Clinical Ophthalmology

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ORIGINAL RESEARCH

Approach of an Academic Ophthalmology Department to Recovery During the Coronavirus Pandemic

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Introduction: A methodology for safe recovery of an ophthalmology department during a pandemic does not currently exist. This study describes successful recovery strategies for an urban, multi-specialty ophthalmology department serving a high-risk patient population.

Methods: The study took place at a large multi-specialty tertiary care academic ophthalmology department in a metropolitan city during a seven-month period (March–October 2020). Five recovery ad hoc committees were charged with formulating metrics and initiatives to manage clinical volumes while maintaining safe practices, providing patient access, and minimizing financial damage. A six-tier system was created to resume non-urgent appointments in May 2020. Educational and research activities were maintained through the development of virtual curricula and research platforms.

Results: The number of clinical and surgical visits per month in 2020 compared to 2019 and the time to reach ≥95% of pre-COVID patient volumes were monitored. In October 2020, ≥95% of pre-COVID volumes were attained (11,975 vs 12,337 patient visits in October 2019; 266 vs 272 surgical cases in October 2019). Despite significant financial losses, the department surpassed December 2019 collections in December 2020. No faculty, staff, or trainees received furloughs or pay cuts. There was no COVID-19 transmission between faculty, staff, and patients.

Discussion: With strategic implementation of recovery strategies following CDC safety measures, it was possible to safely deliver care to patients with urgent and non-urgent eye conditions. Patient volumes were fully recovered in an ambulatory urban healthcare setting within a high-risk COVID-19 population within seven months while educational and research missions were successfully sustained.

Keywords: coronavirus, COVID-19, ophthalmology, resurgence, pandemic

Introduction

The vast disruption in clinical care worldwide by the novel coronavirus syndrome COVID-19, caused by exposure to coronavirus 2 (SARS–CoV-2) underscores the importance of employing strategic approaches to delivery of care during a pandemic. The first cases of COVID-19 appeared in December 2019 in Wuhan, China.[1] The first case of COVID-19 in the United States was reported in Washington State on 01/20/2020, and on 03/11/2020, the World Health Organization (WHO) officially declared the COVID-19 outbreak a pandemic.[2,3] In response to this, healthcare facilities around the globe began triaging patient care by limiting access to care for non-emergency services in order to curtail viral spread.[4–6] Global lockdown, coupled with reluctance of patients to seek care during the pandemic, led to disruptions in ophthalmic care of patients around the world, worsening visual outcomes due to delay in providing timely treatments.[7,8] Additionally, the restrictive measures taken to reduce the spread of COVID-19 affected ocular health in other ways. For example, the switch to remote work and school, which frequently involve prolonged use of video display terminals, has increased the risk of ocular surface disorders, such as dry eye disease (DED), by causing changes in the precorneal tear film.[9]

Received: 2 October 2021
Accepted: 18 January 2022
Published: 8 March 2022

Ophthalmology departments were severely impacted due to the necessity of close proximity to patients, thereby increasing the potential risk of COVID transmission, which primarily occurs by inhalation of direct or airborne respiratory droplets.[10,11] Ocular transmission, while much less common than respiratory transmission, was also a concern for ophthalmologists. COVID-19 can cause conjunctivitis due to the dynamism of the ocular surface system and the distribution of ACE2 receptors and TMPRSS2 proteins, both of which play a role in the virus's cell entry.[12] There is disagreement over the prevalence of conjunctivitis in COVID patients. Most studies have not investigated the antiviral side effects of topical ophthalmic medications, which may help to prevent COVID transmission through the eyes.[13] Nevertheless, most studies agree that ophthalmologists were at higher risk of COVID-19 not only due to close proximity to patients, but also through possible transmission through tears.

Contraction of COVID-19 is of serious concern, as the virus can be severe and potentially fatal, particularly in the presence of comorbidities. As of September 2021, more than 42 million cases of COVID-19 and more than 672,000 deaths have been reported in the United States.[14] The city of Philadelphia has seen more than 171,000 cases and 3840 deaths and has a High Risk of Community Transmission, according to city officials.[15] Philadelphia also has a COVID-19 Community Vulnerability Index of 0.8 and Social Vulnerability Index of 0.95, according to the Centers for Disease Control and Prevention (CDC).[16]

Though vaccinations have undoubtedly provided a powerful tool to minimize COVID-19 transmission, the United States is currently experiencing a fourth wave of coronavirus cases. As of September 2021, 64% of eligible individuals in the United States are fully vaccinated,[17] and average weekly case counts are nearly 300% higher compared to the same period in 2020, according to Johns Hopkins University.[18] The emergence of the contagious Delta variant, low vaccination in some communities, global disparities in vaccine access, and easing of public health measures likely all contribute to this most recent surge. Uncertainties remain about waning immunity from vaccines or future emergence of virus variants.[19] The methodology described in this report may be applicable not only to future pandemics, but also to potential future surges of COVID-19.

A major challenge during the nationwide lockdown and afterward was the shifting guidance from organizations like the CDC and the American Academy of Ophthalmology (AAO). For example, in March 2020, the AAO recommended that ophthalmologists only see urgent cases, but the definition of "urgency" was unspecified.[20] As a result, the treatment of patients during the lockdown and the safe reopening of practices was largely left to the discretion of individual practices. Security against medical liability was also threatened by the lack of universal guidelines and of protocols regarding the sanitation of operating rooms.[20] This paper aims to assist other ophthalmology departments and clinics by outlining an effective approach to reopening in a safe manner.

From the standpoint of safe delivery of routine eye care, the most significant challenge was to care for patients while protecting patients, physicians, trainees, and staff from contracting COVID-19. Further, achieving financial stability was an undeniable priority when faced with a pandemic that had no definite endpoint in sight. Our department was fortunate to learn from institutions in New York City, which suffered from extreme viral surges and had very limited access to personal protective equipment (PPE) in the early phase of the pandemic. With lessons taken from New York and the broader ophthalmology community, we report a multilayered approach to address the clinical and practical challenges of academic ophthalmology department recovery, including managing patient lobby and waiting room volumes with key metrics, ensuring effective communication about the virus, re-organizing spaces for imaging to allow for social distancing, mitigating financial losses, supporting our educational mission, and maintaining research productivity.

Methods

In accordance with nationwide and global shutdowns to limit viral spread, the department cancelled all non-urgent patient appointments and elective eye surgeries beginning the week of 03/16/2020. A detailed decision tree was created for each subspecialty to distinguish between emergent, urgent, and non-urgent patients so that patients could be appropriately triaged (Supplementary Material). Providers continued to see emergent and urgent conditions in their clinics, and patients with emergent symptoms were also directed to the same-day appointment clinic, which remained open throughout the pandemic. A number of safety measures were implemented for these in-person visits, in accordance with CDC guidelines. These

included (but were not limited to) thorough patient pre-screening, thermo-scanning, face covering requirements, use of COVID isolation rooms, social distancing in waiting areas, and limited visitation (detailed in Supplementary Material).

In May 2020, the clinical recovery of the department began with an attempt to safely bring back patients and staff in phases, carefully working through a backlog of approximately 11,500 appointment cancellations. The cancellations, recorded by date and time, were provided to the physicians to triage into six groups. These groups were: 1. emergent patients, who received same day appointments; 2. urgent patients, who received appointments within one week; 3. patients who could be deferred to within four weeks; 4. elective appointments, which were rescheduled within five to nine weeks; 5. telemedicine appointment as a videoconference visit; and 6. telemedicine appointment as a telephone visit. This effort was accomplished by technicians working from home, making more than 18,000 phone calls to patients for scheduling appointments and surgeries. For cancelled surgeries, the Medically Necessary Time-Sensitive (MeNTS) Prioritization system was used to determine priority when reintroducing surgical appointments.[21]

The leadership of the department created five physician-led resurgence ad hoc committees to drive department recovery efforts and develop strategies to safely manage increasing patient volumes (Table 1). These ad hoc committees addressed Clinical Visit Scheduling, Surgical Scheduling, Telemedicine, Telemedicine Enhancement Pathway (TEP)—an initiative started to bring patients onsite for imaging/testing and follow-up virtually with physicians to review results), and Education/Research. This research was exempt from institutional review board approval as no identifiable patient data was used and the research poses no risk to patients.

Results

The action items of the ad hoc committees included communicating with staff about COVID-19, monitoring lobby and waiting room volumes, improving patient access to healthcare, implementing COVID-19 safety measures, providing full PPE for faculty, trainees, and staff, mitigating financial loss to the department, and maintaining education and research initiatives. The creation of ad hoc committees was effective in ensuring steady progress toward committee goals and communicating emerging COVID-19 information to the department.

Frequent and Organized Communication

Weekly faculty meetings were held virtually during the first several months of the pandemic, with progress reports provided by ad hoc committee chairs. Two department-wide virtual safety meetings were held to educate staff about COVID-19 mitigation measures adopted by the department. A question-and-answer session was held during each of the two safety meetings to address COVID-19 related concerns submitted anonymously by faculty and staff. This format allowed employees to comfortably voice anxieties and seek answers. The safety meeting also reviewed workplace hygiene, safety policies, and employee expectations, including proper handwashing and wearing personal protective equipment (PPE).

Table 1 Purposes of the Resurgence Task Force Subcommittees

Subcommittee	Purpose
Clinical Visit Scheduling	-Lead the phasing back of clinical visits using a 6-tier system to assign appointment type based on urgency.
Surgical Scheduling	-Lead the phasing back of surgical visits using MeNTS[17] to determine priority in phasing surgical appointments.
Telemedicine	-Manage the increase in virtual patient visits, beginning in March when non-urgent in-person appointments were cancelled.
Telemedicine Enhancement Pathway (TEP)	-Implement a system for providing imaging and testing to patients in-person, followed by a virtual visit (rather than an in-person visit) with a physician to discuss results and treatment plans.
Education and Research	-To preserve tripartite mission in compliance with evolving CDC guidelines.

Implementation of Key Metrics

In order to allow for social distancing, spatial changes were implemented in waiting areas to limit viral spread. At each of four clinical care locations, staff members began monitoring and recording lobby and waiting room patient volumes every two hours. The maximum waiting room capacity was determined for each waiting area based on the number of patients who could be seated while maintaining six feet of social distancing. Overflow waiting areas were designated once maximum capacity was reached. During the initial steps of recovery in May 2020, department leadership determined it was safe for physicians to see a maximum of 15–20 patients per day. This first step of returning to patient care was during a time when there was significant fear about contracting COVID-19, strict social distancing rules limiting volumes of waiting areas, and still scarce data about how safe ophthalmic patient care could be conducted. Every few weeks, the maximum number of patients seen per day increased, and by October 2020, guidelines had been raised to 40 patients per day.

Patient volumes were measured and reviewed weekly. At the start of the pandemic, patient volumes dropped from 10,323 patients/month in February 2020 to 2130 patients/month in April 2020. Similarly, surgical volumes dropped from 242 cases/month in February 2020 to 41 cases/month in April 2020. With strategies in place to prevent the spread of COVID-19, the department reached ≥95% of pre-COVID clinical and surgical patient volumes in October 2020 (Figure 1A and B).

New Initiatives for Patient Access

In order to address the backlog of cancelled patient visits and to improve access for new patients, modifications were made to each physician's clinical schedule. This included creation of 4 freeze-thaw slots for each physician. Freeze-thaw slots are appointments that must remain "frozen" (or held from scheduling) until four days prior to the clinic date. The appointment "thaws" (or becomes available for scheduling) within the four-day window. The idea for this policy stems from research demonstrating that better access to timely healthcare improves patient compliance.[22] While extended patient care hours were not mandated, a large number of physicians added extended clinic hours during mornings, evenings, and weekends from May 2020 until the fall of 2020. Extended hours into the evenings were scheduled by physician preference and in-line with existing guidelines; extended hours enabled physicians to offer care to any patients with time-sensitive needs. Weekend schedules varied by physician and could allow for increased volumes for a single provider if the waiting areas were not shared with other physicians simultaneously. During extended and weekend hours, staff generally did not necessitate overtime pay. Reduced patient volumes during regular hours required fewer staff, and thus the need for staff was spread into extended hours and weekends; this helped staff meet their expected wages. To increase capacity and ensure social distancing, the photography suite at the largest clinical site was renovated and re-organized to allow more patients to be tested.

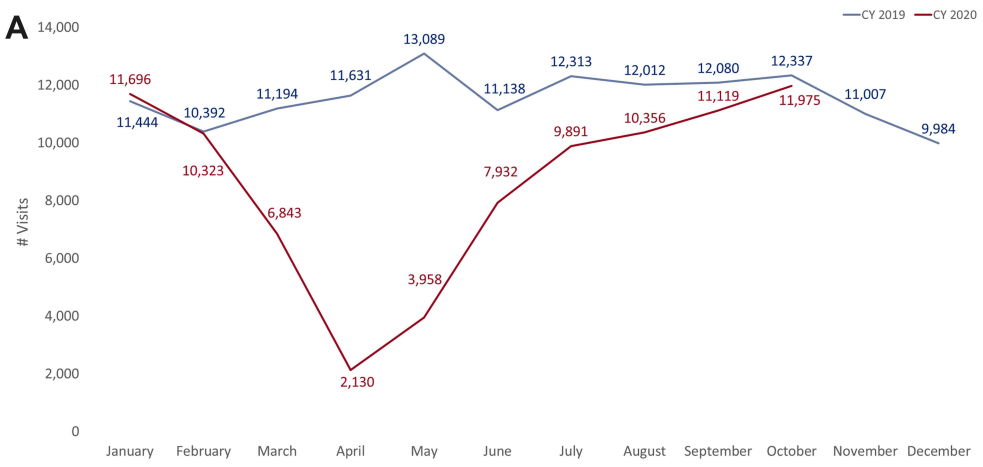

Figure 1 Continue.

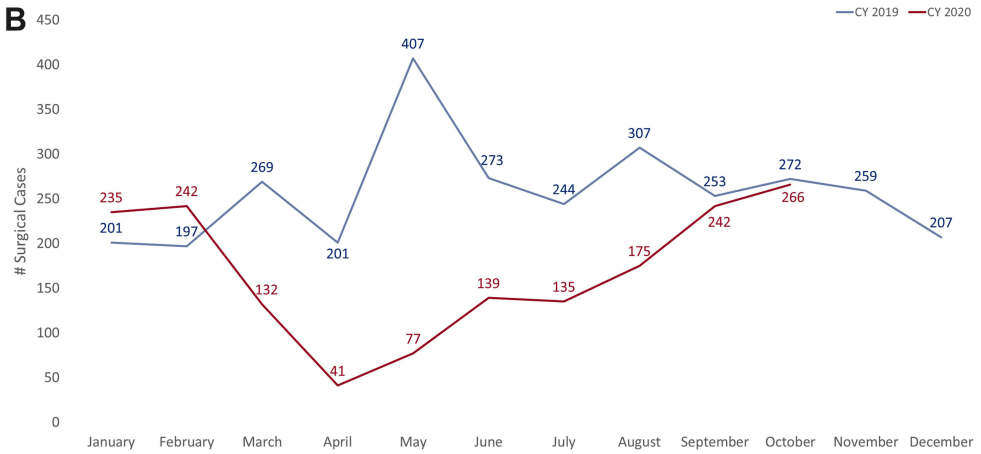

Figure 1 (**A**) Pre-COVID and 2020 patient visits from 01/01/2020 to 10/31/2020. In April 2020, clinical volumes dropped to 18% of volumes reported in April 2019. By August, patient volumes had reached 86% of those reported in 2019. The department reached 97% of 2019 patient volumes in October 2020. (**B**) Pre-COVID and 2020 surgical volumes 01/01/2020 to 10/31/2020. In April 2020, surgical patient volumes dropped to 20% of volumes reported in April 2019. The department reached 98% of 2019 surgical patient volumes in October 2020.

When non-urgent appointments were cancelled, patients were given the option to have a telemedicine appointment.[23,24] Patients with urgent conditions were triaged by their providers. Best practices and new applications in telemedicine were shared at weekly faculty meetings. Telemedicine visit volume increased sharply from April to May 2020, and then gradually declined during subsequent months. The highest telemedicine volumes were seen in comprehensive ophthalmology, dry eye, and glaucoma subspecialties. Additionally, the TEP was implemented to provide ophthalmic imaging and testing as a discrete pathway. Rather than combining testing with a same-day in-person appointment, patients came onsite for testing, returned home, and met virtually with their physicians at a later date to discuss results of the imaging/testing and treatment plans.

Financial Impact of COVID-19

Appointment cancellations and restrictions on the number of patient visits during COVID-19 pandemic resulted in enormous income loss for healthcare facilities around the world.[25] For our Department, collections dropped from $1.38M in February 2020 to $456,172 in May 2020. In total, the Department received $4.26M less in clinical and surgical collections in 2020 compared to 2019. This was offset at UPenn by money from the federal government that was distributed to the departments to allow break even status at the end of the fiscal year. Decisions had to be made amid the pandemic to protect all salaries by developing rigorous work-from-home policies and to support the future financial stability of the department. Despite financial challenges, no staff members were laid off or suffered pay reductions as a result of the pandemic. The department financially recovered in December 2020, when total collections surpassed payments in December 2019 (Figure 2).

With staff shortages and absent technicians, the department piloted the use of technician pods. Grouping the technicians to work for multiple providers at a particular location allowed for even distribution of work per technician, maximizing resources and allowing for fewer technicians for the same number of providers. Tech pods have been found to boost morale by allowing technicians to work together on dividing tasks, fostering a climate of teamwork and accountability.[26]

Education and Research

Our department maintained our research productivity and educational mission throughout the pandemic. In fiscal year 2020, our department received 38 grants awards from the National Eye Institute (NEI) (Figure 3) and published 140 papers (Figure 4). These numbers are comparable to those of fiscal years 2017, 2018, and 2019. After a three-week pause, resident conferences and lectures, including weekly departmental grand rounds, resumed the week of 04/06/20

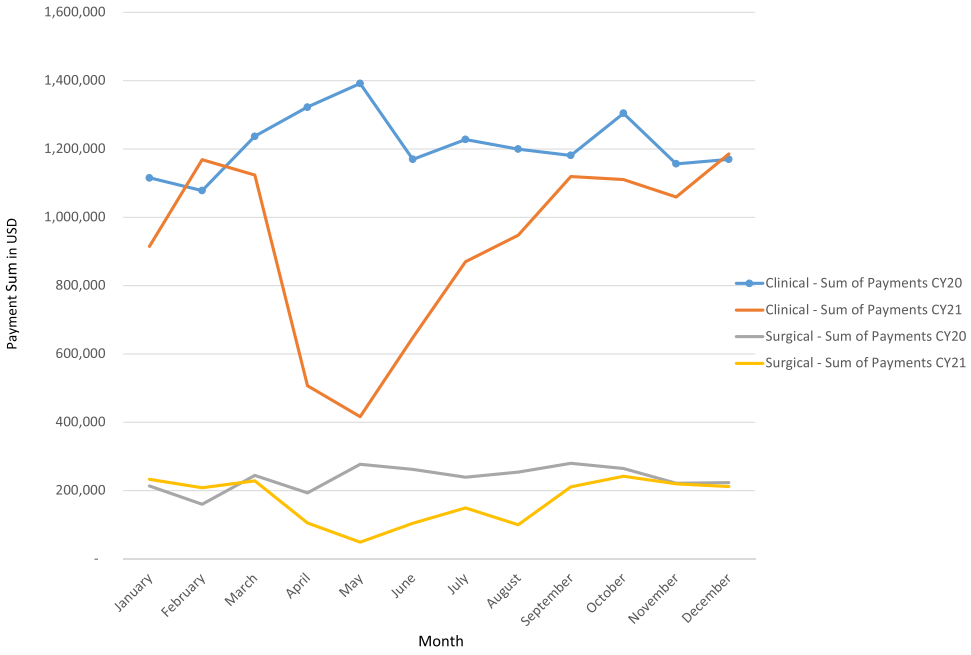

Figure 2 Clinical and surgical collections, CY2019 vs CY2020. The department suffered losses in clinical and surgical collections starting in April 2020 due to the COVID-19 pandemic. In December 2020, the department surpassed December 2019 total collections.

with the use of videoconference technology. In addition, our team rapidly transitioned our annual alumni meeting to a virtual setting, which took place on 05/30/2020. This allowed attendance to increase from 150–200 attendees to nearly 500 in 2020, and free Continuing Medical Education (CME) credit was provided to attendees. Open sharing of educational opportunities was a priority for the department.

COVID-19 Safety Measures

The department adhered to the general safety requirements recommended by the CDC to promote social distancing and slow viral spread.[27] Specific actions are explained more thoroughly in the Supplementary Material.

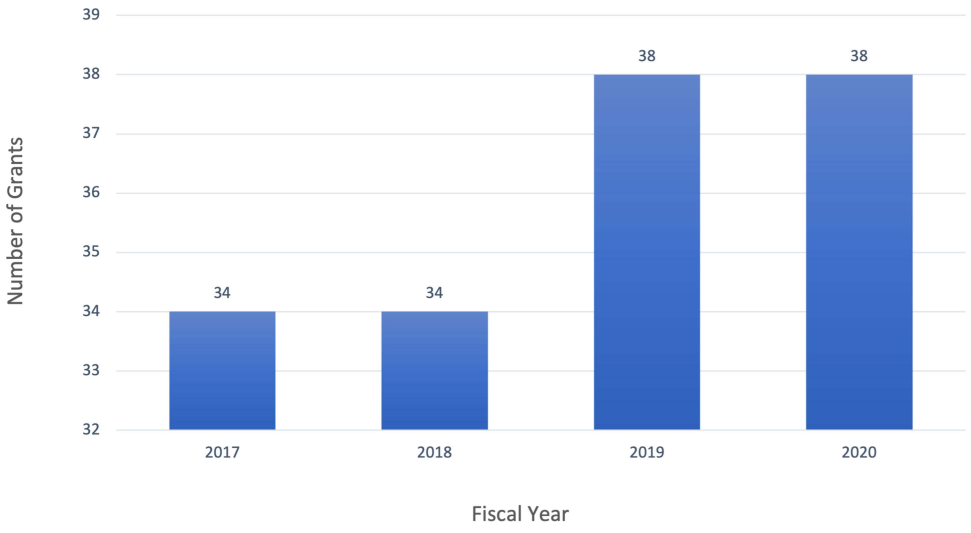

Figure 3 NEI awarded to University of Pennsylvania Investigators, FY2017-FY2020. The number of grants awarded to the department was maintained in fiscal year 2020.

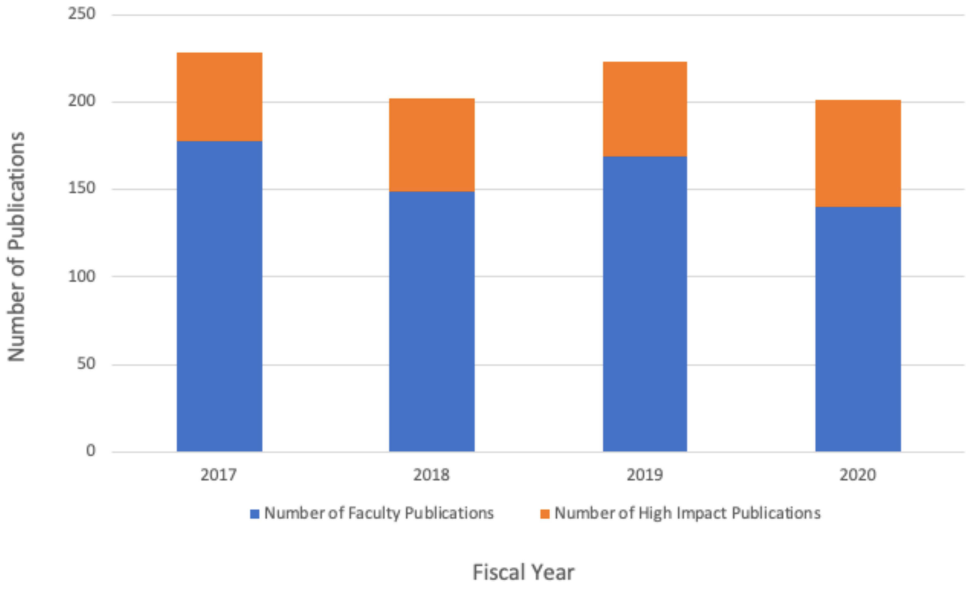

Figure 4 Papers published by Ophthalmology Department Faculty, FY2017-FY2020. Similar to grant funding, the fiscal 2020 did not reveal significant decrease in research productivity, as measured by papers published and high-impact publications. *High impact publications are defined by the authors as Cell Press, the Lancet Press, Nature Press, Circulation, JAMA/Arch OPH, Journal of Clinical Investigation, New England Journal of Medicine, PLOS Medicine, and Science (including Science Translational Medicine).

Discussion

The 1918 H1N1 pandemic was reported to be the most severe in recent history, causing approximately 675,000 deaths in the United States.[28] The COVID −19 pandemic disrupted day-to-day life as well as clinical care of patients. It has also demonstrated a need for thorough future planning by healthcare facilities, so that clinical care of patients can continue safely during viral surges. Our multi-faceted recovery methodology attempted to address and mitigate challenges that were faced by healthcare providers in caring for patients during COVID-19 slowdown and recovery. The strategy focused on frequent communication, monitoring key metrics, implementing new initiatives for patient access, mitigating financial loss, and preserving research and educational missions. Results of this study indicate that with these strategies, along with adherence to CDC guidelines, pre-COVID patient volumes were achieved safely in seven months, without any cases of COVID transmission between faculty, trainees, staff and patients.

The clinical resurgence subcommittees were entrusted with sharing up-to-date and accurate information about COVID-19 with faculty and staff. During a pandemic, misinformation can create panic and anxiety amongst staff and patients, especially given the significant negative mental health impacts of the pandemic among healthcare workers.[29] It is important to share information frequently, as the situation evolved rapidly. Effective leadership and information sharing have been shown to be associated with lower rates of healthcare-associated infections.[30] To protect patients, faculty, trainees, and staff, department leaders took steps to ensure effective communication within the department, such as holding two virtual safety meetings with staff and faculty. These meetings were important to alleviate the significant mixed-messaging about safe practices during the early months of the pandemic.

By carefully monitoring waiting room volumes on a daily basis, it was possible to make informed decisions on how to increase the volume of patients seen safely without risking transmission of COVID-19. We also observed that telehealth visits increased substantially near the beginning of the pandemic but decreased as the volume of in-person ophthalmic care increased. The ophthalmic areas with the highest use of telehealth were comprehensive ophthalmology, glaucoma, and dry eye subspecialty services. Physicians found that telehealth could be used to some extent for anterior segment evaluation and medication management, but all physicians ultimately preferred in-person visits. In addition to the need to examine a patient in-person, this may also reflect the current inefficiencies surrounding telehealth. It is possible that further development of telehealth could increase its utility, including imaging appointments followed by virtual visits

(TEP pathway described). Similar initiatives have been implemented in other ophthalmology centers, such as the use of telemedicine to screen for diabetic retinopathy.[31,32]

As expected, there was significant financial loss, but the department fully recovered by December 2020. The 30–60 day delay in financial recovery compared to clinical and surgical volume recovery reflects the usual time it takes for payments to be processed and received. These financial numbers do not account for any variance in contracts with healthcare insurance plans from 2019 to 2020, but such changes would have had minimal impact on the data. It is worth noting that no faculty or staff members were laid off or received salary reductions during the pandemic. Rather, it was believed to be more cost-effective and supportive of employee well-being to find meaningful work for staff members. This course of action also avoided the time and financial burden required to recruit, hire, and train new employees in the future as clinical volumes recovered. Additionally, the financial and patient access challenges related to COVID-19 spurred the development of new initiatives by the department.

This study is limited by the unavailability of data on some initiatives implemented. We cannot exclude the possibility that other management approaches could safely increase clinical volume recovery faster, and our department has been eager to learn and share knowledge with other institutions as we fight COVID-19 together. We hope to address weaknesses, such as prolonged wait times, by learning from other institutions' methods. For example, we find significant value in methods used by the Singapore National Eye Center (SNEC) to address spatial concerns and minimize patients' time in the clinic. SNEC, Singapore's largest tertiary ophthalmology referral center, used a Health Insights data analytics unit to track patient loads and attendance at various times in order to create "heat maps," which guided policy. This allowed the center to identify peak times where there was crowding at various "touch points," such as at registration counters, investigation rooms, clinics, and pharmacies, and to adjust accordingly.[33] While this is a unique and effective method that Scheie could use, not all ophthalmology practices have access to such statistical analysis units.

We acknowledge that other institutions have implemented similar reopening strategies as Scheie by triaging patients in tiers of urgency and by expanding telehealth services. Our approach is unique in its innovative strategies to address specific concerns, such as the creation of technician pods to combat the shortage of technicians, and in its combination of existing strategies, such as the use of freeze-thaw slots and ad-hoc committees.

Given the extraordinary circumstances of the COVID-19 pandemic, the authors hope that sharing this information will be of benefit to other ophthalmology departments as COVID-19 continues to surge. The information provided not only demonstrates the impact of the COVID-19 pandemic on an ophthalmology department, but also provides potential management approaches for viral surges of COVID-19 or future pandemics. In this report, we provide what was a successful approach for our department, which is located in an area considered of high COVID-19 vulnerability.

Conclusion

Ophthalmic diseases have the potential to impact the health of our patients in the long run if timely care is not administered, especially for those patients with glaucoma, diabetic retinopathy, macular degeneration, and other chronic conditions. Extended disruptions of clinical care have a negative impact on these patients. The unprecedented nature of COVID-19 caused an initial slowdown to limit viral spread, but methodical clinical recovery efforts led the department to reach ≥95% clinical volumes without increasing the risk of transmission of COVID to patients, faculty, trainees, and staff. Virtual platforms allowed research and educational missions to be maximally productive.

Financial Support: This work was supported by the National Eye Institute, Bethesda, Maryland (grant #1RO1EY023557-01) and Vision Research Core Grant (P30 EY001583). Funds also come from the F.M. Kirby Foundation, Research to Prevent Blindness, The UPenn Hospital Board of Women Visitors, The Paul and Evanina Bell Mackall Foundation Trust., and Regeneron Genetics Center. The Ophthalmology Department at the Perelman School of Medicine and the VA Hospital in Philadelphia, PA also provided support. The sponsor or funding organization had no role in the design or conduct of this research.

Disclosure

The authors report no conflicts of interest in this work.

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