. The majority of patients across all categories of questions had some increased levels of concern in our survey. This fear and anxiety vary between different factors including the pause in care, limited access to providers or treatments, concern for disease progression, and risk of contracting COVID-19 by coming into the ophthalmology clinics. Our department, similar to others around the world, underwent a massive rescheduling effort as over 4819 visits were canceled or moved during March and April 2020. This abrupt adjustment in clinical visits clearly left patients with a sense of uncertainty.

Our data confirm that many of our patients had increased concern with maintaining ocular health and loss of vision during the acute phase of the pandemic. A large majority of all patients (76%) were more concerned they could not be seen by their ophthalmologist soon enough and 58% were more concerned they could not even contact their doctor if needed. Glaucoma patients had concerns about the availability of medications (48%) and progression (80%). Similarly, retina patients had concerns about access to treatments (49%), progression (85%), and access to emergency care (67%). Interestingly, these rates were very similar between the glaucoma and retina groups, thus no further comparative analysis was performed.

Last, and perhaps most importantly, the survey responses show 55% of patients were afraid of contracting COVID-19 by coming into our clinics. Traveling to see the doctor, touching clinic surfaces, and close contact with staff and physicians were all important concerns. However, being in close contact with other patients was the greatest concern by far, with 79% reporting a “significant” concern and 100% reported it as at least of some level of concern. Perhaps this is related to our patient’s expectation of tightly packed waiting rooms and diagnostic/imaging suites as many glaucoma and retina providers have high clinic volumes in normal circumstances.

Despite the overall high level of concern around contracting COVID-19, 57% of all respondents still felt they needed to be seen in the clinic for their ocular condition during the pandemic. This highlights a key finding that despite the high risk of COVID-19 in New York City and the increased mortality rates in our elderly glaucoma and retina patients, the perception of their disease burden is sufficiently high enough that over half felt the need to be seen despite the risk. Patients are faced with competing interests: stay at home and risk vision loss or seek ophthalmic care to preserve vision and risk COVID-19 exposure.

VF loss in glaucoma impacts the vision-related quality of life<sup>13</sup> and it has also been reported that primary open-angle glaucoma patients have increased rates of anxiety and depression, with anxiety prevalence reported up to 13% in primary open-angle glaucoma patients.<sup>14</sup> Most often, the functional status of the better-seeing eye has been associated with vision-related quality of life.<sup>15</sup> In our study, we found concern over maintaining eye health, access to care, glaucoma progression, or visual function loss were correlated to worse VF MD, VF severity, RNFL and RGC thickness. Interestingly, we found that both the better and worse eye VF MD and VF severity correlated to these areas of concern, with no predilection for the “better” or “worse” eye specifically. We also found across these categories of questions that RGC macular thickness was more frequently positively correlated than RNFL thickness. In addition, the last visit higher IOP correlated with increased concern for progression and feeling

their visual function was worse since the last visit. However, VA did not correlate with these categories.

Our results suggest that even in times of a waxing and waning pandemic, limited clinic hours, and periodic clinic closures, patients are anxious about ocular health. This may be offset to a large degree by having office personnel contact patients to offer reassurances about emergency availability, a continuation of essential care, and ongoing availability of prescription medications.

When asked about concern for COVID exposure in the clinic there was no significant correlation with age, race, or any of the other categories tested, however, there was a trend, albeit not statistically significant, towards women being more concerned than men. These associations are important to understand as they get at the root of our patient's fears and anxieties and allow us to use our data to predict which patients are most at risk. Further analysis of our data looking for associations in both glaucoma and retina patients is paramount.

Where do we go from here? Our hope is these patient responses can help us better understand our patient's concerns. This will be critical as we adjust to new paradigm shifts in health care delivery during the COVID-19 pandemic and beyond. Social distancing, telemedicine, decreased waiting rooms, and less contact with clinic devices are among the many aspects of care that have already begun to change. Yet, there is certainly more to come from the standpoint of COVID-19 transmission reduction in health care delivery. Perhaps the pandemic has revealed areas of ophthalmic patient care that undoubtedly had preexisting shortcomings. Refocusing on the patients' concerns will be of tremendous value when devising the future of ophthalmic care.

There is no reason to think some of these COVID-related changes in eye care delivery cannot persist. Patients' perspectives are vital in developing new models of clinical care that are hopefully more patient-centric. Once we decrease wait times and congested waiting rooms, perhaps we will set a new standard of care that better meets patient preferences. Perhaps the need for decreased contact time with traditional VF machines drives new technology development for home visual field testing or allows imaging devices to reduce the need for perimetry. The opportunities for advancement with modern technology exist and we can hope that this black swan event pushes us into a new and better future of health care delivery. In any case, an improved understanding of patient concerns and anxieties is the starting point to drive meaningful advancement of patient-centered care. Further work in this arena is essential, and our report serves as a starting point in this discussion.

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