

Assessing optometric care delivered by telehealth during the COVID-19 public health emergency

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Abstract

Background: The emergence of coronavirus disease 2019 (COVID-19) forced many eye care providers to implement telehealth services while in-person visits were reserved for essential and/or emergency eye care.

Objective: This study documents how an optometry group successfully implemented telehealth to care for patients during the outbreak of the COVID-19 pandemic in the United States.

Design: Retrospective, comparative case series.

Methods: Records were reviewed for patients seen in an academic optometry clinic from 23 March through 7 April 2020, the period of the Massachusetts stay-at-home advisory issued in response to COVID-19. Patients who completed telehealth visits were compared with those who received in-person care. Services delivered by telehealth included a check of symptoms, medication refills, health education, and assurance of future follow up. The study took into account the reason for each visit, as well as the rate of scheduled and completed follow-up appointments. Patient satisfaction with in-person care was evaluated by Press Ganey patient experience surveys.

Results: Out of 855 patients scheduled, 421 patients completed telehealth encounters (49%), and 46 patients completed in-clinic visits (5.4%). A further 272 patients canceled appointments (32%), 123 patients were unable to be contacted (14%), and 8 patients declined care offered by telehealth (0.94%). Most patients who were cared for by telehealth returned to see optometrists (88%). By contrast, most patients who required in-person visits during this period were subsequently seen by ophthalmologists (58%, $p < 0.001$). Patient satisfaction remained high for in-person visits that took place during the COVID-19-related emergency, with improvements noted in patient satisfaction regarding 'information about delays' (47% versus 100%, $p = 0.007$) and 'concern for questions or worries' (76% versus 100%, $p = 0.037$) compared with the same period 1 year prior.

Conclusion: Optometrists rapidly embraced telehealth to deliver eye care to their patients during the COVID-19 public health emergency. Most eye issues were able to be addressed through telehealth; urgent eye problems were triaged and referred to the optometry clinic, when appropriate.

Keywords: COVID-19, patient satisfaction, quality improvement, telemedicine

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Introduction

The sudden emergence of coronavirus disease 2019 (COVID-19) forced many businesses to pause their operations, including many eye care practices.^{1,2} Stay-at-home advisories caused many health facilities to shut down to protect the safety

of both patients and staff.¹ Larger and well-equipped clinics, especially those associated with medical centers, transitioned to providing eye care through telehealth visits and limited in-person services to essential and/or emergency eye care.²⁻⁸ Telehealth involves the delivery of healthcare

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services, health education, and outreach to patients remote from the clinic by means of synchronous telephone or tele-video technology.

This study assesses the rapid, transformative experience of a university-based optometry practice that adopted telehealth to care for patients after the recognized outbreak of COVID-19 beginning in March 2020 in the United States. We also evaluate patient satisfaction with in-person eye care delivered during the COVID-19 public health emergency by comparing patient experience surveys collected during this period with the same period 1 year before the COVID-19 outbreak. Finally, we examine the rate of return for recommended, in-person eye care in the period after the local stay-at-home advisory imposed at the time of the public health emergency.

Methods

In Massachusetts, the state declared a public health emergency on 15 March 2020,¹ which expanded to include a stay-at-home advisory announced by the Governor of Massachusetts, Charlie Baker, on 23 March 2020.⁹ Telehealth was fully deployed at our medical center in response to the COVID-19 stay-at-home advisory that limited in-person care.^{2,10} Telehealth was delivered to any patient who could not be seen in clinic because of prevailing public health conditions,¹¹ or as a method for triaging eye complaints of patients who contacted the clinic without a previously scheduled appointment. Responsibility for telehealth visits was assigned on a rotating basis and often without reference to prior relationships to the patients. Telehealth visits were conducted by telephone or tele-video technology, for example, FaceTime® (Apple Inc., Cupertino, CA, USA). Services delivered by telehealth included a check of symptoms, refilling of any medications, health-related education, and assuring future follow-up.

The records of all patients seen by the optometry service of the Lahey Medical Center, Peabody, Massachusetts, were reviewed from March 23 through the end of the stay-at-home advisory which ended on 7 April 2020. Demographic information, including age, sex, race, and appointment history, was extracted from the electronic medical record. The reason for each encounter was based on the patient's presenting complaint

and/or billed ocular diagnosis. These diagnoses were separated into the following categories: external disease, including dry eye/blepharitis/lid pathology; retinal conditions; glaucoma-related conditions; refractive and routine eye health, for example, history of cataracts or contact lens use; and all other eye conditions, including new and acute miscellaneous problems. It was also noted whether the telehealth visit was initiated by the clinic (a scheduled examination converted to a telehealth appointment) or by the patient (new patient or problem-specific). Incomplete visits were subcategorized into those where (1) a patient declined a telehealth encounter when contacted, (2) a call went unanswered, or (3) a call went through to voicemail which made it possible for the provider to leave a message. By contrast, canceled telehealth visits were those where patients, or someone acting on their behalf, actively canceled the appointments on or before the date and time of the scheduled visit. Patients were excluded from the analysis if they died, moved out of state, or had a documented transfer of care to an outside provider.

Assessment of patient satisfaction

The 15-item Medical Practice Survey was used to assess patient satisfaction (Press Ganey Associates, LLC).¹² Outpatient discharge records from patients seen in-person in the optometry clinic were randomly selected for postal mailings. The period of the COVID-19-related public health emergency (March 2020–May 2020) was compared with the same period 1 year prior and was limited to those providers who provided outpatient optometry services during both periods. Completed questionnaires were collected by mail, Internet, and phone. The survey response format was Likert-type, on a scale from 1 to 5 as follows: Very Poor (1), Poor (2), Fair (3), Good (4), Very Good (5). A patient was considered satisfied with their experience in each category if they gave it a very good rating of 5. Scores of 1 through 4 were considered low satisfaction.

Statistical analysis

SPSS® statistics version 27.0 (IBM Corp., Armonk, NY, USA) was used to analyze data. Categorical variables are presented as percentages and compared using the two-sided χ^2 test with significance judged at the 5% level ($p < 0.05$). Data for continuous variables are recorded as

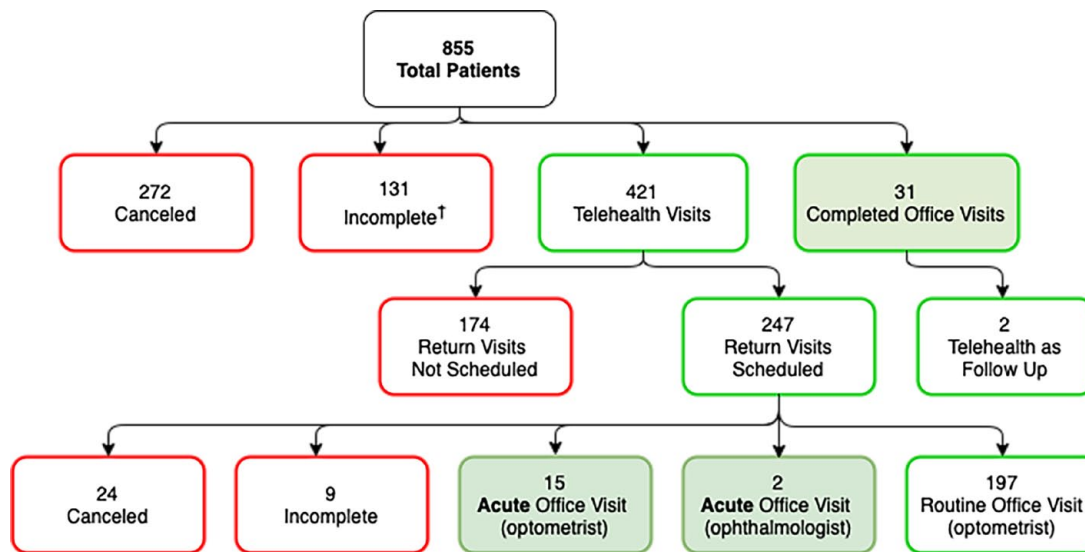


Figure 1. Patients who received optometric care during the period of the COVID-19 stay-at-home advisory in Massachusetts. †Incomplete visits include eight patient who declined telehealth visits when contacted and did not schedule or complete a return visit.

mean \pm standard deviation (SD) and compared using the two-sided Student's *t* test with significance judged at the 5% level ($p < 0.05$).

Results

During the study period, 855 patients were scheduled to be seen by one of four Doctors of Optometry (Figure 1). Most patients cared for during the period of the stay-at-home advisory received telehealth (93% of total): 404 patients were managed with telehealth alone (89%), 29 patients received in-person care without telehealth as triage (6.9%), 17 patients had a combination of telehealth as triage followed by an acute in-person visit (3.8%), and 2 patients received telehealth after an in-office visit (0.44%). Nearly all telehealth visits were completed by telephone. Less than 1% of all telehealth visits utilized tele-video technology, and even in those cases, visits were usually initiated by telephone (data not shown). In-clinic volume precipitously declined to just 46 optometry encounters over this same period, a 96% reduction from the same period 1 year prior. If we include care delivered by telehealth, the reduction in volume was 40% as compared with the prior year. Most patients who completed telehealth were established patients (93%). By contrast, many patients who required in-person care were patients new to the department (39%, $\chi^2 = 112.7673$, $p < 0.001$).

Out of the 855 patients for whom optometric care was available by means of telehealth, 272 patients canceled appointments (32%). We were unable to differentiate between patients who canceled their appointments by calling the clinic and those who used the automated appointment system. Patients who did not call to speak to someone were likely to be aware of telehealth as an option for remote eye care. A further 131 appointments converted to telehealth were incomplete, of which 123 patients could not be reached (14%). Voice messages were left by providers for 90 of those patients (69%). Finally, eight patients who were reached by providers declined eye care offered by mean of telehealth (0.94%).

With regard to the demographic characteristics of patients cared for during the period of the stay-at-home order, most patients were older (64.0 ± 16.4 years; median 66 years), identified as White, non-Hispanic (90%), and were predominantly female (58%). There was no difference in age, race, or gender when we compared patients who completed telehealth visits with those who received in-person care (Table 1). By contrast, patients for whom telehealth was incomplete tended to be younger (57.5 ± 17.6 years; $p < 0.001$) and were less likely to identify as White, non-Hispanic (83% versus 90%, $\chi^2 = 4.2595$, $p = 0.039$).

The types of eye problems commonly treated by telehealth were significantly different from those

Table 1. Demographic and clinical characteristics of patients who completed telehealth.

Characteristics	Telehealth		<i>p</i> value ^b	Office visits (<i>n</i> = 46)	<i>p</i> value ^c
	Completed (<i>n</i> = 421)	Incomplete ^a (<i>n</i> = 131)			
Age (years)					
Mean (SD)	64.3 (16.4)	57.5 (17.6)	<0.001	60.8 (16.9)	0.175
Median	66	59		64	
Sex					
Female	58%	57%	0.886	61%	0.704
Race					
White (non-Hispanic)	90%	83%	0.039	93%	0.656

SD, standard deviation.

^aIncludes eight patients who declined TH visits when contacted (1.9%).

^bComparison between patients who complete a TH visit and those for whom the visit was incomplete.

^cComparison between patients who complete a TH visit compared with those who completed an in-office visit.

Significance is marked in bold ($p < 0.05$).

that required in-office management ($F_{1,8} = 5.496$, $p = 0.047$). Primary diagnoses for telehealth encounters included 40% who were seen for retina-related conditions (including 22% for diabetes with or without retinopathy); 24% for routine care/refractive issues (including 10% who had a history of cataracts); 14% for external disease, including dry eye/blepharitis/lid pathology; 13% for glaucoma and related conditions; and 8.8% for other eye issues, for example, eyestrain and migraine headaches. The primary reasons for in-office visits were as follows: 39% for external disease, 28% for retina-associated conditions (including 6.5% for diabetic retinopathy), 4.3% for glaucoma and related conditions, and 28% for other eye issues, for example, corneal foreign bodies or double vision (Figure 2).

Of the 46 patients who completed in-person visits to the optometry clinic, 17 patients did so after a telehealth encounter for triage. Optometrists cared for 15 of those patients (88%), 9 of whom were seen within a day of the telehealth encounter (5 of those patients were also new to the practice). The reasons for those visits included symptoms attributed to acute posterior vitreous detachments, progression of age-related macular degeneration, a suspected ocular foreign body, punctal plug dysfunction, trichiasis, and a case of acute chemical conjunctivitis. Although a similar number of patients managed by telehealth and in-clinic visits had retina-related conditions (40% versus 28%, $\chi^2 = 2.576$, $p = 0.109$), a substantially larger

proportion of patients with diabetes and/or diabetic retinopathy were managed remotely (22% compared with 6.5%, $\chi^2 = 5.6714$, $p = 0.017$). However, those patients seen in the clinic generally had more urgent complaints, including two patients who were referred directly to an ophthalmologist after telehealth with an optometrist. Both of those patients had complaints of acute vision loss and a known history of diabetic retinopathy. One of those patients was ultimately diagnosed with acute vision loss from worsening diabetic macular edema and the other had decreased vision attributed to a vitreous hemorrhage because of high-risk proliferative diabetic retinopathy that ultimately went on to treatment with panretinal laser photocoagulation.

Impact of COVID-19 on patient follow-up

Return visits were ordered for 71% of the 421 patients who completed telehealth visits. By comparison, 84% of the 46 patients seen in-person had a specific follow-up order placed ($\chi^2 = 6.7229$, $p = 0.010$). The timing for recommended follow-up was significantly sooner for patients seen in-person compared with those who received telehealth (34 ± 38 days versus 98 ± 34 days, $p < 0.001$). The likely reason for this difference is the greater urgency of eye conditions experienced by patients who required in-person care. Interestingly, a similar rate of those patients recommended to return did so after completing a telehealth visit, compared with an in-person visit

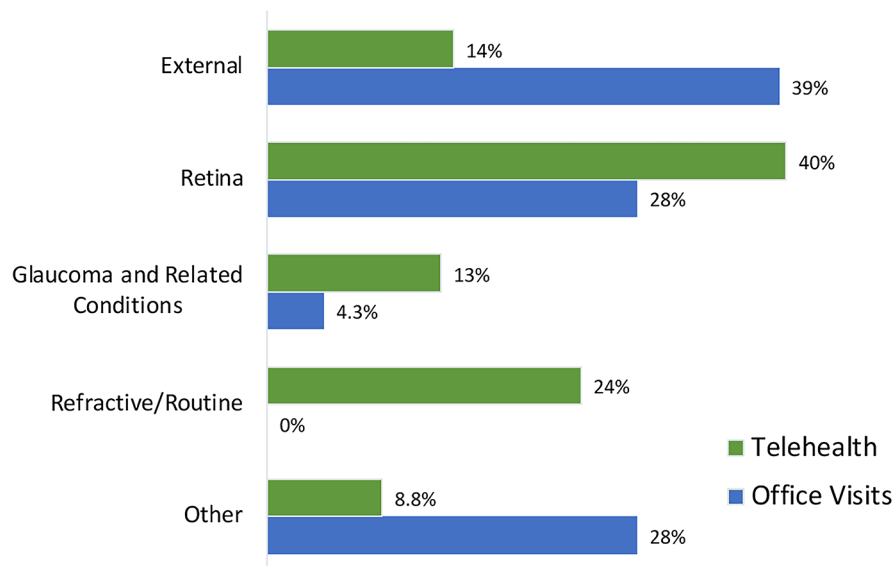


Figure 2. Reasons for completed appointments.

(71% versus 76%, $\chi^2 = 0.3261$, $p = 0.568$). The majority of return, in-office visits were completed by patients after the lifting of the stay-at-home advisory (80% versus 6.9%). A further 10% of patients canceled their scheduled appointments, and 3.6% failed to show for their scheduled appointments. There was no association between diagnosis and likelihood of in-person return (data not shown).

Most patients of the 421 patients who were able to be cared for by means of telehealth returned for future care with optometry (88%). By contrast, fewer patients who required in-person care were subsequently retained by optometry (42%, $\chi^2 = 38.7438$, $p < 0.001$). Instead, they were more often seen by an ophthalmologist for follow-up care.

Impact of COVID-19 on patient satisfaction

Although significantly fewer outpatient, in-person visits took place during the months encompassing the COVID-19-related health emergency, there was no difference in the rate at which patient experience surveys were returned at our institution compared with the same period 1 year prior (data not shown).⁵ A total of 23 patients returned patient satisfaction surveys that spanned the period of the stay-at-home advisory in 2020. These were compared with 48 surveys returns evaluating care delivered by the same optometry providers over an equivalent period in 2019. Patient satisfaction

regarding ‘Information about delays’ in the optometry clinic doubled during the COVID-19 period, compared with the prior year (47–100%, $\chi^2 = 7.370$, $p = 0.007$), while satisfaction with overall care and safety remained high during both periods (Table 2). Patient ratings of the ‘Care provider’s concern for questions or worries’ also rose for visits that took place during the peak of the COVID-19 outbreak (76–100%, $\chi^2 = 4.331$ $p = 0.037$). One area where patient satisfaction did not show improvement was with ‘Wait time at clinic’. This may reflect challenges in access related to COVID-19 safety restrictions.^{2,3,5}

Discussion

During the period of a stay-at-home advisory issued in response to the outbreak of COVID-19,⁹optometrists in our practice rapidly and effectively transitioned to providing eye care by means of telehealth services.⁵⁻⁷ In contrast with other practices, including those in neighboring US states that temporarily closed or had reduced availability because of the prevailing public health conditions, our optometry service which is associated with an academic medical center remained open and available to deliver eye care uninterrupted. Limiting the number of in-person visits to urgent or emergent conditions helped to make possible social distancing designed to reduce the spread of the COVID-19 virus.^{2,5} Our study found that younger patients and those from racial and/or ethnic minority groups were less likely to access

Table 2. Patient satisfaction results for patients seen in the optometry clinic.

	COVID-19-related health emergency (%) ^a	Prior year (%) ^b
Access		
Ease of scheduling your appointment	92.9	72.7
Ease of contacting (e.g. email, phone, web portal)	91.7	n/a ³
Moving through your visit		
Degree to which you were informed about any delays	100	46.7
Wait time at clinic (from arriving to leaving)	50	65.2
Nurse/assistant		
How well the nurse/assistant listened to you	66.7	n/a ^c
Concern the nurse/assistant showed for your problem	83.3	68.4
Care provider		
Concern the care provider showed for your questions or worries	92.3	76.2
Explanations the care provider gave you about your problem or condition	100	81.8
Care provider's effort to include you in decisions about your care	92.3	76.2
Care provider's discussion of any proposed treatment (options, risks, benefits, etc.)	92.9	n/a ^c
Likelihood of your recommending this care provider to others	92.3	81.8
Personal issues		
Our concern for your privacy	88.9	81.3
How well the staff protected your safety (by washing hands, wearing ID, etc.)	100	80.9
Overall assessment		
How well the staff worked together to care for you	90.9	87.0
Likelihood of your recommending our practice to others	92.3	87.0
^a Patient experience returns ¹² for the period during the peak of the COVID-19-related public health emergency (March 2020 to April 2020, <i>n</i> = 23). ^b Patient experience returns 1 year prior to the COVID-19-related public health emergency (March 2019 to April 2019, <i>n</i> = 48). ^c The 15-question revised Medical Practice Survey (2019) added several questions to better measure certain aspects of the patient overall experience, as well as made other minor changes to the instrument. ¹³		

telehealth services, a finding reported by others.¹⁴ Further efforts need to be made to improve health equity. This is especially important because the number of patients from diverse backgrounds continues to increase,^{15,16} including at our medical center (data not shown).

Our study demonstrates that eye care delivered by optometrists by means of telehealth is readily accepted by most patients, and that telehealth can be effectively used to triage, as well as provide follow-up care for certain patients and eye conditions.⁶⁻⁸ The majority of patients brought into the

clinic for potentially serious eye complaints were new to the practice. Because providers typically lacked access to prior eye examination data for those patients, it made sense to bring those patients in to the clinic in greater numbers to ensure that undiagnosed eye disease was not overlooked. By contrast, the majority of patients served by telehealth were established patients. An existing relationship with a patient, especially if it provided access to a baseline comprehensive eye examination, even if previously performed by another member of the practice, provided an additional level of comfort to providers using this new method of eye care delivery. Hybrid visits, where clinical data and diagnostic testing are either gathered asynchronously or historic data are reviewed to guide the management of eye disease, have been shown to improve access, reduce costs, and increase equity in healthcare.^{13,17,18}

Previous studies have demonstrated that teleophthalmology can decrease the need for certain types of in-person visits and provide effective health education to maintain or even strengthen the therapeutic relationship between patient and provider.^{5,19–23} Our study supports a role for telehealth as a method for identifying patients with serious eye problems that require in-person care or a referral for medical or surgical interventions, most often provided by ophthalmologists.^{6,24} It is our hope that telehealth will continue to play such a role in future optometric care beyond the period of the acute outbreak of COVID-19, and that it will encourage further collaboration between optometrists and ophthalmologists.^{14,25,26} Telehealth may also be executed to increase provider productivity, if used as a part of comprehensive eye care. A study in the Veterans Affairs Healthcare System found an increase in provider productivity by including telehealth services alongside in-person care.²⁷

A majority of patients who utilized telehealth services scheduled an in-office, return visit to the optometry clinic, and completed those visits after the lifting of the 2-week stay-at-home advisory. Notably, no patients included in this study were identified as having lost vision as a direct result of delayed or missed eye care. In addition, all patients who required in-person evaluation were able to visit the eye clinic safely during the study period despite disruptions to normal clinical operations caused by COVID-19. It is somewhat contrary to what one would expect that younger patients were more likely to have an incomplete

telehealth encounter, especially since younger patients generally have more favorable attitudes toward telehealth²⁴ and more commonly have access to mobile phones, including those equipped with smartphone technology which are ideal for providing many telehealth services.²⁸ Possibly younger patients faced different impediments or responsibilities during the early stages of the COVID-19 pandemic or may simply not have required these services.

Finally, the positive response to optometric care delivered under the extraordinary circumstances after the outbreak of COVID-19 is reflected in the high level of patient satisfaction recorded by patients seen over this period. The large number of patients who returned after these telehealth visits for in-person care also shows that these services not only resulted in continuity of care but maintained the patient–doctor relationship. In total, 20% of all in-person optometric visits during this period were preceded by a telehealth visit as triage, that is, 9 out of 46 patients were seen within a day of a telehealth encounter. Although patient experience surveys did not include patients who received exclusively telehealth, our results likely reflect the opinions of a subset of such patients who received telehealth services prior to an in-person visit. Prior studies that evaluate patient satisfaction with outcomes of teleophthalmology note that patients are highly satisfied with this type of service of delivery, and patients have reported feeling confident that the accuracy of the evaluation was comparable to that of an in-office visit.^{19,23,29–31} Future studies are needed to determine whether increased access to tele-optometric services improves patient satisfaction with eye care in the period beyond the COVID-19 public health emergency.

The limitations of the present study include its retrospective nature and focus on a suburban population based at a single academic medical center. Most patients who received telehealth services during the early part of the COVID-19 outbreak did so because they had existing appointments converted to telehealth. The actions taken by providers were also left to individual clinical judgment and were governed by a standardized set of telehealth guidelines.⁵ Our analysis of clinical events extracted from the electronic medical record cannot, of course, take into account patients who were offered telehealth but declined or were never scheduled for such services. Our study also does not account for other

barriers to care, such as level of education, transportation, or specifics related to socioeconomic or employment status, all of which could affect the ability of patients to access telehealth or follow-up. It is also possible that we overestimated the rate at which patients failed to complete follow-up care because we could not take into account patients who may have received care from practitioners in the community, especially after the end of the acute period of the COVID-19 public health emergency. Finally, the short-term nature of our evaluation under the very specific conditions of the COVID-19 pandemic limits our ability to draw conclusions about how telehealth will affect the longitudinal risk of patients failing to return for care or becoming lost to follow-up or their satisfaction with telehealth services outside of the public health emergency caused by the pandemic. Future studies should ideally include a longer study period, larger sample size, and assess visual outcomes for patients engaged by telehealth in the period after the pandemic.

In conclusion, the COVID-19 pandemic caused many patients to miss or delay optometric visits. To compensate for these gaps in care, providers had recourse to telehealth to evaluate patients for symptoms of disease progression and to provide health education on the importance of continuous monitoring. In addition, telehealth served as an important method for triaging patients with serious or urgent eye complaints, and it provided follow-up care for others. In sum, optometrists rapidly embraced telehealth to deliver eye care and maintain meaningful clinical connections with their patients during the COVID-19 public health emergency. Future studies should ideally seek to determine whether telehealth delivered as a part of ordinary optometric care can help improve outcomes for our patients.

Declarations

Ethics approval and consent to participate

The research followed the tenets of the Declaration of Helsinki and was approved as a quality improvement initiative by the institutional review board of the Lahey Hospital & Medical Center, Burlington, MA. Information was gathered and secured in compliance with the Health Insurance Portability and Accountability Act. The requirement for informed consent was waived because of the retrospective nature of the study and a waiver [20203092, 05/07/2020] granted by the institutional review

board of the Lahey Hospital & Medical Center, Burlington, MA.

Consent for publication

Not applicable.

Author contributions

Justine H. Pidgeon: Data curation; Formal analysis; Investigation; Writing – original draft.

Mahesh K. Bhardwaj: Formal analysis; Writing – review & editing.

Patrick Titterington: Formal analysis; Writing – review & editing.

Karen Latulippe: Formal analysis; Resources; Writing – review & editing.

Shiyoung Roh: Formal analysis; Supervision; Writing – review & editing.

David J. Ramsey: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Supervision; Writing – original draft; Writing – review & editing.

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Competing interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to the use of confidential patient medical record data. Participants of this study did not agree for their data to be shared publicly, so supporting data are not available.

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Supplemental material

Supplemental material for this article is available online.

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