

Ophthalmology and Glaucoma Practice in the COVID-19 Era

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Coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), will touch the lives of all of us, whether it be through our own personal illness or the illness or death of a patient, friend or loved one. At the time of this writing, the virus continues its march in many nations, severely limiting ophthalmic and glaucoma care to emergent or urgent care situations. Many universities, governments, public health agencies and local, national and regional professional medical organizations have issued guidance regarding the appropriate care of patients and how to best protect physicians, health care workers and our staffs from personal harm. These precautions are rightly geared primarily to emergency departments, hospital-based staff, intensive care units and individuals in front-line care situations during the pandemic. Despite these precautions, ophthalmologists, optometrists, and other eye care professionals remain at higher risk of infection because of the proximity to our patients during the physical examination, high patient volumes, and/or lack of personal protective equipment during the early phases of disease spread. The fact that many patients are asymptomatic or minimally affected was partly responsible for the delayed understanding, noted first in China, that health care workers are at high risk and that outpatient settings, with close personal contact, could be responsible for enhancing sustained community transmission. The result of this knowledge has led to social (physical) distancing, closure of schools and businesses and, closer to home for eye care physicians, suspension of the vast majority of our office activities, staff furloughs, mounting business expenses, and fears for the future.

At the apex of the COVID-19 tsunami, hospitals and healthcare systems remain under enormous stress. However, we are beginning to see glimmers of hope that our efforts to combat the disease are beginning to take effect and the rates of transmission, total number of cases, and deaths can be mitigated through public health measures, and that this effect is beginning to spread across the

globe. Yet, what will tomorrow look like when it comes to the practice of ophthalmology and ophthalmic surgery? Long before we reach a COVID-free future, we will need to think carefully and wisely about how we can safely care for our patients when there is still circulating COVID-19 virus with likely intermittent, more localized outbreaks (the “COVID era”). COVID-era care paradigms will likely force us into new models of care that just months ago were not even on our radar screens and would have been thought unthinkable.

Changes to the ways we deliver glaucoma care in the post-pandemic COVID era will affect all aspects of eye care. Many of our colleagues in medicine are rushing to telemedicine applications to fill the immediate void, but the applications of teleophthalmology, while potentially impactful for data and image transfer, is not well suited at the present time for a detailed examination of intraocular structures and surgery. Since we will still need to physically (not virtually) examine patients in our offices or clinic settings, creativity is required as we rethink our care models, beginning from the first point of patient contact to the moment the patient leaves our offices. Many of these changes are readily apparent, others less so. Each slit-lamp must be meticulously cleaned between use and better barriers ought to be created between the patient and the examiner. Both examiner and patient will need to be masked and many of us will wear gloves. The utility of reusable Goldmann tonometers may require reassessment, and more attention will be focused on disposable tonometers with single-use protective sleeves, which come in a variety of forms, some of which have not been adequately tested, limitations identified, or correlation to Goldmann tonometry clarified. Some institutions may require the use of single-use gonioscopy, laser and hand-held indirect lenses. Pneumotonometers and air-puff tonometry, both of which can presumably aerosolize the tear film and viral particles, may need to be avoided. New techniques for the sterilization of non-disposable equipment require elucidation and our most

basic interventions and handling of instrumentation reinvented. Do we place the indirect ophthalmoscope on our heads first, with new gloves, or do we examine the patient, change gloves, and then don the instrument? Will multi-use eye drop bottles (dilating agents, for example) become obsolete? Seemingly simple actions require new forethought.

While it is apparent that the costs to our practices of personal protective equipment for providers and patients and increased utilization of disposable equipment will rise, patient flow will also be deeply impacted. Some form of physical distancing will need to be maintained and will affect the positioning of staff and patients. Certain staff will be redeployed to new tasks, such as pre-screening patients for COVID-19 symptoms before they even enter our offices. Efforts at curtailing waiting times and lines will become paramount and enforced hand sanitizing at check-in and check-out will become routine. Waiting rooms should be rearranged and reduced in capacity. Accompanying persons may be discouraged or be limited to one. Patients in suburban locations may be asked to wait in their cars and sent text messages about when they can enter the office. Alternatively, instead of using waiting rooms at all, patients can be sent directly to the examination room. Entry doors, the use of stairs, and elevator capacity require patient flow modulation. We will need to reconfigure space so that no two patients occupy the same small diagnostic area at the same time. For example, rooms with more than one perimeter or imaging device may no longer be appropriate. Pre-surgical testing will likely include some form of active COVID-19 or serologic testing. General anesthesia protocols for intubation and extubation procedures to minimize aerosolized exposures will be adapted from our anesthesia colleagues. The trend away from trabeculectomy towards procedures with less intensive postoperative care, such as minimally invasive surgery and tube-shunts, may accelerate. The above laundry list of challenges, by no means exhaustive, will require our ingenuity to solve.

The use of diagnostic equipment for glaucoma care is of particular concern. Imaging devices will necessitate careful cleaning between patients and protocols updated to protect staff, patients, and equipment. Automated perimetry needs to be completely revisited, since the perimetry bowl is not only a potential source of viral spread, but also notoriously difficult to clean without damage. Our industry partners that manufacture these apparatuses must step forward and assist us in their care, upkeep and maintenance protocols. Most importantly, it is imperative that we (clinicians and researchers) urgently and immediately develop and validate - through the investigation of existing large structure-function databases and by new prospective studies - novel paradigms to diagnose and monitor glaucoma patients in the event that automated perimetry is not accessible (i.e. remains unsafe) or available for only limited patients. For example, we may limit perimetry to patients for whom an incisional surgical decision needs to be made and develop new diagnostic optical coherence tomography (OCT)-only paradigms for glaucoma suspects, ocular hypertensives, or established glaucoma. These are not issues for tomorrow, but for today. Lastly, our office hours will need to change. We will be inundated with patients for whom care has been delayed. The new safety protocols and physical distancing that will be required are incompatible with our present workflows. Our offices will remain open for far greater periods of time, by expanding or initiating evening and weekend hours and staggering physician and staff work schedules. "Routine post-op" care for cataract surgery in non-glaucomatous eyes could likely be cut further via teleophthalmology to allow us to have more time to examine sicker patients or those with new problems. Transfer of electronic data or digital pre-population of historical or present illness information could further reduce patient time in the office. Describing the issues raised here, and others yet to be identified, are but the first steps in dealing with our new eye care environment in a sensitive, thoughtful, and constructive way.

Yet, we should be encouraged, rather than discouraged, by these challenges. Teaching institutions are developing new ways to educate residents and are already rethinking the best ways of addressing the needs of our current and future trainees. Ophthalmologists and ophthalmic researchers have been, and are, among the most innovative of all members of the health care community and our solutions to these problems will change medicine forever.

This was not our original vision for 2020. As we continue to battle the pandemic and support our front-line colleagues, we should initiate development of our new COVID-era eye care paradigms so that we are ready to meet the extraordinary and unprecedented challenges that face us and our patients as we strive to preserve their vision in the months and years ahead.

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