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Editorial

Severe Acute Respiratory Syndrome Coronavirus Disease 2019: More Safety at the Expense of More Medical Waste

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The severe acute respiratory syndrome (SARS) Coronavirus Disease 2019 (COVID-19) outbreak put extreme pressure on the supply chain of common medical personal protective equipment (PPE), such as gowns, masks, and respirators. Hospital and health systems were left to develop their own approaches to managing supply shortages, with some guidance from the World Health Organization and experience from previous outbreaks. Procurement teams urgently sought new manufacturers and suppliers, while also looking for reasonable substitutes. Hospitals began to modify policies on PPE use to conserve supplies. These included but were not limited to restricting access to PPE stocks; allowing or requiring multiple uses of surgical masks, respirators, and isolation gowns; and suspending all but emergent or urgent procedures (which also diminish the risk of spreading COVID-19 to patients and staff).

Most ophthalmic anterior segment surgeries are considered elective. This forced most ophthalmology departments to postpone or reschedule surgeries. As we learn more about this disease and reopen these surgeries, guidelines for patient and staff safety have changed.[1] Most places now require testing and triaging patients with symptoms[2] and the increased use of face shields and other PPE in ophthalmic clinics and operating rooms.[3]

Ophthalmology should seek ways to improve resilience and become more sustainable as care facilities reopen after the disruptions caused by COVID-19.

The increased use of PPE, though important, presents several dilemmas. In addition to the challenges of securing proper stocks of PPE, there is a larger issue with both the waste generation and the additional environmental and public health impact of resource consumption in health care caused by SARS COVID-19.

Recent studies suggest that the US health care sector has a large footprint on public health. Responsible for approximately 10% of the greenhouse gas (GHG) emissions and 9% of air pollutants in the United States, the US health care sector contributes substantially to the negative health impacts of pollution and climate change.[4,5] Cataract extraction is the most commonly performed operation globally and as such has a significant role in emissions; therefore, ophthalmology as a specialty has an excellent opportunity to mitigate a portion of those impacts. Research has emerged quantifying the waste and emissions of both glaucoma[6] and cataract surgery via phacoemulsification.[7,8] Studies in high-income countries show that the manufacturing and procurement of disposable supplies are major sources of GHG emissions in cataract surgery. Likewise, studies in low- and middle-income settings demonstrate that emissions in high-income countries could safely be reduced substantially, approximately 95%, with no adverse impact on clinical outcomes.[9,10] Surveys conducted before the COVID-19 outbreak suggest that ophthalmologists in New Zealand and the United States are concerned about climate change and the physical waste generated while providing ophthalmic care.[11,12] US ophthalmologists are interested in implementing more resource-efficient practices with supplies and pharmaceuticals, but they feel impeded from enacting them because of liability concerns, regulatory restrictions, and manufacturer instructions for use.[12]

Now that practices have reopened after the first onslaught of the SARS coronavirus 2 pandemic, the waste generated by these practices and their GHG emissions are increasing. Most PPE in the United States is single-use and disposable. Clinics and surgery centers are likely to continue purchasing disposable PPE. Scheduling is now spaced out to reduce the risks of COVID-19 spreading between patients and to allow more time for cleaning clinical spaces, both in offices and operating rooms, between patient visits. This will not only increase the per-patient overhead costs but also the per-patient emissions associated with energy use. What steps can ophthalmologists take to maintain a safe working environment while reducing their footprint in this uncertain era?

It would be in the global interest to reduce, to whatever extent possible, the health care system's reliance on single-use supplies. We must follow the leads of other nations and explore options for multi-use and biodegradable materials, rather than remain tied to entirely disposable and single-use equipment in the operating room. Single-use supplies and their global supply chains make health care delivery vulnerable to disruptions, like those seen when the pandemic hit. These supply disruptions will only become more frequent as climate change becomes more severe.[13] Ophthalmology should seek ways to improve resilience and become more sustainable as care facilities reopen after the disruptions caused by COVID-19.

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Serving as both an adaptation and a mitigation strategy, multidose pharmaceuticals, as specified by Food and Drug Administration labeling, and reusable supplies must be incorporated into daily practices. With proper laundering and sterilization, reusable PPE such as gowns and masks can be safely used in operating rooms, as demonstrated by the clinical outcomes in low-resource settings where reusable PPE is standard.[14] Reusable PPE is manufactured by major medical suppliers and can be purchased in the United States, although processes need to be in place for their care and storage. Reusable PPE often has a lower environmental footprint than disposable PPE and, of equal importance, costs less over the life span.[15] It also means the hospital or health care facility controls their stock, reducing the risk of extreme shortages. Because reusable PPE is designed for a long life span, it may potentially be more comfortable and safer than disposable PPE when used for multiple cases.

Single-use device (SUD) reprocessing is another method of reuse, although more limited, but it does allow reuse in the face of space constraints and just-in-time procurement practices. Commercial SUD reprocessors receive Food and Drug Administration approval to clean, test, sterilize, and sell used SUDs (e.g., pulse oximeters, tubing, and compression sleeves) back to hospitals for less than the original manufacture in a fast-growing medical supply market.[16] Although carbon footprinting of this process has not yet been studied, SUD reprocessing reduces the amount of medical waste sent to a landfill. Although COVID-19 has caused an increase in PPE reprocessing, especially for single-use N95 respirators, SUD reprocessing remains available only for select instruments. Although single-use PPE reprocessing is found to be safe, many respirators and masks must be thrown out because of damage.[17] Therefore, this trend is unlikely to continue after PPE shortages become less critical.

COVID-19 also saw innovation in PPE and medical product development. In both the clinic and operating room, biodegradable drapes, gloves, and masks could be mass produced to meet demand while maintaining appropriate protection and leaving minimal carbon footprint.[18]

Beyond supplies, COVID-19 has taught us to be inventive and consider changing the way we currently manage patients. In the interest of protecting public health, ophthalmic (and other) providers should continue to be more selective about recommending clinical care or in-person visits. Eye care providers should reconsider the frequency and necessity of follow-up visits as well as the procedures performed at each visit. With accurate home tonometry, virtual reality, and tablet perimeters and nonmydriatic fundus cameras, cheaper and more efficient health care may be on the horizon.[19] Both home tonometry and tablet perimetry at home minimize waste in the office setting and give clinicians more useful information. Fewer patient trips lead to fewer emissions from travel, and fewer unnecessary preoperative or postoperative tests will also reduce the resource use and footprint of ophthalmic care.

COVID-19 has also led to an increase in telehealth, as the Centers for Medicare and Medicaid Services issued emergency protocols for reimbursing these visits, and in many countries, telehealth was used to decrease the risk of COVID-19 exposures.[20-22] Telemedicine similarly reduces the resource use and footprint of clinical care by reducing patient travel and minimizing supply use in clinics. Ophthalmology, like other specialties, will need to sort out how best to use telemedicine,[23] and COVID-19 has increased the motivation for doing so. The use of smartphone apps for vision testing and even refraction,[24] tablet and other portable perimeters,[25,26] home tonometry enabled by technological advances,[27-29] and virtual visits made feasible by improvements in electronic health records and telecommunications,[20,30-34] have all enabled patient evaluations that would otherwise have to be performed in person to be done remotely by the patient without technical expertise or onsite support. Perimetry on tablets could be done at home, and home tonometry would minimize the carbon footprint of diagnostic medications as well as tissues commonly used in routine glaucoma management.[28,29] This would minimize the carbon footprint of patient travel while having a better idea of intraocular pressure fluctuation and a better feel for perimetric progression. The potential use of artificial intelligence in glaucoma management has the potential to semi-automate patient care, hopefully minimizing unnecessary waste.[35] Increasing telehealth in ophthalmology might not only improve the frequency of care and decrease cost and quantity of care but also enhance the patients' satisfaction with care and access in rural or remote areas.[36-38] These changes in practice should not be relegated to the past once the current pandemic wanes; indeed, work should continue to develop new technologies, applications, and tools for in-home testing, diagnostics, and follow-up.

We hope that we will learn from these tumultuous times. Sustainability in health care, both mitigating environmental emissions and adapting to supply shortages like those seen during COVID-19, should be part of medical school and postgraduate curricula, as today's students will be operating entirely in a climate-disrupted world.[39] The American Academy of Ophthalmology and the American Society of Cataract and Refractive Surgeons have joined the Medical Society Consortium for Climate and Health[40] and must continue to take steps to educate their members about safe and environmentally friendly practices to encourage more sustainable processes and products from manufacturers, and work with policy makers to develop safe and flexible policies that enable resource-efficient health care delivery. As the building industry has the LEED "green building" certification and household appliances can be labeled "EnergyStar" efficient through the US Department of Energy and the Environmental Protection Agency, ophthalmology societies and medical accrediting bodies might consider some form of "green" certification to encourage, validate, and reward a larger shift toward more sustainable practices.

Necessity in management of patient care, safe for patients, staff, and physicians, has resulted in new technologies, new understanding of protection and safety protocols, and new definitions of what can and cannot be done safely in the face of contagion. We can use this knowledge going forward to inform our actions broadly. We should learn how to best protect ourselves, our staff, and our patients in both a financially and environmentally sustainable manner. We should not let what we have learned from a serious crisis go to waste.

Footnotes and Disclosures

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