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Ocular Characteristics of Non-COVID-19 Patients: A Retrospective Study of Time-Sensitive Ophthalmic Care during the Pandemic

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Ocular Characteristics of Non-COVID-19 Patients: A Retrospective Study of Time-Sensitive Ophthalmic Care during the Pandemic

Abstract

Purpose: To analyze the cohort of clinical patients seen during the COVID-19 pandemic shutdown at Emory Eye Center in comparison with prior weeks.

Method: We conducted a retrospective chart review from three outpatient clinical sites over a period of eighteen weeks, which covered pre-COVID-19 dates as well as the dates of when our clinics were closed near the beginning of the COVID-19 pandemic. We utilized data from providers assigned to daily triage coverage for in-person exams. Primary diagnosis and visit type data were extracted to look for trends and commonalities among urgent or time-sensitive patients.

Results: For the nine weeks prior to clinic closure, there were 11,700 primary visit codes. During the nine-week closure, there were 1,624 in-person visit codes. We were able to observe some trends for descriptive purposes. Diagnoses of patients seen in person with higher frequency during the closure included vitreous disorders (i.e., posterior vitreous detachment), corneal ulcer, optic nerve disorders, idiopathic intracranial hypertension and post-operative care. We also looked at our telehealth visit numbers. However, there were very few telehealth visits (n=25), which rendered the telehealth analysis statistically insignificant.

Conclusion: Through an analysis of the pool of non-COVID patients who were seen during the shutdown in our clinics via in-person urgent or time-sensitive exams, we were able to observe a breakdown of visit type and diagnosis. A comparison of those patients with the distribution seen in person during the previous nine weeks was reviewed. Although our numbers for data analysis during closure were too small to devise an evidence-based algorithm, there were still several lessons we learned from this first wave of the COVID-19 pandemic such as: 1) how to predict which patients may be more time-sensitive or urgent from a pre-determined list of diagnoses; and 2) how to immediately establish an ophthalmologist/optometrist (MD/OD) daily triage coverage schedule. We found it difficult to successfully incorporate a significant number of telehealth visits because most eye conditions, which were already deemed urgent by our call center, were in general considered conditions that required further evaluation by a provider. We hope that these take-away lessons will further improve ophthalmic care for any future pandemic or widespread closure.

Keywords

Ophthalmic Care during COVID-19 pandemic, Ophthalmic Clinic Closure during pandemic, Care of ocular emergencies during COVID-19 pandemic, Time sensitive ophthalmic care during pandemic, Non-urgent ophthalmic exams during pandemic

Cover Page Footnote

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INTRODUCTION

Coronavirus disease 2019 (COVID-19, SARS-CoV-2) is a novel respiratory illness with the potential to become fatal if it develops into severe acute respiratory syndrome (SARS). Due to interspecies transmission, SARS-CoV-2 has been identified to infect human non-ciliated bronchial epithelium and type II pneumocytes causing fever, cough, shortness of breath and pneumonia, and kidney failure in severe cases.[1] On January 20, 2020, the World Health Organization declared the outbreak of COVID-19 a public health emergency of international concern. On March 12, 2020, the WHO Director-General officially declared COVID-19 a pandemic.[2]

For an unprecedented time, Emory Eye Center closed all its regular clinics in the metro Atlanta area in response to the COVID-19 pandemic. We closed all non-time-sensitive clinical care between March 16, 2020, and May 15, 2020. This included ophthalmic care, since provider risk-to-care ratio was deemed significant due to the close proximity required for ophthalmic examinations.[1,3–6] The potential transmission of the virus through tears was supported by more than half (or 59.1%) of ophthalmologists in a survey where they expressed concerns that they were at a higher risk of contracting the virus.[4,7,8] Early on, there was evidence that SARS-CoV-2 (or COVID-19) could be transmitted by asymptomatic patients.[5] Thus, many eyecare services and clinics limited care to only emergency cases based on their own clinical judgment.[4] Keeping these considerations in mind, eye care providers at Emory University School of Medicine Department of Ophthalmology were ultimately assigned on a rotating basis to cover urgent or time sensitive care for non-COVID patients at three locations for a span of several weeks. Urgent visits were those patients who called in with emergent complaints. Time-sensitive patients included those deemed serious enough such as post-operative care, and those needing follow up for existing sight-threatening conditions, e.g., Intravitreal Avastin (IVA) injections for retinopathies, and clinical drug trial patients.

The main objective of this analysis was to look at trends in patient ocular diagnoses and visit type during the shutdown, as compared with delivery of care during pre-COVID times. There was insufficient commensurate data to perform an inferential data analysis. Therefore, this paper takes a descriptive look at the weeks selected. Telehealth was also explored as a delivery model during this time but is not included in this analysis.

METHODS

Procedural Methods

This study was approved by the Emory School of Medicine Institutional Review Board (IRB). We analyzed Emory Eye Center patients who received an exam, between the dates of March 16, 2020 and May 15, 2020. Patients eligible for this study matched the following three criteria: 1) between the ages of 18-89 years old. (For simplicity, we chose to obtain IRB approval for 18 years or older in case that the initial IRB for contacting any of the patients who were minors would need to be revised, which would require a separate protocol.) The upper limit of 89 was arbitrarily chosen because our range of patients did not exceed age 89; 2) given an urgent/triage appointment (in a regular new or follow up slot) for an in-person visit; 3) exam was deemed time sensitive by the provider and therefore should not be cancelled. For comparison of diagnoses, there was also a review of visits prior to clinic closure from January 15, 2020 to March 13, 2020, with the same age range.

During the shutdown, each provider reviewed their schedules and determined the need for an in-patient visit verses re-appointing at a later time. We used the triage provider model to subsequently deliver any care deemed time-sensitive. All urgent call-ins were also scheduled with the daily triage provider.

Statistical Methods

This is a descriptive statistical look of the weeks selected; we lacked sufficient patient and diagnosis numbers to perform an inferential statistical analysis. Diagnosis codes were based upon those patients who arrived at the clinic and were assigned a code by their provider. A review of the primary codes entered by the daily triage provider was undertaken, as the code presumably linked to the chief complaint and primary purpose for the patient visit. Codes were only counted one time if they applied to either eye. Due to the number of codes, the codes were grouped based on 0.1 digit for global description of the diagnosis. Our primary objective was to analyze the most frequent diagnoses seen during and prior to the shutdown to look for statistically significant differences. Using the specific ICD-10 code to the 0.001 digit yielded hundreds of diagnoses. In order to narrow down, we took the designated ICD-10 code to the 0.1 digit as representing the global diagnosis category versus the specific code for billing purposes. For example, H43.8 was used, which represented disorders of the vitreous body, that is, posterior vitreous detachment versus H43.811, 812 and 813 for laterality, combining all three codes into one general code to capture the frequency.

All primary ICD-10 diagnoses were tabulated using frequency and percent during the shutdown and prior to the shutdown. The fifteen (15) diagnoses with the highest frequency for each category were considered for analysis. Differences in diagnosis categories between time periods were tested using a chi-square test with an alpha of 0.05. All tests were conducted using SAS v9.4.

RESULTS

For the nine weeks prior to the COVID-19 shutdown a total of 11,700 primary diagnosis codes were obtained. During the COVID-19 shutdown, there were a total of 1,624 primary codes for in-person visits (see table 1). Since telehealth exams were not a model of care previously delivered at the Emory Eye Center, we assembled a small team and did some pilot work before rolling out that visit type to the department. By the time a protocol was in place, in-person visits had resumed, and the telehealth protocol was then reserved for rare instances and only for established patients who had stable minor conditions. This included dry eye follow up visits, checking postoperative medication compliance and medication refill related questions in patients with stable glaucoma. As illustrated by Table 1 the percent of telehealth visits were extremely small.

	DURING SHUTDOWN (n=1649)		**PRIOR TO SHUTDOWN (n=11700)**	
	Frequency	**Percent**	**Frequency**	**Percent**
In person	1624	98.0	11700	100
Telehealth	25	2.0	-	-

Table 1 Analysis of Visit Types

Characteristics of visit types for patients seen during and prior to the shutdown were examined (see table 2). Established patients were seen more frequently across the board as predicted by our scheduling templates in general and were similar for in-person visits during and prior to the shutdown (70.81 vs. 71.78). Our frequency of seeing a new patient was also similar during those two time periods (20.02 vs. 22.39). The 'New Established' category included patients seen in the eye center but were considered new to the appointment provider. This allowed for increased scheduling time. Of note, we did not perform any telehealth visits for new patients given our initial protocol, as decided by the pilot test group.

	DURING SHUTDOWN						PRIOR TO SHUTDOWN	
	Scheduled (n=5924)		In person (n=1624)		Telehealth (n=25)		In person (n=11700)	
Patient Type	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Established	4742	80.05	1150	70.81	24	96.00	8398	71.78
New	659	11.12	325	20.02			2620	22.39
New Established	110	1.86	47	2.89			238	2.03
Not Specified	413	6.97	102	6.28	1	4.00	445	3.80

Table 2 Description of type of patients seen by visit type and time period

Table 3 gives a broad overview of those patients that were given a specific visit type which was based upon the schedulers' interpretation as well as previous follow-up instructions by the provider. The frequency numbers in each column represent the number of visits scheduled along with the corresponding percentages based upon the total patient n for each category. The most frequently encountered visit types included contact lens and postoperative visits. Specialty contact lens providers continued to see time-sensitive scleral lens fittings and evaluations related to severe corneal irregularities. Scenarios for post-operative evaluations included those patients that had surgery before the sudden shutdown and those who had emergency surgeries during the shutdown.

		DURING SHUTDOWN				PRIOR TO SHUTDOWN	
		Scheduled (n=5924)		In person (n=1624)		In person (n=11700)	
Clinic Visit Details		Frequency	Percent	Frequency	Percent	Frequency	Percent
Cataract Visit	Cataract	112	1.89	29	1.78	267	2.28

	Retinal Cataract	2	0.03	2	0.12	9	0.08
Cornea Cross Link		6	0.10	26	1.6	39	0.33
Procedure		16	0.27	0	0	29	0.25
Contact Lens		385	6.50	105	6.47	849	7.26
Low Vision		109	1.84	26	1.60	271	2.32
Tumor		84	1.42	46	2.83	271	2.32
Post-op		396	6.68	161	9.91	812	6.94
Injection		43	0.73	58	3.57	109	0.93
Laser		11	0.19	0	0	16	0.14
Strabismus		30	0.51	6	0.37	63	0.54
Study		30	0.51	69	4.25	144	1.23

Table 3 Specialty Visit Type

Table 4 lists the fifteen (15) most frequent ICD-10 codes for both in person during the shutdown and in person prior to the shutdown. For descriptive comparison, after combining the data from both categories, nineteen (19) total diagnoses were used for analysis. Again, the frequency column represents the total number of patient encounters with the specific clinical diagnosis and the corresponding percentage based upon the total patient n. In general, those diagnoses from patients seen in person with a higher frequency during the closure included vitreous disorders (i.e., posterior vitreous detachment), corneal ulcers, optic nerve disorders, idiopathic intracranial hypertension (IIH) and post-operative care. These represented diagnoses that 1) resulted in urgent patient calls to our scheduling center; 2) required much needed post-operative care performed in the days/weeks prior to the abrupt shutdown; and 3) were previously scheduled appointments which the provider deemed time sensitive as needing to be seen. An increased frequency in the ICD-10 code for long term use of medications during the shutdown may likely have resulted from the continuation of university clinical drug trials and time-sensitive evaluations necessitated by individual study protocols.

	During Shutdown		Prior to Shutdown	
	In person (n=1624)		In person (n=11700)	
ICD10	Frequency	Percent	Frequency	Percent
Myopia	19	1.17	1238	10.58
Glaucoma suspect	16	0.99	949	8.11
Cataract extraction	77	4.74	5.52	4.72
Keratoconus	92	5.67	535	4.57
Nuclear Sclerosis cat	30	1.85	510	4.36
Open-angle glaucoma	17	1.05	454	3.88
Presbyopia	5	0.31	438	3.74
Astigmatism	12	0.74	407	3.48
Dry Eye	40	2.46	336	2.87
Cataract other	22	1.35	323	2.76
Macular degeneration	62	3.82	301	2.57
Filtering bleb	89	5.48	273	2.33
Diabetes without complication	8	0.49	267	2.28
Corneal scar	32	1.97	232	1.98
Long-term medication	65	4.00	228	1.95
Idiopathic intracranial hypertension	33	2.03	113	0.97
Vitreous disorder	50	3.08	100	0.85
Corneal ulcer	44	2.71	79	0.68
Optic nerve disease	34	2.09	76	0.65

Table 4 Comparison of top 15 ICD-10 codes at various time points (total of 19 combined diagnosis)

Discussion

The Emory Eye Center practice consists of multiple specialties, which often overlap with one another. Each of these departmental specialties includes both optometrists (ODs) and ophthalmologists (MDs). Depending on the type of specialty, some services have more MDs or ODs to accommodate the care provided. The specialties include triage and post-op care, refraction and contact lenses, low vision, specialty contact lenses, and in-patient hospital consultation. The more concentrated sub-specialty MD departments include Glaucoma, Cornea, Retina, Uveitis, Pediatrics, Neuro-ophthalmology, Oncology and Oculoplastics. Knowing this background helps to explain the higher frequencies for some of the top diagnoses pulled for the analysis such as filtering blebs, macular degeneration,

corneal ulcers, optic nerve disease, idiopathic intracranial hypertension (IIH) and cataract exams.

Being a referral facility affiliated with an academic medical center, some of the patients may have been kept on the schedule if they were referred by clinics and practices for time-sensitive or urgent matters. We have several larger hospital affiliations which provided access for care to people who would otherwise be receiving care at some of the smaller local clinics and practices, many of which were closed during the statewide shutdown. Due to a significant reduction in patient volume and need for safety precautions, not all providers were physically required to be present in the respective facilities. A formalized daily "doc of the day" schedule was ultimately established, assigning an OD or MD on a rotating basis. Generally, a provider was assigned one to two days a week, sometimes less. Other specialty providers who needed to perform urgent surgical cases or time-sensitive procedures, like vitreous body injections, may have volunteered to cover triage for the day since they knew they would need to be in clinic anyway. Comprehensive providers (mostly ODs) and corneal specialists were those primarily assigned to daily triage. This process took a couple of weeks to construct and implement as several providers had issues such as childcare, which made assigning coverage challenging.

During the time of social distancing, providers, staff and patients at Emory Hospitals and Clinics were given guidelines to stay at least six feet apart from one another. This was impossible for an ophthalmic exam, given our proximity to patients for many of the exam procedures. However, the waiting room seating was limited and adjusted. Providers were required to wear surgical masks and goggles for all patient encounters. Additionally, clear plexiglass shields were ordered and installed on all slit lamps. Studies revealed that social distancing, including citywide lockdowns, can have a positive impact for containing a COVID-19 outbreak.[3,4,9–11]Masks were required for all individuals to enter the facilities with signs posted in common areas and entry ways reminding all staff personnel and patients to keep the six feet apart distancing, as well as markings on chairs to space out seating areas. All visitors, with a few exceptions, like visually impaired patients and those needing physical assistance, were restricted. Anyone accompanying a patient was instructed to wait outside the facilities. Patients were pre-screened for temperatures over 100 degrees F, cough, shortness of breath or difficulty breathing, sore throat, congestion that differed from seasonal allergies, body aches, fatigue, loss of smell or taste, and diarrhea.

Our practice regularly cleaned all high touch areas in the exam rooms in between patients and removed all clutter such as brochures and magazines from lobbies, exam rooms and all common areas. Patient self-service coffee stations and water

dispensers were removed from our lobby areas. High touch areas such as door handles, countertops, computer keyboards/mouse and work tables were cleaned with administration approved cleaning products per CDC recommendations.[12,13]

Regarding frequency of visits as outlined in table 4, it was interesting to see that keratoconus made it as one of the top diagnoses to turn up in the higher frequencies during the shutdown, as the condition in and of itself, outside of a corneal hydrops, would not be considered emergent or time-sensitive. However, we do have several corneal specialists who perform collagen cross linking and some of these exams could have included follow up for procedures performed before the shutdown. Furthermore, our specialty contact lens department also has a high number of keratoconic patients who depend on scleral lens and rigid gas permeable services, which would make some of these exams to be considered time-sensitive; the cancellation of these services could lead to extreme visual debilitation, disrupting activities of daily living and quality of life.

As investigators and collaborators with other departments within the School of Medicine, there were several of our patients in clinical drug trials who were on a time-sensitive schedule. A substantial number of these eye exams were required as part of the study protocol, e.g., cancer treatment. Such exams are required for routine monitoring for the patient to continue with their treatment or stay in the clinical trial. There were several weeks in which additional clinical drug trial enrollment of new study patients was disallowed. However, we continued to see those who were already enrolled as part of a study. Some of these clinical trial exams included additional testing, such as OCT imaging or visual fields.

Dry eye, a common ocular diagnosis in general, was one of the top fifteen (15) ICD-10 codes. A small number (7) of patients were seen via telehealth for dry eyes. Although highly speculative, we suspect the demand to work remotely from home resulted in more frequent computer and screen time during this period. People who would normally not be using the screen as often, such as educators and students and many other professionals who would normally meet in person, were suddenly forced to switch to remote meetings and online platforms. One article stated that 42% of the US labor force was working remotely from home full time and a quick check into two major US cities, Atlanta and Chicago, indicated an expected fourfold increase of its work force had switched to working remotely from home, as compared with pre-COVID times.[14] After the clinics re-opened for routine exams, many patients confessed that they were forced to stretch out the time of how long they wore their contacts for fear of running out of replacements or because they were on their last pair. Several patients called during the pandemic because they relied solely on their contacts and either did not have back-up glasses or their glasses were not up to date. For a few weeks, it was difficult to find another optical

that was open for service, as our own optical was closed as well. All this, in combination with a new demand for longer than usual daily screen time, could be a cause for new eye-related discomfort. Previous studies have found a correlation between reduced blink rates or incomplete blinks during screen viewing[15,16] Another study found discomfort associated with screen time use more related to cognitive function, rather than blink rate. Despite the differences for the cause, it is universally accepted that increased screen time is associated with visual strain and can induce discomfort with prolonged usage.[17–19]

At Emory Eye Center, we began piloting telehealth for the first time to care for patients, but took several weeks to implement this full scale, delaying use of this delivery model. When we re-started seeing patients in person, the modality was essentially abandoned for a variety of reasons including coordination of scheduling, HIPAA-compliant video chat platform limitations and provider preferences. A related article demonstrated how the practice had incorporated telehealth. Although the article was published May of 2020, early in the pandemic, the approach was similar to that described in our clinic.[20] However due to the small number of telehealth visits in our data, we were not able to adequately compare or assess the effectiveness of the utilization of telehealth in our clinic.

The idea of telehealth is not new. Since 2015, literature reviews have pursued defining a framework for the implementation of telehealth, in particular, the promotion of video consultations as a way to reduce contagious transmission in the United States and the United Kingdom.[21] Some papers and articles mentioned countries, such as France [21] and Australia, [22,23] that promote telehealth by having a national health system response in place to reimburse telemedicine during the time of an outbreak; these countries were compared with others which did not have such a system in place. [21, 22] Two different authors who are proponents of electronic health services stressed the importance of adapting to this new method of delivering care. They found that there are challenges and necessary changes in order to make telehealth more mainstream, such as training, accrediting the health work force, providing flexible funding arrangements, and finding a way to seek reimbursement for these remote or online services during an outbreak.[21,22] Additional studies looked at the feasibility of telehealth medicine and concluded that although telehealth can be a useful tool in healthcare, there are still limitations to its utility and that the acceptance of telehealth still requires a significant change in management effect, as well as a need to redesign current models of care.[10,22] There is currently a lack of regulatory framework for integrating telemedicine in the delivery of patient care during an emergency or outbreak surge.[21] We have also found this to be true for our clinic. Literature shows that healthcare systems which already invested in telemedicine were in a better position to accommodate COVID-19 patients.[24] Prior to the pandemic, at least 15% of physicians worked in practices

that use telemedicine, and adoption of telehealth by private insurers has increased by 50% per year for most of the decade.[25] Many other ophthalmology practices and academic medical centers in the United States have implemented similar protocols as well.[26] Despite COVID-19 cases remaining elevated in our area during the time of this current analysis, much has been learned in handling the pandemic with ensuing steps to re-open and seeing patients again. It is certainly worth exploring the incorporation of telehealth in the event of any future new outbreak with an unfamiliar virus.

There were some limitations and challenges of this study. The results became a description of our data because we discovered that it was impossible to conduct a direct statistical analysis. One database was designed for template scheduling while the other was designed based on a schedulers' assignment for where the patient will go according to the scheduling template. Between these two datasets, the linking was imperfect as not everything that was scheduled had a direct match to existing provider templates. Additionally, the visit description between the scheduling database and the visit database was slightly different. So, it is possible that something was designated as one reason for scheduling and something else for the visit database. Lastly, we had to use the global ICD-10 code due to voluminous diagnoses and the patient visit volume was significantly higher in the pre-closure period, making statistical comparison inaccurate.

CONCLUSION

Although our numbers for data analysis during closure were too small to devise an evidence-based algorithm, there were still several lessons we learned from this first wave of the COVID-19 pandemic such as: 1) how to predict which patients may be more time-sensitive or urgent from a pre-determined list of diagnoses; and 2) how to immediately establish an ophthalmologist/optometrist (MD/OD) daily triage coverage schedule. We found it difficult to successfully incorporate a significant number of telehealth visits because most eye conditions, which were already deemed urgent by our call center, were in general considered conditions that required further evaluation by a provider. We believe that prompt delivery models of urgent and time-sensitive care can provide relevant data for predictive purposes and lessons learned for future unexpected events.

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