Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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COVID-19 Perspectives

Using Social Media to Disseminate Ophthalmic Information during the #COVID19 Pandemic

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On March 11, 2020, the World Health Organization declared coronavirus disease 2019 (COVID-19) a pandemic. As of May 11, 2020, 4 006 257 people have been infected and 278 892 people have died worldwide.[1] As cases of COVID-19 spread globally, so did sharing of experiences and research via social media in efforts to mitigate the disease spread and to increase awareness. Of note, the first warning came from an ophthalmologist, Dr. Li Wenliang, who had attempted to inform his colleagues via the social media platform WeChat and subsequently on Weibo (a Chinese microblogging website) about a suspected outbreak of severe acute respiratory disease-like illness.[2,3] A coordinated global response has been important since to enable preparedness among healthcare workers, especially because healthcare workers are thought to be affected disproportionately during the pandemic. Specific to ophthalmology, concern has emerged that eye care providers are at a higher risk of contracting COVID-19 because of their close working proximity during an ophthalmic examination.[4,5] With this perspective, we outline how social media increasingly has become integrated into our emergency response as a field.

Rapid Dissemination of Information on Social Media

In the early 2000s, when the severe acute respiratory syndrome outbreak affected China, Hong Kong, and Canada, before widespread use of social media networks, text and instant messaging were used primarily for rapid communication. Now with more than 2.9 billion users worldwide,[6] social media, with its constant accessibility, has transformed how we communicate. Compared with more traditional methods of communication, such as television or print media, social media allows for instant dissemination of accurate information, which has been critical in alerting both the public and healthcare sectors to evolving guidelines and treatments.[7]

Although many social media platforms exist, Twitter, in particular, has been used widely by physicians.[8,9] This microblogging platform allows authors to make short posts with up to 280 characters, along with an image or a link to another website. In the first quarter of 2020, Twitter reported that its average daily users had increased by 24% over the previous year to 166 million daily users, attributing much of that increase to activity resulting from the COVID-19 pandemic.[10] The American Academy of Ophthalmology (AAO) *Ophthalmology* journal Twitter account (https://twitter.com/AAOjournal) shares recently published articles and the AAO's account (https://twitter.com/aao_ophth) also posts regular updates for its members and the general public. By sharing recently published peer-reviewed articles online and alerting Twitter followers to these new updates, users can access research and new information much faster than with traditional print methods. As of May 1, 2020, *Ophthalmology*'s growing collection of COVID-19–related research articles and commentaries totaled more than 58 059 impressions on Twitter (mean impressions per post, 6451; range, 1626–18 216). When users like, comment, or retweet a post, it also can increase the original post's impressions. Users on Twitter can amplify a post further by making a comment while retweeting another user's post. These new posts additionally generate their own set of impressions, which are not counted in the original post's impressions, thereby increasing visibility. For example, when totalling the impressions across the Twitter accounts of the 5 *Ophthalmology* social media editors (E.T., A.R.C., L.M.P., M.T.F., R.C.R.), the resulting total impressions for the same COVID-19 collection was 63 115 (mean impressions per post, 3005; range, 1252–8684). Thus, the visibility of posts shared on Twitter may be more far reaching than the 27 000 copies of *Ophthalmology* currently in print circulation. Additionally, because the number of practicing ophthalmologists in the United States is approximately 17 600,[11] these posts are likely being viewed by ophthalmologists worldwide as well as healthcare professionals in other fields, which depends largely on each user's followers.

Increasing Collaboration and Research

Social media and the Internet also have accelerated the creation of research networks and collaborations. In a global collaboration with ophthalmologists from Australia, China, Italy, Korea, Singapore, the United Kingdom, and the United States, Olivia Li et al[7] reported global variations in risk mitigation for asymptomatic patients with COVID-19, with institutions around the world reporting varying uses

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of personal protective equipment in the clinical setting. In the era of COVID-19, as an alternative to scheduling in-person consensus meetings or online meetings over many different time zones, potential exists for working groups to be created via social media and for these groups to generate questions for guidelines. Radiation oncologists have used Twitter to create guidelines on prioritizing patient treatments during the pandemic as well as how to reduce the risk of transmission in the clinic.[12] Also initiated through Twitter, rheumatologists have created a global registry of patients with rheumatic disease to evaluate the effects of pre-existing immunosuppression and outcomes of COVID-19 in this population.[13] Gastroenterologists also were surveyed on Twitter regarding what constituted urgent endoscopy during the COVID-19 pandemic to help guide triage further.[14] Similarly, ophthalmologists around the world have shared their responses and changes in clinical practices to decrease the risk to patients and physicians.[7,15] Within other subspecialties of ophthalmology, patient care recommendations have been developed rapidly from groups such as the American Association of Ophthalmic Oncologists and Pathologists[16] and the American Society of Retina Specialists.[17] Social media groups on Facebook also have provided a means for healthcare workers around the world to communicate quickly about their experiences, discuss treatments and how they have adapted to the pandemic, as well as to provide emotional support.[18] It is clear that evidence-based consensus guidelines are needed to decrease the risk of transmission as well as future outbreaks, and social media may have the potential to bring individuals together to create these guidelines. Furthermore, in an international effort to increase access and collaboration and to accelerate COVID-19–related discoveries, many journals, including *Ophthalmology* (https://www.aaojournal.org/covid-19), have made their COVID-19 related articles freely accessible.

Enabling Preparedness among Ophthalmologists

As COVID-19 spread globally, countries such as China and Italy were affected before the United States, and within the United States, certain states experienced outbreaks earlier than others. This pattern of regional spread enabled lesser-affected areas to prepare for a potential surge of cases. On a national and international level, social media accounts from authorities such as the United States Centers for Disease Control and Prevention, the National Institutes of Health, and World Health Organization used social media campaigns to encourage physical distancing and hand hygiene. The Centers for Disease Control and Prevention has a COVID-19 social media toolkit that provides templated text and images for each social media platform.[19] Specific to ophthalmology, designs of shields for slit-lamp biomicroscopes and imaging instrumentation were shared online for use by clinical practices and were circulated on social media.[20,21] Weeks before large outbreaks in the United States, a report from Asia published in mid-February 2020 suggested the possibility of ophthalmic manifestations of COVID-19 and transmissibility of severe acute respiratory disease coronavirus 2 (SARS-CoV-2) via tears and discussed the importance of protective eyewear.[21] Subsequent to this, experience on infection control in Hong Kong eye clinics was published in the first week of March 2020[20] and later from ophthalmic practices in Singapore[22,23] and Italy.[24] In addition to discussing infection control measures, several studies evaluated the potential transmissibility of SARS-CoV-2 in ocular fluid that were shared widely on social media.[25–28] These early experiences helped to guide ophthalmologists to develop best practices in maximizing the safety for patients, staff, and physicians.[15] Furthermore, to provide a central repository and easily accessible source of information, the AAO has created guidelines about SARS-CoV-2 and COVID-19 regarding infection prevention and triage guidance, available at https://www.aao.org/coronavirus. These guidelines are updated regularly. Routinely scheduled Twitter posts from the AAO also update more than 28 000 followers regularly on these evolving guidelines.

Cautions Regarding Social Media during the Pandemic

Because ophthalmologists and healthcare workers in general both seek and share COVID-19–related information on social media, it is important to keep in mind the potential pitfalls of social media. The World Health Organization has cautioned that there has been an overabundance of information during the COVID-19 pandemic, terming it an *infodemic*.[29] Subsequently, this may have resulted in difficulty in finding reliable information. Moreover, misinformation may be propagated via social media.[29] Therefore, it is important that accurate information be communicated by experts and appropriate authorities. Although social media has the potential for widespread dissemination of information, the content is not moderated. Healthcare workers should exercise caution when interpreting posts and should continue to follow guidelines from trusted sources.

The use of online preprint servers to disseminate research related to COVID-19 and SARS-CoV-2 has increased significantly. In the physical sciences, archives such as arXiv have been in use for nearly 30 years. In the biological sciences, bioRxiv was founded in 2013 and has seen exponential growth. In contrast, the most popular medical research-related server, medRxiv, was launched in only 2019. The aim of these servers is to disseminate information rapidly, to increase collaboration, and to invite feedback before formal peer review and journal publication. During a time when rapid sharing of information and collaboration are needed to facilitate discoveries of new treatments and to further our understanding of this disease, preprint manuscripts have garnered much attention through both traditional media and social media. Preprints have been shared widely on social media and have been subject to comments by the public and research community.[30] Unlike the use of preprint information in other disciplines, the use of unvetted information in preprints in medical practice may

harm individuals, and thus they should be viewed with caution by the research community and the media because of their unvetted nature. In this regard, social media may lead to amplification of unvetted information, but also may provide comment on the limitations. For example, a recent headline of a preprint reporting that hydroxychloroquine compared with standard-of-care treatment increased mortality in hospitalized veterans with COVID-19[31] was amplified by social media and prominent traditional media sources,[32] and within hours of the preprint upload, social media commented on the limitations of the study.[33] In general, although rapid delivery of new information has many perceived advantages, preprints should be treated with caution until after undergoing formal expert peer review and publication in an academic journal.

Conclusions

As the pandemic continues to evolve, social media will be an important avenue for physicians to share experiences, to collaborate on research, and to initiate discussion on a global scale. Further study into how social media platforms can be integrated into pandemic preparedness and response will be critical. Freely accessible, peer-reviewed, high-quality evidence from trusted sources also will help to combat widespread misinformation. Undoubtedly, the lessons learned from this pandemic will prepare us better for inevitable future outbreaks.

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