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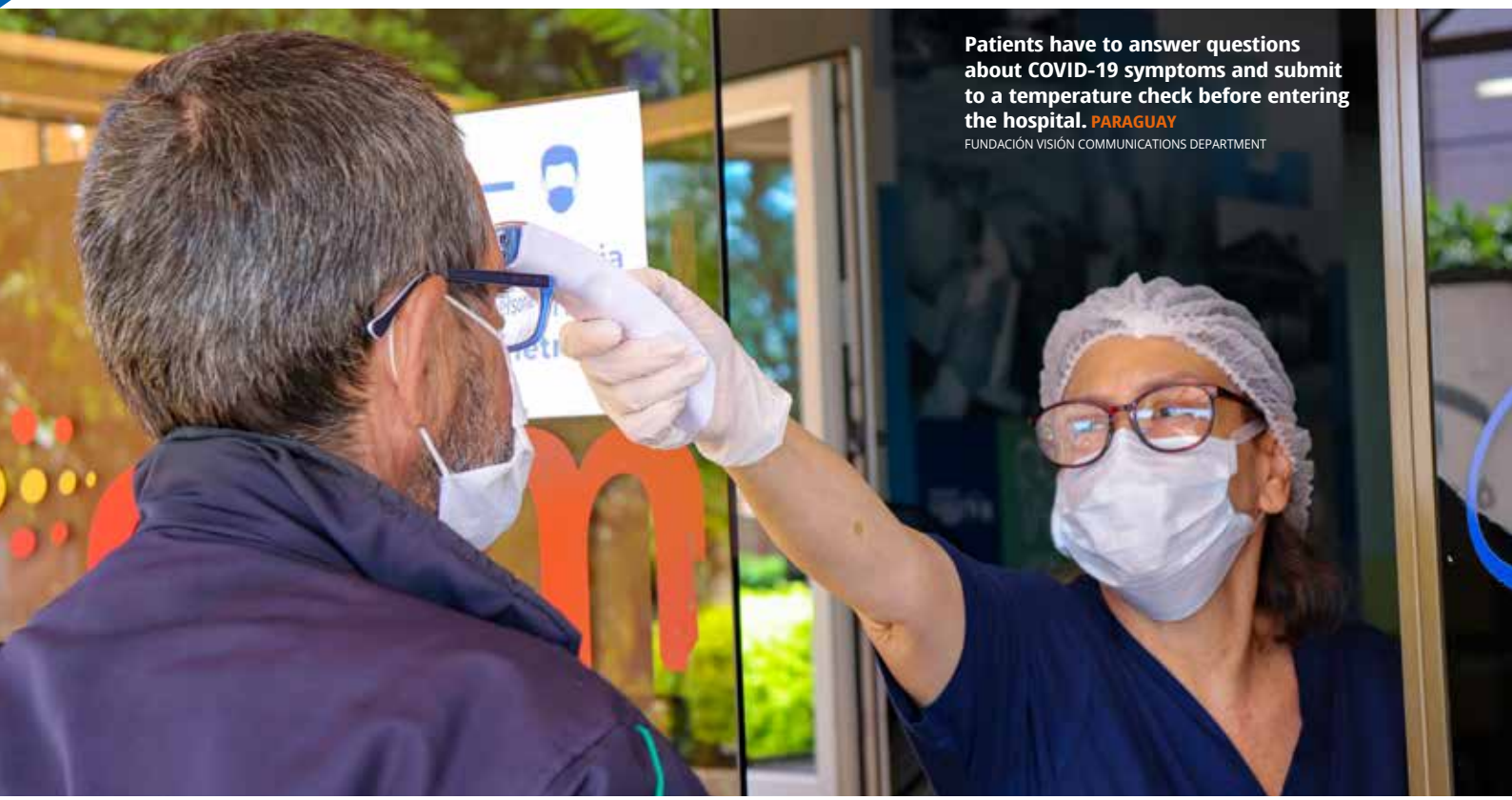

Patients have to answer questions about COVID-19 symptoms and submit to a temperature check before entering the hospital. PARAGUAY
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Responding to COVID-19 in eye health


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The COVID-19 pandemic has brought enormous challenges, and its repercussions have been felt around the globe, including in eye care.

Millions of people have been infected with the SARS-CoV-2 virus and many have become seriously ill, threatening to overwhelm the ability of health systems to cope. Many lives have been lost – including those of health care workers.

Countries have adopted different strategies to reduce transmission, including:

- Encouraging hand washing, the wearing of masks in public places, and social distancing, such as staying 1–2 metres away from others in public
- Containment of areas where there are outbreaks by restricting travel into and out of affected countries, for example
- Enforcing quarantine or lock-down measures.

The human cost

The virus itself, and the measures taken to contain its spread, have had a profound impact on individuals and the community, including long-term social isolation and massive disruption to businesses and the economy. The livelihoods of many have been put at risk and others have been forced into poverty.

Existing inequalities in gender, ethnicity, working conditions, and socioeconomic status have been exposed and exacerbated by the pandemic across the globe. For example, people living in overcrowded accommodation or informal urban

Continues overleaf ➤

About this issue

The COVID-19 pandemic is having a devastating impact on people, communities and economies, including health care and eye care. In this issue, we offer guidance and practical advice on adapting eye services, deciding which patients to see, personal protective equipment (PPE) and cleaning & disinfection. Learn how to make your own face shield and hand sanitiser, be inspired by case studies from eye health professionals around the world, and update yourself on the latest evidence about the disease and the virus causing it.

Contents

settlements are at higher risk of contracting and spreading the virus. Daily wage earners are often forced to continue working even if they develop symptoms of an infection; if not, they risk falling into poverty. Women, who make up 70% of the global health workforce worldwide,[1] are likely to bear a disproportionate proportion of domestic labour, including looking after children when schools are closed.

Health care workers are facing many personal and professional challenges while working on the front line of the efforts against this pandemic.

It should come as no surprise that mental health and wellbeing have emerged as an urgent priority; not just for health care workers, but also for patients and the wider community.

People with disabilities also face challenges, whether this is with the practicalities of hand washing or when communicating with health workers who are wearing face masks. It is therefore vital that we include people with disabilities when planning and communicating about the changes to eye services during the pandemic.

Adapting eye services

Eye health providers, along with other sectors, have had to reshape how services are provided while responding to a constantly evolving situation, full of uncertainties; this includes reducing services and deciding which patients to see, and when.

The virus has officially reached almost every country, and there has been significant variation in national measures and how long these will remain in place. We present various case studies in this issue to show how different eye units around the world are responding to the challenge and dealing with the reopening of services. More case studies

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and articles are available via the *Community Eye Health Journal* app (bit.ly/CEHJ-app) and on our website (cehjournal.org).

Vital tools to protect health workers and patients from COVID-19 include cleaning and disinfection, the correct use of personal protective equipment, and handwashing using soap and water and/or hand sanitiser. At times, however, global supply chains have been unable to meet the demand for PPE, which has resulted in shortages in many countries across the globe. This issue features a collection of hands-on tips for making the most of personal protective equipment, cleaning and disinfecting the hospital environment, and producing face shields and alcohol-based hand sanitiser.

Guidelines and useful websites

Guidelines are being updated continually as circumstances change and more becomes known about COVID-19. We encourage you to visit these websites, and those mentioned in the articles in this issue, to stay up to date.

- International Agency for the Prevention of Blindness (IAPB). COVID-19 and Eye Health. bit.ly/IAPBcov19
- World Health Organization (WHO). Country & Technical Guidance – Coronavirus disease (COVID-19). bit.ly/WHOcov19
- International Council for Ophthalmology (ICO). Coronavirus Information for Ophthalmologists. bit.ly/ICOcov19
- Royal College of Ophthalmologists. COVID-19 Clinical Guidelines. bit.ly/RCOpth
- American Academy of Ophthalmology. Coronavirus and Eye Care. bit.ly/AAOcov19
- World Council of Optometry. COVID-19 news. bit.ly/WCOcov19

We must take whatever measures are needed to protect everyone in the eye care team from COVID-19, including non-clinical or non-medical workers such as security guards, porters, and cleaners, whose work is vital for safe eye care delivery and yet often invisible.

"SARS-CoV-2 is a new virus, and we are continuously learning about it. Guidelines are therefore changing constantly to reflect new research as it comes in."

SARS-CoV-2 is a new virus, and we are continuously learning about it. Guidelines are therefore changing constantly to reflect new research as it comes in. We encourage you to read and follow the national guidelines in whichever country you are based, and to visit the websites in the panel to stay up to date with new developments.

In this time, we need to carefully appraise the information available and make measured, rational judgements. We still have the responsibility and privilege of providing the best care we can to our patients, no matter what the situation is. We also need to continue to integrate our services into universal health care; more so now than ever.

The COVID-19 pandemic has pushed the world to its limits in many respects. But, along with the challenges, it has also brought opportunities to rethink and re-evaluate practices and fast-forward innovations, including the use of videoconferencing tools for triage and teaching. The inspiration for this special CEHJ issue came from the recent ICEH online conference "Ophthalmology and COVID-19 in African Units" (bit.ly/COV19videoconf) attended by more than 270 eye care professionals, predominantly from sub-Saharan Africa. This online event is one among several other examples that showed we can stay connected and search for solutions across the globe, together. We hope that this issue will provide you with the information and tools you need to keep yourself and your patients safe during this time, and to serve communities in need of accessible, high-quality eye care.

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Eye care during the COVID-19 public health emergency: a WHO perspective

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During the COVID-19 pandemic, the World Health Organization emphasises care for people with disabilities and non-urgent eye conditions, safety, documenting innovations and further integration of eye health in health systems.

The World Health Organization (WHO) declared the COVID-19 outbreak a Public Health Emergency of International Concern on 30 January 2020. The outbreak – now a global pandemic – has affected the lives of all segments of the population around the world, including health care workers. The purpose of this article is to emphasise some important points, from a WHO perspective, for health workers involved in eye care.

Take measures to protect and care for people with disabilities

People with one or more disabilities are particularly vulnerable during the COVID-19 pandemic.

People with disabilities may be disproportionately affected by the outbreak. This could be due to disruptions to the services and support they rely on, difficulties they may experience in implementing basic hygiene measures and enacting social distancing and barriers in accessing public health services and information. In some cases, pre-existing health conditions can leave them at a higher risk of permanent, serious illness if they contract the virus.

Barriers experienced by people with disabilities can be reduced if key stakeholders take appropriate action. WHO guidance on appropriate actions and measures that governments, service providers, communities and people with disabilities themselves can take to protect individuals with a disability during the COVID-19 pandemic is available at **https://bit.ly/Cov19disability**

Use personal protective equipment from approved sources only

There are current disruptions in the global supply chain of PPE due to the surge in demand that has been driven by COVID-19. Every country has registered sources of certified PPE for patients and providers. WHO recommends to only use PPE derived from approved sources, and to avoid self-made, or social media-advertised, distributors of PPE of uncertain quality. Further information on the rational use of PPE for COVID-19 can be found at **https://bit.ly/CovPPE**

Ensure patients who need non-urgent eye care are not left behind

While the focus during the pandemic is to maintain the delivery of essential eye care services and to avoid interruptions in access to medicines for patients with chronic eye conditions, patients requiring non-urgent care need not feel left behind.

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Patients wait their turn outside Fundación Visión Eye Hospital. PARAGUAY

Take advantage of telehealth and other technological advances not only to practice effective triage and facilitate coordination between care providers, but also to ensure that patients needing non-urgent appointments remain engaged and informed, adhere to their prescribed treatment strategies and preventive actions, and continue in their care-seeking behaviours as we emerge from the pandemic.

Document and share innovative approaches and their impact

The COVID-19 response has shown us that innovative workforce management approaches, such as temporary relocation, task-sharing and role delegation, can be effective to address acute workforce shortages or inefficiencies. It is important that those working in eye care document any new or innovative approaches that have been adopted during the pandemic, as well as their impact on eye care delivery and outcomes. This can provide the basis for planning high quality health services and implementation research (following the pandemic) to verify if and how these approaches can be scaled up to improve clinical care and people's lives, and to enhance equity in the provision of high-quality eye care service delivery.

Integrate eye care within health systems

The most significant recommendation of the World Report on Vision is to ensure that eye care is integrated within the health sector service delivery system and its strategic plans. This recommendation was relevant before the pandemic, as there are currently at least 1 billion people with vision impairment that could have been prevented or is yet to be addressed, and vast inequities exist in access to eye care services between and within countries.

This is relevant during the pandemic given that, if eye care is an integral part of the health sector, there is an increased likelihood that it will play a more prominent role within the response plan of the health sector. Integration will be vital when implementing eye care programmes after the COVID-19 pandemic to ensure their sustainability and provide continuity of care for patients.

Understanding COVID-19: the virus

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Novel coronavirus disease 2019 (COVID-19) is the clinical disease caused by SARS-CoV-2, the virus first discovered in Wuhan, China. It has since spread worldwide and by mid-August 2020 had infected over 21.7 million people, resulting in over 770,000 deaths.[1]

The virus responsible for COVID-19 is the coronavirus SARS-CoV-2. It was discovered in Wuhan, China and was isolated and identified on 7 January 2020.[1,2] Coronaviruses are single-stranded, spherical RNA viruses, measuring approximately 120 nanometres in diameter – similar in size to influenza virus and HIV, and a little larger than adenoviruses. In coronaviruses, the viral envelope contains three surface proteins: S (spike) protein E (envelope) protein and M (membrane) protein. (Figure 1). It is the projections of the S protein, as seen using electron microscopy (Figure 2), that give coronaviruses their name, as they resemble the solar corona – the halo visible around the sun during a solar eclipse (Figure 3).[2]

The S protein binds to receptors on the surface of the host cell, which enables the virus to fuse with the cell membrane and enter the cell. Once inside the cell, the virus is able to 'hijack' the cell so that the host cell produces copies of the virus that then go on to infect other neighbouring cells.[2]

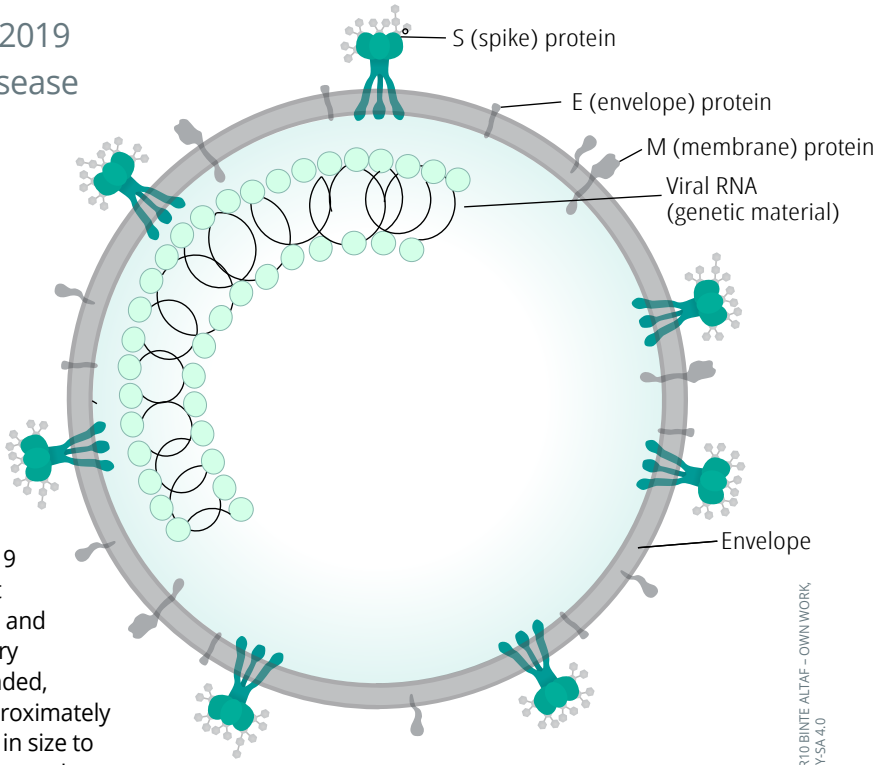

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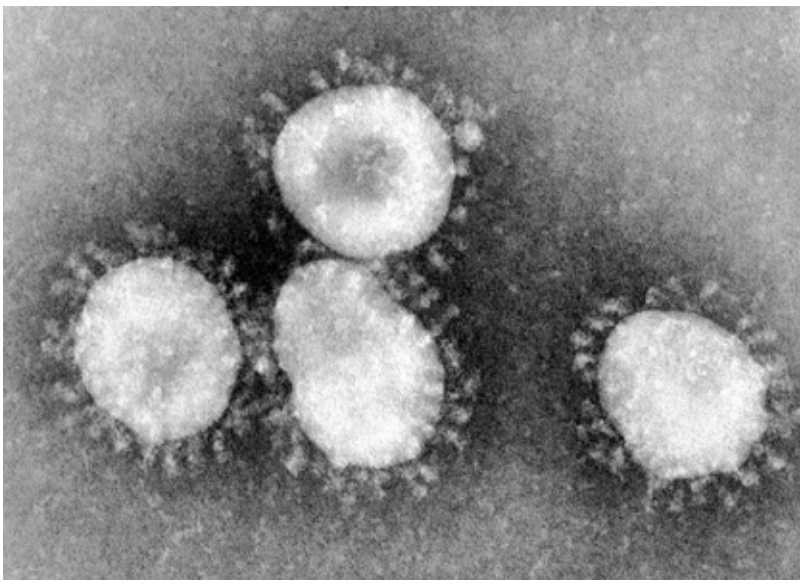
Figure 1 Illustration of SARS-CoV-2 virion

Transmission

SARS-CoV-2 is primarily transmitted between people via respiratory droplets that are produced when an infected person coughs, sneezes, or speaks. The virus can be transmitted to anyone within a 1 metre radius via their mouth, nose or conjunctiva.

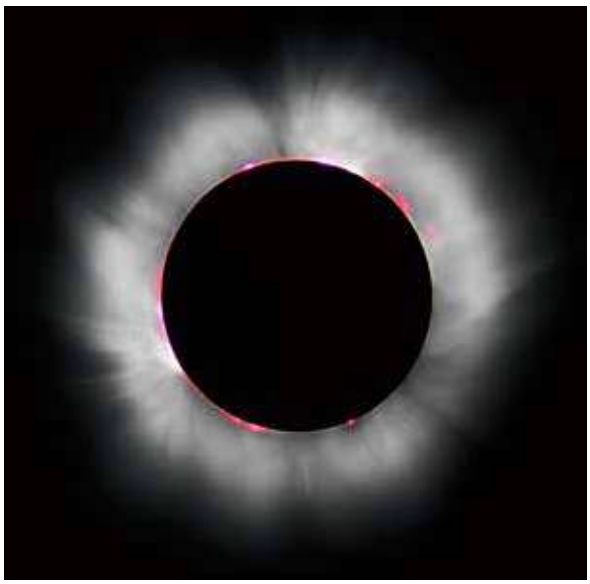
Transmission may also occur via indirect contact, when droplets contaminate surfaces or objects in the immediate environment. Airborne transmission has not been reported under real-life conditions, but may be possible in specific circumstances, such as procedures that generate aerosols (for example, endotracheal intubation).[3–5]

Figure 2 The S (spike) proteins of coronaviruses



CDC/DR FRED MURPHY

Figure 3 Corona visible during total solar eclipse, as seen in France in 1999



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There is evidence that conjunctival secretions and tears from infected patients contain virus RNA and those with conjunctival symptoms may pose higher risk.[6] Some studies have also shown that SARS-CoV2 may be present in urine or faeces; however, there have been no reports of transmission through faeces or urine.[7] Asymptomatic transmission has also been reported.[8]

Clinical disease: signs, symptoms and course

The key symptoms of COVID-19 are as follows:

1 Common symptoms: fever, dry cough, tiredness (malaise), shortness of breath (dyspnoea)
2 Less common symptoms: aches and pains (myalgia), nasal congestion, headache, sore throat, diarrhoea, loss of taste or smell (anosmia)
3 Uncommon symptoms, but described in cases: conjunctivitis, skin rashes, discolouration of fingers or toes.

The incubation period is between 2 and 14 days, with most people developing symptoms on day 5 or day 6.[9] Fever is the most commonly reported symptom (documented in around 88% of patients), but not always at initial presentation.[10] A dry cough is present in 66% of patients, although a large minority do have sputum production, and it frequently persists for longer than five days. Gastro-intestinal symptoms and nasal congestion are rarer and have each been reported in about 5% of patients. Difficulty breathing (dyspnoea) is a well-recognised feature, indicating and prognosticating more severe disease. Loss of the sense of smell (anosmia) has also been reported as a strong predictor for COVID-19.[11] Conjunctivitis has only been reported in 0.8% of cases; this is in keeping with other coronaviruses which are also known to (infrequently) cause conjunctivitis.[12,13]

Around 80% of people who become infected will have mild or asymptomatic disease and 14% will have a more severe course, with 5% requiring critical care.[11] It is worth noting that most of the published studies characterising the symptoms of COVID-19 have been done in the hospital setting and so are likely to have captured a more severe spectrum of disease. Case series documenting milder disease have shown the variability in symptoms from asymptomatic to minor fever or respiratory symptoms, with a highly variable illness duration.[14,15]

Prognostic factors

Although the infectious dose (the number of viral particles needed to establish an infection) for COVID-19 is as yet unknown, it is likely to be low given the rapid spread.[16] Recent data suggests that higher viral loads isolated in patients is a poor prognostic indicator, which has led to concerns that a high initial infectious dose, to which healthcare workers are likely to be exposed, might lead to higher viral loads and poorer outcomes. There is insufficient evidence to back this up at the moment, although studies have shown this to be the case for influenza A.[17]

Groups that have been shown to be at higher risk of more severe disease include the elderly, particularly those >80 years old, who have a fatality rate of 14.8%, compared to a documented 2.3% total case fatality rate.

COVID-19 transmission update

The World Health Organization (WHO) published a new scientific brief on COVID-19 transmission on 9 July. According to the brief, some outbreak reports related to crowded spaces indoors have suggested the possibility of aerosol transmission, combined with droplet transmission; for example, during choir practice, in restaurants, or in fitness classes. The full brief is available at **www.who.int/news-room/commentaries/detail/transmission-of-sars-cov-2-implications-for-infection-prevention-precautions**

Other at-risk groups include smokers, men and people with any underlying comorbidity, especially chronic kidney disease, chronic obstructive pulmonary disease and cerebrovascular disease.[18]

Disease control and prevention

The spread of respiratory viruses can be prevented by hygienic measures such as handwashing, wearing of personal protective equipment (PPE) and by isolating people who are infected. for the 10–14 days it takes for the virus to clear (depending on the severity of the illness.[19] A Cochrane review article on this subject found that surgical masks or N95 respirators were the most consistent and comprehensive measures to stop the spread of infection.[20] The subject of face masks has been hotly debated, with many countries now legislating requiring members of the public to wear masks outside the home. In health care settings, WHO recommends frequent hand hygiene, cough etiquette, environmental cleaning, maintaining physical distancing and training health care personnel in the rational and appropriate use of PPE.[3]

Testing for SARS-CoV-2

Many tests have been developed and granted emergency approval for detecting infection with SARS-CoV-2, with more being developed on a weekly basis.[21,22]

Testing can involve:

- Looking for evidence that the virus is **currently active** in the body; this involves looking for viral RNA and is known as **antigen testing**
- Looking for evidence that someone has been **infected previously** and has developed some level of immunity against the virus, e.g., by producing antibodies; this is known **antibody testing**.

An **antigen** is any substance that causes your immune system to produce **antibodies** against it; in this instance the antigen is the SARS-CoV-2 virus.

The tests fall into four main technical categories:

1 Reverse transcription polymerase chain reaction (RT-PCR) (currently the standard detection test for active SARS-CoV-2 infection)
2 Loop-mediated isothermal amplification (LAMP)
3 Lateral flow
4 Enzyme-linked immunosorbent assay (ELISA).

These are outlined in more detail below.

1. Reverse Transcription Polymerase Chain Reaction (antigen test)

RT-PCR can be used to detect the virus's single-stranded RNA genome, which may be present in an individual actively infected with SARS-CoV-2. It is a commonly

used diagnostic test that has been in widespread use in research and medicine for over two decades. It is currently the most widely used of the diagnostic tests for SARS-CoV-2. [21,22]

Practically, this test is performed by taking samples from the nasopharynx, oropharynx and/or sputum and sending these to a designated laboratory (Figure 4). These samples will contain a mixture of the patient's DNA and any viral RNA that may be present. Additional molecules such as fat, proteins and DNA are destroyed and removed using chemicals. The enzyme in the test, reverse transcriptase, creates a complementary DNA copy of the RNA. Specific regions of the DNA are then isolated with "primers" that have been designed to only detect the complementary DNA of SARS-CoV-2. This is then amplified by using DNA polymerase to synthesise new DNA strands from the deoxynucleoside triphosphates. The PCR machine cycles the test temperature so that, ultimately, 35 billion copies of viral DNA are made for each strand of viral RNA that was initially present. Fluorescent markers then bind to the amplified DNA, emitting light that is read by the PCR machine to give the test result. Once the light intensity is above a defined threshold, the test is deemed positive. It is also possible to get a quantitative estimate of the viral load in the patient's sample from the number of PCR cycles that were required to give the positive result.

"Many tests have been developed and granted emergency approval for detecting infection with SARS-CoV-2, with more being developed on a weekly basis."

RT-PCR is considered the "gold standard" for detecting SARS-CoV-2. When swabs have been taken appropriately, it is a very sensitive test that can detect current infections of the disease, allowing clinicians to determine who is infected and who is not. However, it relies on active infection and **viral shedding**, so will miss patients who have cleared the infection and recovered, or those who have been recently infected and have not yet started to shed virus. Viral shedding varies in location between individuals and across time, meaning that on one occasion swabs may be positive from sputum but not from the nasopharynx, potentially leading to false negative results.[21,22] According to limited data in the literature, the sensitivity ranges from 56–83%.[23] With a high prevalence of SARS-CoV-2 in the population, the negative predictive value will decrease. A negative result should therefore be interpreted with caution. Furthermore, it requires expensive equipment and reagents that are not widely available in resource-limited settings, meaning that samples must be sent to a centralised laboratory. This can result in a testing turn-around time of over 48 hours.[21,22]

Viral shedding takes place when a virus replicates inside the body and is released into the environment.

Figure 4 Demonstration of a nasopharyngeal swab for COVID-19 testing being performed in Germany

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2. Loop-Mediated Isothermal Amplification (LAMP) (antigen test)

LAMP is a newer technology than RT-PCR and uses a similar approach to detecting viral genetic material. However, unlike PCR it performs the testing at a set temperature without cycling. The amount of DNA produced this way is much greater and the result can be visualised without needing a machine to interpret the results, as the reaction mixture turns cloudy due to the production of the chemical magnesium pyrophosphate. Like with PCR, fluorescent dyes can be added to increase the accuracy, so that when a given threshold of light intensity is produced, the test result is deemed positive.[21,22]

As LAMP works on the same principle of detecting the viral RNA, it has similar advantages and disadvantages to RT-PCR above in detecting individuals actively infected with the virus. It is also dependent on a swab capturing viral RNA. However, it is cheaper and easier to perform with results visible by eye, meaning it can be performed at hospital laboratories, with results available within 2–3 hours. This reduces the testing turnaround time and may make this test more appropriate to resource-limited settings. However, there is far less evidence relating to the accuracy of these tests and they are still being assessed in clinical settings.

3. Lateral flow (antibody test)

These tests are commonly referred to as "antibody tests" or "point-of-care tests" and use the same technology used in urine pregnancy tests and other rapid diagnostic tests. Unlike the two tests described above, they are designed to detect the patient's antibodies to the virus circulating in the bloodstream, rather than the virus (or viral RNA) present in secretions in the throat or nose.[21,22]

A finger-prick of blood is dropped onto a small, absorbent pad in the test device, whilst a small amount of 'buffer' solution is added to carry the blood across the device. If there are antibodies against SARS-CoV-2 present in the blood, these bind to specific chemical antigens embedded in lines on the test device. Once captured on these lines, a colour change happens, meaning that the clinician can read off the result. There are usually three such lines: one for IgG antibodies, one for IgM antibodies, and a control line. The control line indicates that the test was performed correctly. Results are available within about 20 minutes.

It usually takes at least 4–5 days for an infected person to produce IgM antibodies. In one study, a total of 90% of infected patients tested positive for IgM antibody tests by days 11–24. IgG antibodies are created later and can be detected several weeks after the initial infection.[21,22] It is not known how long IgG antibodies remain present.[24] As these tests rely on patients' antibodies to be present, the test will be negative early in a patient's illness. If positive, this could be because they are currently infected or because they had the infection in the past. There are also concerns regarding a low specificity, i.e., a relatively large number of people who test positive for antibodies even though they haven't had COVID-19 (false positives); this potentially gives people a false sense of security that they are immune. Some tests detect antibodies to other coronaviruses that can cause relatively harmless upper respiratory tract infections. Testing kits are currently expensive and labour intensive if many tests are to be performed.

4. Enzyme-Linked Immunoabsorbent Assay (ELISA) (antigen and antibody test)

An ELISA is a frequently performed biochemical test that detects either antigens or antibodies of interest. Within the COVID-19 setting, tests have been developed to detect antibodies to SARS-CoV-2, similar to that described in the lateral flow testing above. ELISAs use enzymes that are linked to antibodies that are able to specifically bind to either IgM or IgG anti-SARS-CoV-2 antibodies. When they bind, a colour change occurs, the degree of which can be measured by a machine. [21,22]

As antibody tests, these share the same advantages and disadvantages of the lateral flow testing, allowing people to know whether they have been infected at some point in the past. It has the advantages, over lateral flow, of being cheaper and more easily scaled up to allow larger numbers of patients to be tested. However, these tests are still being developed for SARS-CoV-2 and diagnostic accuracy indices are currently limited.

Comparison with other diseases

It is important to note that when we talk about 'the virus' within the context of COVID-19, we are specifically referring to the SARS-CoV-2 virus. It should not be confused with other viruses that have caused epidemics or pandemics recently.

Although there have been a number of viral epidemics in the 21st century, there has only been one other official pandemic this century: the 2009 H1N1 influenza pandemic. However, it is important to consider the current COVID-19 pandemic within the context of other recent epidemics to place it in context and also see what has been learned from previous experience.

Severe Acute Respiratory Syndrome (SARS) epidemic (2002–2004)

SARS shares a number of similarities with COVID-19: they are both coronaviruses, both first presented in China, both have likely originated from animals (known as zoonosis), and both spread through respiratory droplets.[25] However, there are also a number of differences. The cases of SARS were more severe than what is currently being seen in COVID-19, which helped with contact tracing and, eventually, containing the spread of the virus. The mortality rate was also higher, at about 9.6%. However, the virus itself seemed less able to persist in the human population. As a result, there were only 8,098 cases reported across 29 countries. Most transmission occurred within the hospital setting.[25]

Figure 5 A point-of-care rapid antibody test being performed in Peru. A blood droplet is collected by a pipette

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Middle East Respiratory Syndrome (MERS) epidemic (2012–present)

Like SARS, the MERS epidemic is also a zoonotic coronavirus that causes fever and cough, as well as poor clinical outcomes that are associated with older age and comorbidities. The MERS outbreak originated in Saudi Arabia in 2012 and is still not contained. To date, there have been 2,494 confirmed cases and 858 deaths across 27 countries, with a case fatality rate of 34.4%. Like SARS, most transmission is nosocomial, with limited community transmission – in contrast to COVID-19.[25]

H1N1 Influenza pandemic (2019)

As the only other pandemic of the twenty-first century, the H1N1 influenza pandemic infected a quarter of the world's population and led to over 284,000 deaths. It ran from January 2009 until August 2010. Unlike COVID-19, children were most frequently infected, with 47% of children globally aged between 5 and 19 developing symptoms.[26] This was also one of the groups with the highest mortality rates. Furthermore, antiviral medications existed for severe infections and the development of a vaccine was relatively straightforward, given that influenza vaccination research and manufacture occurs on an annual basis. Vaccine research started in April 2009, and the vaccine was made available by December 2019.

Ebola epidemics (2014–2016 and 2018–July 2020)

Ebola virus is an extremely deadly virus that can cause mortality rates of up to 50%.[27] However, it is only spread through bodily fluids such as sweat, blood and vomit, rather than aerosols. This usually occurs in the later stages of the infection when an individual is already unwell and showing symptoms. This is unlike COVID-19, which may be carried asymptomatically. This in part helped in the control of the virus as it made contact tracing relatively more straightforward. There have been two recent epidemics of Ebola: the first between 2014 and 2016 originating in West Africa, and the

second starting in 2018 in the Democratic Republic of Congo and still ongoing. In the 2014–16 outbreak, there were 28,616 cases resulting in 11,310 deaths. As of April 2020, there have been 3,461 cases and 2,279 deaths in the current outbreak in DRC.[27]

1981 – present: Human Immunodeficiency Virus (HIV) pandemic
HIV is also occasionally referred to as 'the virus' and should therefore not be confused with SARS-CoV-2. The HIV virus, clinical disease and pandemic are very different from the other outbreaks listed above. HIV is a retrovirus that infects CD4 immune cells, leading to immunodeficiency and ultimately Acquired Immunodeficiency Syndrome (AIDS) if not treated. Transmission is through contaminated bodily fluids, meaning it can spread through sexual contact, contaminated needles or blood products. The first cases were recognised in 1981 and since then it has spread globally, with a significant burden of the disease being borne in Africa.[28] At present, there are over 37.9 million people living with HIV globally, of whom 62% have access to treatment in the form of antiretroviral therapy.[29] The outbreak has spanned four decades and although there has been significant progress in terms of treatment and prevention, there is still no commercially available vaccine.

Vaccines and therapies

No vaccine or specific treatment has so far been licenced for COVID-19, although research into these is happening at an unprecedented rate. Regulators are permitting fast-tracked human trials into new possible therapies and vaccines without the need for going through the usual preliminary research and development. Details of these therapies are beyond the scope of this article, but a summary of current research can be found at the Centre for Evidence-Based Medicine.[30]

Human trials of a vaccine have recently commenced, although it is unlikely to be ready for distribution until the end of 2020, at the earliest. A wide number of drugs have been trialled in patients, but case series are small and evidence for their routine use is lacking. Treatment of COVID-19 remains supportive, with severe cases needing supplementary oxygen or non-invasive ventilation. In the most severe patients, admission to an intensive care unit is required, with sedation, intubation and ventilation. A recent clinical trial has demonstrated that dexamethasone can reduce the mortality in severe patients who are ventilated or receiving supplementary oxygen.[31] Readers are recommended to follow WHO clinical guidance on its use.

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Disability and COVID-19

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Several organisations have already published guidelines for eye health services during this pandemic. However, most of them neglect the needs of people with disabilities, including people who are blind or partially sighted.

CBM/NIRPHAD

A patient is screened for COVID-19 before being allowed into the eye hospital. INDIA

People with disabilities are at greater risk of having difficulties when performing essential hygiene measures (for example, accessing water pumps for handwashing), following recommendations for physical distancing, and/or accessing health information material.[1] This increases the risk that people with visual impairment and other disabilities may contract SARS-CoV-2.[2] Here are a few practical recommendations for eye health professionals.

Involve people with disabilities in decision making

Reach out to local organisations of persons with disabilities (OPD), also known as disabled people's organisations (DPOs), and involve their representatives in adapting eye health services for people with different types of impairments during the pandemic. If these organisations do not exist, there are very helpful web-based resources available, for example from the International Disability Alliance webpage (International Disability Alliance).[3]

Make communication accessible

Make any mass media communication as accessible as possible by using captioning, sign language translation, high contrast, Braille, and so on.[3] Short and simple toolkits to improve the accessibility of documents for people with low vision are readily available, for example from the webpage of the World Blind Union.[4] It is also important to secure a budget for more costly resources, such as sign language translation. The use of face masks, and recommendations to talk as little as possible during slit lamp examinations, significantly reduce verbal and non-verbal communication. It is important to explain the need for these adaptations to patients ahead of an examination.

Face masks might intimidate older patients as well as individuals with hearing, cognitive or psychosocial impairments, and conveying medical information in an encouraging manner is more difficult if patients cannot rely on non-verbal information sources such as facial expression. This can aggravate the general fear and anxiety caused by the pandemic. Be very patient, take additional efforts to repeat information as needed, and try to use transparent masks, if available.

A helpful "ABC mnemonic" was recently published to improve non-verbal communication when wearing facemasks, especially during communication with older patients or those with cognitive impairments: "Attend mindfully – Behave calmly – Communicate clearly."[5] Use plain language and clear illustrations to convey health information messages.[6]

Provide inclusive guidance for people with disabilities

General COVID-19 guidance may not be feasible for people with disabilities. For example, people may not be able to stay 1–2 metres away from others (as recommended by the World Health Organization) if they rely on carers or family members for help with their daily tasks. To "cover your mouth with the elbow when coughing" can be impossible for people with spinal cord injuries or muscular-skeletal conditions. Health information material should inform people about possible modifications and tailored recommendations.[7] For example, if individuals with cognitive disabilities are not able to avoid touching their eyes, the people supporting them could help them to wash their hands more often. Service providers should make sure that equipment used by people with physical impairments, such as wheelchairs, handrails, and crutches, are frequently cleaned and disinfected, and that people with disabilities have access to water, sanitation and hygiene facilities that do not pose a risk to them.

Some conditions, such as Down's syndrome, are associated with other health conditions which increase the risk of those affected becoming seriously ill from COVID-19. If possible, proactively test them, and the people supporting and caring for them, for SARS-CoV-2 infection. Carers should also write down who they have been in contact with; this supports contact tracing in communities with lower levels of SARS-CoV-2 infection.

Engaging with Organisations for Persons with Disabilities and including the needs of people with disabilities in the planning and improvement of eye care services should be a long-term goal for eye health services worldwide. For more information, please see the 2013 issue of the *Community Eye Health Journal* titled Disability and Diversity (**www.cehjournal.org/disability-and-diversity/**) and specifically this article: **www.cehjournal.org/article/a-vision-for-inclusion**

Hearing impairment

It is very important to consider those patients who are hard of hearing and in need of eye health services, as well as the large number of patients with combined visual and hearing impairments. Results from a population-based study in Telangana state, India, suggested that 25% of people with visual impairment also had an additional moderate or severe hearing impairment.[8] It is easy to imagine how difficult it might be for them to get information and to communicate with health workers during the COVID pandemic, and all the stress this brings. Recommendations for medical personnel to facilitate communication with patients who are deaf, hard of hearing or deafblind[9] include the following:

1 Integrate accessible communication in pandemic preparedness plans. During a pandemic, health systems are overwhelmed. It is essential that medical facilities optimise accessible communication with patients with all types of impairments before a pandemic, so that they are prepared accordingly.
2 Every hospital should have pen and paper, or whiteboards and markers, so that people with hearing impairments can communicate with health care workers.
3 Transparent (see-through) face masks offers speech reading (lip reading) advantages for listeners with severe-to-profound hearing losses, especially in noisy hospital settings.[10] Instructions for self-made transparent masks are circulating in social media; however, these masks have not been tested against common safety standards, so the level of protection they provide may be no greater than that of a fabric mask.

CASE STUDY: INDIA

An eye hospital's humanitarian response to COVID-19

NIRPHAD (Naujhil Integrated Rural Project for Health and Development) Rural Eye Hospital is a secondary eye hospital in the state of Uttar Pradesh, Northern India. It focuses mainly on eye patients from vulnerable populations and has strong links to community-based rehabilitation services, as well as organisations of people with disabilities.

Since the declaration of the COVID-19 pandemic, the eye hospital offered services to emergency patients only. At the same time, staff members decided to organise humanitarian response activities. NIRPHAD Rural Eye Hospital is located next to one of the main national highways in India, and the sudden announcement of a national lockdown in India at the end of March resulted in thousands of migrant workers passing by on their way back to their homes in rural villages. Hospital staff members handed out around 1,500 sanitisation kits and food packs in this time (Figure 1).

Figure 1 NIRPHAD Rural Eye Hospital distributed sanitation packs to people queueing in front of the hospital's entrance

CBM/NIRPHAD

Figure 2 NIRPHAD Rural Eye Hospital distributed food and sanitation packs to a man with a physical disability who is using a three-wheeled vehicle

CBM/NIRPHAD

Figure 3 A man with visual and physical impairment received food and a sanitation kit

CBM/NIRPHAD

Eye hospital personnel also started to distribute soap, masks and food to poor and vulnerable people in Mathura town, focusing on people with disabilities (Figures 2 and 3). This targeted humanitarian response was possible because the health workers already had access to information about people with disabilities in the community, including where they live, thanks to a disability-disaggregated community survey that was conducted before the pandemic.

Personnel trained in disability-inclusive development supported the district authorities to provide accessible health information, for example by using plain language that is understood easily by everybody, including people with cognitive disabilities.

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Wellbeing and mental health during the COVID-19 outbreak

Acknowledging distress is often the first step to recovery. By recognising this – and putting simple measures in place to support the population, patients and staff members – health services can contribute to greater resilience and capacity to recover following major epidemics and other emergencies.

HEIKO PHILIPPIN

Taking time out for something as simple as a cup of tea with colleagues can help health workers to cope better with stress.

Since the beginning of 2020, it has become clear that the COVID-19 pandemic is going to have a long-term impact; not only on those directly affected, but also on the global economy and the systems that meet the health, education, social protection and other basic needs of populations. It is also likely that the pandemic will set us back in terms of achieving the Sustainable Development Goals. However, for most of us, the impact on our own lives, and on the lives of those around us, is the immediate and most pressing concern. For people who are already near the poverty line, and living without financial or other reserves, the impact is more severe. People who are marginalised due to health problems or disabilities, especially in lower-income countries, often face additional barriers to getting the care and support they need.

Addressing mental health in communities and services

At times of disruption, change and uncertainty, it is natural for us to worry, and this can cause problems not only in feelings of anxiety and concern, but sometimes can also affect how well we function in our daily lives, our workplaces and our relationships. Increased irritability, emotional exhaustion, exacerbation of pre-existing conditions, poor concentration and poor sleep may be examples of such mental challenges.

During the COVID-19 pandemic, it is good to ensure that mental and physical wellbeing are a component of our response in the health services, so that we can minimise distress and prevent people developing more significant mental health problems, such as depression or anxiety.[1] In addition, it is important that we care for our own mental health so that we can cope with what may be a very stressful situation and can continue to support the people around us.
Fortunately, there are good evidence-based recommendations on what to do to reduce the negative impact of the crisis and promote wellbeing. The dedicated Mental Health Innovation Network COVID-19 page has a list of resources on how to support different population groups during the COVID-19 virus outbreak: **https://bit.ly/MHINcov**

Recommendation 1: Support people in the community

Most people cope well during stressful times by turning to those around them – their friends, families and communities – for practical and emotional support that supports their resilience: their ability to withstand stress and bounce back from difficult experiences or events. This healthy and effective means of getting help is more challenging during an epidemic where populations are advised, or even ordered, to keep physically distant or to practice isolation and quarantine.[2]

What you can do

- Promote communication between people to minimise social isolation. This might be via telephone or online contact, or through interaction that follows safe practice in order to avoid the transmission of infection. There are also some good basic strategies that can help people to cope with the stresses of self-isolation and with their concerns or worries about COVID-19 in particular (see panel on page 36).
- Ensure that people who might be alone, isolated or marginalised are not neglected; for example, check that people who are disabled (e.g. with visual impairment) are able to receive communication on how to avoid the disease and that their basic needs are met, e.g., if they are unable to go out for shopping.

How to look after your own health and wellbeing[1,5]

- Feeling under pressure is a likely experience for you and many of your colleagues. It is quite normal to be feeling this way in the current situation. Stress and feelings associated with it are not a sign of weakness, but a normal reaction to difficult times, and can be managed.
- Follow health advice, especially about avoiding the risk of getting infected or passing on the virus (e.g., wash your hands and distance yourself from others in public).
- Stay informed, but don't immerse yourself in too much negative news. For example, only follow trusted and respected news sources. Seek information at specific times, once or twice a day.
- Maintain a healthy lifestyle: eat well, sleep well and exercise. Don't resort to negative coping mechanisms such as smoking or drinking too much.
- Take time out if you need to. If a situation is very stressful, try to remove yourself from it.
- Find trusted people to talk to, such as friends or colleagues. It can be helpful to speak to a counsellor, if available, if those around you cannot help.
- The World Health Organization has produced an excellent, well-tested self-help guide for dealing with stress – visit **https://bit.ly/WHOdoingwell**

- One of the main reasons why people with disabilities (such as blindness) or diseases (such as trachoma) develop mental health problems is the stigma, discrimination and social exclusion that they experience from the people around them. An effective way to reduce this experience and promote wellbeing is to directly address stigma with community awareness programmes and to facilitate peer support. The neglected tropical diseases (NTD) website **infoNTD.org** has many helpful resources, including screening tools and stigma guidelines: **https://bit.ly/NTDwell**

Recommendation 2: Support your patients

We know that people experiencing chronic illness, pain, loss of function or disability are more likely to have associated mental health problems (comorbidities). This can often have a negative effect on health behaviours and hinder recovery. Unless asked, people will not generally discuss mental health problems, but are more likely to do so if this forms a part of the consultation. Including mental health and wellbeing as part of routine practice can improve health outcomes and allow people to benefit from more comprehensive care that improves their overall wellbeing and quality of life. During emergencies, mental conditions become more common.[3] Experience from Ebola Virus Disease outbreaks shows that epidemics have a particularly significant impact on individuals and communities,[4] so this is even more important during the period of the COVID-19 pandemic.

What you can do

- Ask about your patients how they are feeling. The World Health Organization (WHO) has developed the Psychological First Aid training package,[5] which can be taught very quickly and help frontline staff to communicate empathically and respond in a considerate way if people are distressed or have signs of more significant mental illness. Visit **https://bit.ly/WHOfirstaid**
- In some services, for example when seeing people with more significant illness or disability, simple screening tools are available that have been widely validated and can help to identify people requiring further support.
- Put in place further support for people who need it. It is important that the small number of people who have more significant needs have access to a qualified person who can offer appropriate treatment, such as a psychiatric nurse, psychologist, psychiatrist or general doctor with mental health training.
  This may be via referral to a local mental health service or hospital.
  If this is not available, it is a good opportunity to advocate for such a service to be provided.

"Health workers can be particularly vulnerable to anxiety and fear when providing treatment during an infectious disease epidemic. The social isolation imposed as a result of COVID-19 makes the situation even more challenging."

Recommendation 3: Support other health care workers

Health care workers and other hospital staff members, including receptionists, cleaners and caterers, are particularly vulnerable to anxiety and fear when working during an infectious disease epidemic. It is important that managers recognise and address this so that staff members' wellbeing can be protected.

What you can do

- As a manager or employer, respond practically to people's concerns, e.g., about adequate protection from infection during work, prevention of transmission to homes, economic stresses and the provision of adequate support to families and loved ones.
- All staff members should be able to have time off for breaks during periods of intense work (particularly if using personal protective equipment or if otherwise restricted in movement), and be given time and space to follow a healthy diet and take exercise.
- The workplace should be an environment where anxiety and stress can be discussed, and access to counselling support provided if possible.

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How to adapt your eye service in the time of COVID-19

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Eye services must adapt to prevent the transmission of SARS-CoV-2, the virus responsible for COVID-19.

Depending on national guidelines, eye services worldwide may be running a full service, postponing non-urgent eye care, or re-opening eye services once again. In this article, we discuss the practical considerations of managing COVID-19, whatever stage your country is in.

Waiting areas and patient flow

To reduce transmission among people coming into the clinic:

1 Reduce the number of people in the clinic at any one time
2 Keep people a safe distance apart (1–2 metres)
3 Reduce opportunities for indirect transmission, e.g., when people touch objects that others have touched
4 Ensure good ventilation, which can be as simple as opening doors and windows.

"Ask patients to limit the number of people going with them to an absolute minimum; preferably none."

Note: Patients with COVID-19, or who have symptoms of COVID-19, should be identified early on and seen in a separate area. Some hospitals provide a 'red zone' for patients with confirmed or suspected COVID-19 patients, and a 'green zone' for other patients.

FATIMA KYARI

Slit lamp breath shield made from a transparent plastic folder. NIGERIA

Reduce the number of people in the clinic

- Re-organise different eye clinics (e.g., glaucoma or cataract) so that as few as possible are open on the same day or at the same time. It may also help to schedule patient appointments at specific times. If this is difficult, explore innovative ways such as sending text messages ahead of time. Patient numbers will also be reduced if routine work is deferred.
- Ask patients to limit the number of people going with them to an absolute minimum; preferably none. In some settings, going with an elderly person to the hospital is a sign of respect and care, thus the advantage of fewer people needs to be explained at the time of making appointments or on arrival at the unit. Some accompanying persons will clearly still be needed for some situations, such as for children or those with visual impairment. Otherwise, consider keeping extra people out of the waiting area and the examination room.

Keep people a safe distance apart

- Redesign seating areas to ensure adequate separation between people (Figure 1).
- In areas where people queue, create 'boxes,' using tape on the floor, to show where they must stand.
- Develop one-way systems for people entering and leaving the clinic so people do not have to pass one another in narrow corridors. Indicate the direction of patient flow by creating arrows on the floor. Use contrasting colours so people with visual impairment can see the arrows clearly; for example, white arrows outlined using black tape.

Reduce opportunities for indirect transmission

- Remove from waiting rooms any objects that several people are likely to touch, such as books and magazines.
- Clean chairs and arm rests at regular intervals.
- Avoid using the same room for different purposes where possible. For example, avoid using the same room for staff members (e.g., as a seminar room) and patients at various times of the day. If this is not possible, clean rooms thoroughly between uses.
- Where possible, prop doors open so that patients do not need to touch any door handles. If this is not possible, provide hand sanitiser or hand washing facilities inside the clinic to avoid the spread of infection. Clean all door handles at regular intervals.

Encourage good respiratory and hand hygiene

We all need to make changes in the way we live, work, and interact with people to reduce the spread of SARS-Cov-2. How we speak, cough, sneeze, rub eyes, touch our face, and touch surfaces can aid the transmission of the virus.

- Provide hand sanitisers and hand washing facilities. Patient hand washing facilities should be in a visible and easily accessible location outside the main entrance to the clinic, with hand washing facilities (or hand sanitisers) inside the clinic if needed.

DIPANKAR DATTA

Figure 1 Tape across the central seats prevent patients from sitting too close to one another. The colour of the tape and the high-contrast sign (a thick, black cross on a white background) is helpful for people with vision impairment, including low vision. **INDIA**

- Consider national guidelines on the use of facemasks by patients and others coming to the clinic. Where these are recommended, advise people on the type of facemasks to use (e.g., cloth facemasks) and ensure they understand how to use and care for them. Masks are a personal item which must not be shared under any circumstances, and cloth face masks must be washed after each use.
- A more informed patient community will act more responsibly and help to lower transmission. Place posters and signs with COVID-19 information where they will be noticed. Use clear and understandable images to make the information accessible to people who are unable to read or who have low vision. Important messages include frequent handwashing and how to cough appropriately. An example of this is the **COVID-19 prevention poster** produced by the Nigerian Centre for Disease Control (Figure 2).
- Use audio-visual messaging screens, where available, to engage patients and the people going with them.

NIGERIAN CENTRE FOR DISEASE CONTROL

Figure 2 COVID-19 prevention poster produced by the Nigerian Centre for Disease Control. **NIGERIA**

Seeing patients safely

Over 1,000 health workers have died from COVID-19 worldwide.[1] Minimising the risk to health workers is important as it not only protects doctors from becoming ill, but also prevents them from passing the virus on to other patients. We recommend the following measures in addition to the proper use of personal protective equipment (PPE).

- Avoid shaking hands, or any other patient contact, as much as possible.
- Use protective equipment, e.g., large slit lamp breath shields (Figure 3). These can be bought, or in some cases received for free, from slit lamp manufacturers. Make your own using smooth, transparent plastic material (Figure 3) that is easy to clean. Use a template, such as those produced by some slit lamp manufacturers,[4] or use paper to make your own template by tracing around the eyepiece of the slit lamp.

Continues overleaf ➤

ARCHANA KULKARNI

Figure 3 Portable slit lamp breath shield. UK

ARCHANA KULKARNI

Figure 4 Indirect ophthalmoscope breath shield. UK

- Recommend that patients and clinicians avoid speaking when at the slit lamp (or keep it to a minimum), and to remain 1–2 metres apart at other times.
- Add home-made breath shields to portable slit lamps (Figure 3) and indirect ophthalmoscopes (Figure 4). Avoid using direct ophthalmoscopes.
- Clean and disinfect breath shields and ophthalmic equipment (e.g., slit lamp, tonometer, trial frames, lenses, etc.) with great care between each patient. Use disposable gloves and a solution of household bleach (1.5 tablespoons per litre of water) or alcohol solutions with at least 70% ethyl alcohol and isopropyl alcohol.
- Clean and disinfect surfaces and any areas touched by patients and health workers, such as seats, door handles, phones, keyboards, pencils and any controls/buttons on the slit lamp. Use the same solutions as for cleaning ophthalmic equipment.
- Minimise patient contact time by reviewing any notes beforehand. One option is to place the patient in one room and the clinician in another, and for them to talk via a phone or tablet computer. The clinician then enters the patient room and conducts a swift examination, with minimal speaking, before exiting and continuing the conversation as before. Another option is to hang a plastic screen between patient and health worker where it is feasible to do so.
- Keep investigations such as visual fields or OCT scans to an absolute minimum.
- Restrict the use of cash and avoid sharing personal items such as mobile phones, keyrings and pens/biros.

Disinfectant solutions

- 1.5 tablespoons (22.5 ml) of household bleach per litre of water
- Alcohol solution with at least 70% ethyl alcohol and isopropyl alcohol

Staff members who have any symptoms of COVID-19 should self-isolate at home, in keeping with national guidelines. Staff who are at risk of severe COVID-19 complications, such as those with medical co-morbidities or with an older age, should step down from frontline work, in keeping with national and local guidelines.

Telemedicine consultations

Telephone consultations may have a useful role in reducing the need for face-to-face consultations. An alternative, where possible, is the use of video conferencing. This allows clinicians to see patients, which can be very helpful.

Many telemedicine software options are becoming available and have been successfully implemented in parts of India. Telemedicine will continue to play a significant role into the future,[5] especially for those more vulnerable to severe COVID-19 complications. It also ensures that patients do not feel left behind while face-to-face services are not available.

It is important to maintain patient confidentiality and follow national guidelines regarding data protection.

Governance

- Set up a designated team to regularly check local and national updates (e.g., the daily situation report) to stay up to date with the case definition, local predominant symptoms, and reporting/notification channels, so that suspected COVID-19 patients are managed correctly.

"Staff members who have any symptoms of COVID-19 should self-isolate at home, in keeping with national guidelines."

- Because different institutions and countries have their different health systems challenges, develop written protocols of practice setting out the changes you are making to address COVID-19. These must align with local and national guidelines and advice.
- On the use of PPE, consider the availability and allocation of resources, as well as environmental sustainability. Aim to reduce the amount of waste you produce, but without compromising infection control.
- As more clinical meetings and tutorials are undertaken as webinars, engage with regulatory medical councils and encourage them to review their rules and begin to recognise online continuous medical education for certification.

Future directions

Eye care providers cannot wait indefinitely for the COVID-19 pandemic to resolve itself. As we know, COVID-19 spreads easily and rapidly, but there are non-urgent eye diseases that we need to treat. We must face this challenge, recognise and manage the scientific expectations, and redefine a new normal for the practice of ophthalmology. We recognise that eye diseases and major causes of blindness remain the same, and that treatment for those diseases remain the same. Therefore, we need to adapt our eye care delivery service to redefine the clinical encounter and develop safe delivery systems to prevent outbreaks in our place of work.

Hopefully, effective treatment options will become available soon. In the meantime, many units are now facing the challenge of when and how to restart services beyond very acute urgent and emergency work. The longer services are deferred, and eye diseases are not treated, the greater the risk of vision loss and blindness which could have been avoided.

Tests, prevention, and treatment for SARS-CoV-2 infection

Although our understanding of the epidemiology and clinical pattern of COVID-19 continues to evolve, and clinical trials for treatment are ongoing, it is safer to assume that there is no known treatment for the disease. As of now, resources do not exist for universal testing. But, hopefully, the following options may be available in the near future:

a. Antibody tests for clinicians, staff members, and patients. This will have to be an easy, reliable, affordable, and quick test which could be given to everyone and would identify individuals who are, or have been, infected so they can be isolated and/or their contacts can be traced.
b. Pre-op throat swab tests. This is important in procedures considered as aerosol-generating, e.g. phacoemulsification, and procedures requiring general anaesthesia. Other options are lung CT to assess the lung parenchyma for pneumonia or fibrosis, and full blood count and inflammatory markers assay (e.g., C-reactive protein).
c. Vaccination. Developments are ongoing. A vaccine for SARS-CoV-2 is still some time away.

Medical education

In the medium to long term, eye units and facilities, supported by their professional groups/societies, need to include disaster management and simulation of case scenarios in medical education so that the service disruptions that resulted during this pandemic are kept to a minimum in the future.

Research

There has been much speculation about conjunctivitis in COVID-19, and that the tear-film harbours SARS-CoV-2 and is transmissible during ophthalmic examination at different stages of the infection. It is important to gather evidence through population-based research on the epidemiology, transmissibility, symptomatology and clinical ocular features of COVID-19. This will contribute towards providing more appropriate patient care.

Conclusion

Unfortunately, fragile health systems will return to the new normal in a less unified/organised manner. Where there have been no established social protection schemes, the response will be slower, and even more difficult. Nevertheless, eye services need to balance patients' behaviour and safety with providers' responsibilities in order to provide appropriate medical care more quickly and in a safe environment.

Resources

1 **Guidelines and information from International Council of Ophthalmology (ICO) member societies** http://www.icoph.org/news/news_detail/602/ICO-Global-COVID-19-Resource-Center.html (Last Accessed 10 May 2020).

2 Parke DW. **Ophthalmology after coronavirus disease 2019 (COVID-19): Transition back to patient care**. JAMA Ophthalmology. https://doi.org/10.1001/jamaophthalmol.2020.2004

3 **Nigerian Centre for Disease Control COVID-19 guidelines** https://covid19.ncdc.gov.ng/guideline/

4 **Example templates for slit lamp breath shields** https://www.haag-streit.com/fileadmin/Haag-Streit_Diagnostics/slitlamps/Divers/Template_for_Extended_Breath_Protecting_Shield.pdf

5 **Guidelines on the use of technology for telemedicine** https://www.rcophth.ac.uk/wp-content/uploads/2020/05/Overview-of-digital-technology-and-telemedicine-for-covid-060520-1.docx

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1 In Memoriam: Healthcare Workers Who Have Died of COVID-19. Medscape 1 Apr 2020 (updated 13 May 2020). **www.medscape.com/viewarticle/927976**

COVID-19: Adaptations and changes at Guinness Eye Centre, Nigeria

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The COVID-19 pandemic has brought unprecedented challenges for eye care in Lagos, Nigeria.

ADEOLA ONAKOYA

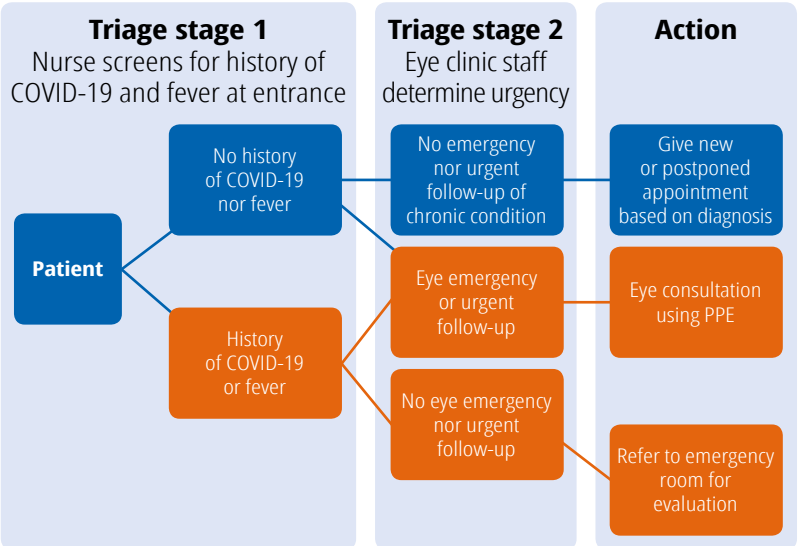
A nurse checks the temperature of patients before they enter the eye centre. NIGERIA

Guinness Eye Centre (GEC) is the Eye Department of Lagos University Teaching Hospital and College of Medicine, University of Lagos, Nigeria; it offers specialist eye care to between 13,000 and 15,000 people per year from Lagos, neighbouring states, and other countries.

The first person to test positive for COVID-19 in Nigeria was identified in Lagos on 27 February 2020. With Lagos becoming the epicentre of COVID-19 in the country, it was vital to adapt eye services to prevent further spread. From 28 February, GEC added more infection control measures whilst continuing to offer all its usual services.

- An auxiliary nurse carried out triage at the entrance to GEC, using an infrared thermometer to check patients' temperature. Patients with a high temperature and/or any history of cough or sore throat were treated as suspected COVID-19 cases (Figure 1).

Figure 1 Protocol for patient triage during the COVID-19 pandemic



- Hand sanitisers, water, and soap were available at all entrances so people could wash their hands before entering.
- Alcohol disinfectants were used to clean surfaces and equipment in consulting rooms and in clinical and administrative areas. Slit lamps were disinfected after each patient.
- All doctors and nurses involved in patient care received face masks, eye protection (goggles) and gloves.

A month later, there was a sudden surge in the number of confirmed COVID-19 cases in Lagos, with suspected community transmission. Hospital managers decided to reduce services and take further measures to protect staff members and patients.

- In order to control the flow of people entering and leaving the hospital, we sealed the back entrance so only the main entrance was kept open.
- Attending physicians and nurses used face shields and protective wear, for example, using adapted theatre gowns as personal protective equipment (PPE) when attending patients.
- Intraocular pressure assessment was performed with non-contact tonometer, and only when this was essential.
- Staff members encouraged and supported to practice social distancing, i.e., stay 1-2 metres away from each other.
- Patients requiring non-urgent follow-up were given extended appointments (i.e., they could come back at a future date).
- Elective surgery was postponed until further notice
- Clinic consultations were restricted to patients with urgent and emergent conditions only, including

ADEOLA ONAKOYA

Physicians and nurses wore adapted theatre gowns and used face shields and face masks when attending to patients. NIGERIA

recent surgery, retinoblastoma, retinopathy of prematurity, unexplained red eye, trauma, and sudden vision loss. Staff members shared contact numbers with patients and, if needed, contacted them to provide further information.

- Staff members were put on a rota and attended only once or twice per week.
- We started to offer some of our training and teaching activities by webinar, which has been very well received.

Going forward at GEC after lockdown involves a gradual return to full services, starting with around 30% of the normal consultations and offering staggered appointment times. Stringent measures are being introduced to reduce the number of people in the waiting area, e.g., by allowing patients to be accompanied by no more than one supporting family member, if needed. Everyone in the clinic will be expected to practice social distancing, wash and disinfect their hands, and wear face masks. Appointments for patients with stable chronic conditions such as glaucoma or refractive errors will be postponed.

Services will be evaluated and reviewed every two weeks. Elective surgery is still on hold until a return to full activities, which depend on a significant decline in the COVID-19 infection rate and a return to normal activities in the country.

Acknowledgements

With thanks to the resident doctors at Guinness Eye Centre, Lagos University Teaching Hospital for their help with the images in this article.

Useful resources

1 Nigeria Centre for Disease Control (NCDC) COVID-19 dashboard. **http://COVID19.ncdc.gov.ng**

2 American Academy of Ophthalmology Advisory on COVID-19. **http://aao.org/coronavirus**

COVID-19 and eye care services in Ethiopia

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In Ethiopia, COVID-19 is spreading less rapidly than in many other countries, with 831 people infected, 191 recovered, and 7 deaths as of 28 May 2020. However, its impact on every aspect of life has been profound. The government has declared a state of emergency, limiting movement and physical contact to control the spread of infection. The need to prevent infection, but still deliver important health care services, has profoundly challenged the health care sector.

The ministry of health recently released a statement about the need to continue to provide facility-based essential health care services in parallel with the COVID-19 response; these include maternal and child health services, services for communicable diseases such as HIV, TB, leprosy, and malaria, and non-communicable diseases such as severe hypertension, cardiac problems, diabetes mellitus, asthma, and chronic obstructive pulmonary disease. Eye health is not included in this list, and it is not yet certain what will happen with eye care services.

Most eye health units have suspended eye examinations for fear of spreading the SARS-CoV-2 virus, which is responsible for COVID-19. Services are limited to managing injury-related eye emergencies. Elective ocular surgery has been suspended all over the country, and people presenting to eye units with bilateral blindness from cataract, for example, are being turned away, even if surgery would improve vision. There are concerns that the situation is likely to drive people to look for alternative care, such as from traditional healers; this may prove costly for people's eyesight and general health.

MATTHEW BURTON

Sight-saving eye surgery has been suspended in Ethiopia due to COVID-19. ETHIOPIA

Ethiopia is the country most affected by trachoma. There were intensive trachoma elimination activities throughout Ethiopia before COVID-19. However, following the World Health Organization (WHO) recommendation on neglected tropical diseases (**bit.ly/cov19ntd**), all trachoma elimination activities were suspended, including Zithromax® Mass Drug Administration (MDA) to clear the pool of ocular *Chlamydia trachomatis* infection in the community. This poses a risk that active infection may re-emerge in districts which were on the verge of meeting elimination targets; this compromises several years of collective elimination efforts. Corrective eyelid surgical services to treat trichiasis (the blinding stage of trachoma) have been stopped, leaving hundreds of thousands of people at risk of irreversible vision impairment. Community-based eye health surveys and ongoing research have also been discontinued, leading to considerable delays in the planning and provision of eye health services.

Overall, the COVID-19 situation in Ethiopia is having a profoundly negative effect on the progress made in the last several years as part of the WHO-led VISION 2020 and global trachoma elimination programmes. This has very significant health and socio-economic implications for a country with high rates of poverty and a high burden of blindness from preventable and treatable conditions.

Ophthalmology during COVID-19: who to see and when

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How to communicate with patients during COVID-19, reduce routine work and maintain a service for patients with urgent or emergency conditions.

EDITH MACHA

During the height of the pandemic, corridors were reassigned as waiting areas for patients with urgent eye care needs. TANZANIA

Eye services must be reconfigured during an epidemic or pandemic, such as the one we are now living through. This includes deciding who to see and which appointments should be postponed. Our task is to balance our patients' long-term and short-term eye health needs against the risk of them suffering health- and life-threatening complications from COVID-19. In many countries, governments are making these decisions and producing national guidelines; it is important that we adhere to these while doing our best to limit the negative consequences for our patients.

Defer routine work

Once COVID-19 takes hold in a country, the advice is to postpone non-urgent, routine work to help stop the spread of infection.[1-4] Many of the people who seek eye care services are older or suffer from underlying medical conditions such as diabetes, so they are at greater risk of severe complications from COVID-19 if they contract the SARS-CoV-2 virus (responsible for COVID-19) at the clinic or along their journey. Reducing routine eye care services protects these patients and allows eye health workers to support other areas of health care during the pandemic.

Where there is an appointment system in place, postpone pre-existing appointments by phone message, letter, or other means, as available. Ideally, send patients written information about any postponed appointments, the advice given, and how they will get new appointments once the guidelines change.

Defer ophthalmic surgery

Defer surgical procedures where possible, until COVID-19 infection transmission in the region has been brought under control. It is ideal to test patients for COVID-19 within 24–48 hours before surgery, but this is not

Communicating with patients and the community during the pandemic

People will continue to have eye care needs during this time, and it is important that they do not feel abandoned.

Stay in touch with patients who have long-term eye care needs or who require postoperative care. Check that they have their medication, know how to use it, and are doing so confidently and consistently, and explain what signs or symptoms to look out for as potential warning signs that their condition is worsening and requires medical care.

Tell people in the community what services are available and when they must seek help, e.g., if they have an eye injury and/or a painful red eye, or if they experience a sudden loss of vision. Tell them what to do and where to go.

Everyone needs to be reassured that it is safe to come to the hospital if they need eye care. Many countries have reported a reduction in the number of patients coming to hospitals for urgent or emergency care, in part due to fear of contracting the virus at the hospital; many clinicians are now concerned about an increase in mortality and ill health in future.

Figure 1 Information about COVID-19 outside eye clinics or hospitals is important, but it is even better to reach people before they leave home.

ELMIEN WOLVAARDT

Explain how patients can get in touch with the eye service if they have concerns or need advice. Some eye health units have set up dedicated call centres; however, to avoid frustration, involve enough trained staff members so they can answer everyone's calls in a reasonable amount of time.

How to reach the community

How we communicate these important messages can include radio broadcasts, adding information on website pages, using social media channels, sending phone messages or letters directly to patients, working with community leaders and organisations, and putting up signs outside clinics or hospitals. To reduce risk, as well as the cost of travel, it is better if this information reaches people where they live – before they start a long journey to the hospital.

always feasible. General anaesthesia is an 'aerosol-generating procedure' (AGP) which increases the risk of virus transmission, so emergency operations should ideally be carried out using local anaesthesia, if feasible, while using PPE as required. Even surgery under local anaesthesia could involve significant exposure between medical personnel and patients which could be considered a significant risk.

Triage patients arriving at the eye health unit

It is important for each eye care facility to plan management and direction of patients and relatives arriving at the facility.

- Display clear information and instructions at or before the entrance.
- Assign health care workers to provide and clarify information as needed while wearing appropriate PPE (as per local guidelines) and with social distancing measures in place. Many units use clear, Perspex screens or plastic curtaining to protect staff members.
- Carry out initial triage, including verbally assessing for symptoms of COVID-19 and temperature checks, as early as possible, e.g., under a roof or inside an open tent outside the hospital building. This should follow a standard procedure.
- Direct patients with non-urgent eye conditions to return home. Tell them where to find relevant information, when they should come back (e.g., if their symptoms worsen) and how to make another appointment.
- Work out pathways for patients who need to be seen urgently, but are symptomatic or at increased risk of having COVID-19.
- As the pandemic slows down, there will be an increasing number of patients without signs of COVID-19 and a decreasing number of patients showing signs of COVID-19. Different pathways and examination rooms for the two groups still need to be maintained to reduce the risk of the eye care facility turning into a source (or 'hotspot') of SARS-CoV-2 infections.

Which patients should I see?

Whether or not a patient should be seen for assessment and potential treatment will depend on several factors:

- The eye disease
- The patient
- The eye care facility
- The COVID-19 situation in the country or region.

It is important that national guidelines are understood and followed. Conducting a telephone or video-conferencing consultation may be helpful for giving advice or deciding whether a review is needed (Figure 2).[5, 6]

Patients who need urgent or emergency care

It is important to set up pathways so that patients can still receive care for urgent or emergency conditions which would otherwise result in serious and irreversible loss of vision.

Patients with urgent or emergency eye conditions will typically complain of an **eye injury**, a **painful red eye**, and/or a **sudden loss of vision**. An experienced clinician should be responsible for detecting these conditions (typically before examining the patient) and deciding how urgently the patient should be seen.

Figure 2 Aravind Eye Hospital Pondicherry (Puducherry) offers remote consultations via video chat and WhatsApp calls. **INDIA**

ARAVIND EYE CARE SYSTEM

Typical diagnoses include:[1, 3, 7]

- Chemical injuries
- Acute angle-closure or neovascular glaucoma
- Suspected elevated intraocular pressure or rapidly progressive glaucoma
- Wet, active age-related macular degeneration
- Sight-threatening treatable retinovascular disease (proliferative diabetic retinopathy and ischaemic CVRO)
- Acute retinal detachments (macular on, macular off < 4 weeks)
- Uveitis – severe active
- Ocular and adnexal oncology – active, aggressive, uncontrolled or untreated lesions
- Retinopathy of prematurity (screening and treatment)
- Endophthalmitis or microbial keratitis
- Sight-threatening trauma
- Sight-threatening orbital disease, e.g., orbital cellulitis, severe thyroid eye disease
- Giant cell arteritis affecting vision.

Continues overleaf ➤

The risk of the patient being exposed to COVID-19 infection versus the risk of harm if treatment is delayed need to be weighed up. Having only one seeing eye would be a strong factor in favour of a patient being seen, for example. If possible, patients should stay away from eye health care settings if they are older than 70 years, have serious pre-existing health problems, or are immunosuppressed. Suggested guidelines exist for subspecialty services, such as medical retina care and glaucoma, which will need to be adapted for the local context.[1]

Telephone or videoconferencing consultations may be helpful for giving advice or deciding whether a face-to-face review is needed.[5, 6]

Triage and protective precautions

Table 1 gives the American Academy of Ophthalmology's guidance on triaging patients and the appropriate precautions to take. However, where and how patients are seen, and what PPE (personal protective equipment) is used, will depend on local policies and the availability of PPE.

Table 1 AAO interim guidance on ophthalmology patient triage and precautions

Clinical situation	Patient management / precautions
1. Routine ophthalmic issues and previously scheduled appointments	• Routine problems should be deferred, and previously scheduled appointments should be cancelled • Appointments should be rescheduled only upon clearance from public health authorities • Refill all necessary medications
2. Urgent ophthalmology appointment for a patient with no respiratory illness symptoms, no fever, and no COVID-19 risk factors	• Standard precautions* • Added precaution of not speaking during slit lamp biomicroscopic examinations is appropriate • In the setting of adequate PPE supplies, use of surgical mask and eye protection** for the clinician as well as surgical mask for the patient may reduce asymptomatic and pre-symptomatic transmission
3. Urgent ophthalmic problem in a patient with respiratory illness symptoms, but no fever or other COVID-19 risk factor	• The patient can be seen in the eye clinic • The patient should be placed in an examination lane immediately with the door closed and placed in a surgical mask. The treating ophthalmologist and health care personnel require surgical masks at minimum • Gown, gloves, surgical mask and eye protection are recommended for the clinician.† An N-95 mask should be worn if a procedure is planned that will result in aerosolized virus • The examining room must be disinfected after examination
4. Urgent ophthalmic problem in a patient who is at high risk for COVID-19	• The patient is best sent to the ER (emergency room) or other hospital-based facility equipped to evaluate for, and manage, COVID-19 • If the patient has an urgent eye problem based on screening questions, the facility should be one that is equipped to provide eye care in the hospital setting • If SARS-CoV-2 infection is confirmed, CDC (or hospital) guidelines for care of suspected COVID-19 patients should be followed for **health care facility preparation** and **infection control** • Eye care is best provided in the hospital setting. Transmission precautions‡ for treating ophthalmologists include wearing a surgical mask, gown, gloves and eye protection (face shield or goggles, if available)
5. Urgent ophthalmic problem in a patient with documented COVID-19 (or person under investigation [PUI])	• The patient should remain in the hospital setting if possible • Determine whether the eye problem is urgent based on screening questions, and if so, evaluation and management should be in the hospital setting • If the patient is not hospitalized at the time of referral, the patient is best referred to the ER or other hospital-based facility equipped to manage both COVID-19 and eye care • CDC or hospital guidelines should be followed for care of COVID-19 patients • Transmission precautions‡ for treating ophthalmologists include wearing an N-95 mask, gown, gloves and eye protection (face shield or goggles, as above) • [Read the American College of Surgeon's guidelines for operating on COVID-19 patients]
[Read the **American College of Surgeons' guidelines** for operating on COVID-19 patients]	

* **Standard** (Universal) **Precautions:** Minimum infection prevention precautions that apply to all patient care, regardless of suspected or confirmed infection status of patient, in any health care setting (e.g., hand hygiene, cough etiquette, use of PPE, cleaning and disinfecting environmental surfaces). See **CDC: Standard Precautions**.

** Supply permitting, tight-fitting **goggles may be preferable to face shields** for eye protection.

† Currently, there are national and international shortages of PPE, which also warrant consideration. Excessive use of PPE may deplete the supply of critical equipment required in the future for patients with COVID-19 as the epidemic expands. Use of PPE should be considered on an institutional and case-by-case basis; universal usage for all patient encounters is not appropriate.

‡ **Transmission Precautions:** Second tier of basic infection control, used in addition to Standard Precautions when patients have diseases that can spread through contact, droplet or airborne routes, requiring specific precautions based on the circumstances of a case. Transmission precautions are required for cases of suspected COVID-19. See **CDC: Transmission-Based Precautions**.

Figure 3 All patients must wash their hands before entering the eye unit

WHO

Conjunctivitis and contact lenses

COVID-19 can cause conjunctivitis and virus particles may be found in ocular secretions, leading to concern about spread to eye care workers.[8] However, in one of the largest studies to date, conjunctivitis was not a common finding in confirmed COVID-19 patients.[9] Virus particles are usually detected in tears when patients have clinically apparent conjunctivitis, which appears to be a late manifestation in patients with severe, systemic disease.[10, 11] Isolated conjunctivitis is not an urgent or emergency condition and many cases could be deferred. For those patients who are seen, it is suggested that the same precautions are taken as with other patients who are likely to have COVID-19. There is, as yet, no evidence of anyone contracting COVID-19 through contact lens wear or that asymptomatic contact lens wearers should cease wearing contact lenses.[12] However, encourage good hygiene practices and lens cleaning, as always.

Resuming non-emergency ophthalmic care

When the number of COVID-19 infections start decreasing and reaching lower numbers, it will become important to consider when and how to restart routine care and elective surgery. National guidelines need to be followed and guidance from the Royal College of Ophthalmology (RCOphth) and the American Academy of Ophthalmology (AAO) can also be considered.[13, 14]

- Gradually reintroduce a service with reduced numbers of patients to help maintain social distancing.
- Prioritise patients at greatest risk of harm from lack of eye treatment, whilst aiming to avoid face-to-face consultations in those at high risk of severe COVID-19 complications.
- Maintain PPE and infection control measures, including changes to patient flow or infrastructures.

Advances in vaccines, immunity tests and other preventive interventions will hopefully play a useful role in future and improve people's access to eye care.

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14 AAO Coronvirus updates. **https://www.aao.org/headline/alert-important-coronavirus-context**

How to make hand sanitiser/hand rub

Hand sanitisers (also known as hand rub) and hand washing play important roles in fighting viral infections.

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The COVID-19 virus can be transmitted when someone touches a contaminated surface and then touches their mouth, nose or eyes, and contaminated hands can also transfer the virus to other surfaces.

The World Health Organization (WHO) recommends hand washing with soap and water for 20 seconds to prevent contact transmission. WHO also recommends the use of alcohol-based hand sanitisers based on the following factors[1,2]:

- They are effective in killing microorganisms
- They are suitable for use in resource-limited or remote areas with lack of accessibility to clean water and sinks
- Hand hygiene using hand sanitiser is easy, fast, and accessible at the point of patient care
- It is affordable to make
- There are few adverse effects.

Figure 1 World Health Organization poster on how to use hand sanitiser

WHO

Alcohol is the active ingredient in hand sanitisers. At high enough concentrations, it will destroy most viruses, bacteria and fungi by denaturing (changing the shape of) the proteins that make up these microbes.

For hand sanitiser to be effective, the final formulation should be 80% ethanol or 75% isopropyl alcohol. To achieve that concentration, the instructions below require either:

- Ethanol (96% alcohol), or
- Isopropyl alcohol (99.8% alcohol).

Note: The World Health Organization recommends that hand sanitisers are used on skin with **no visible dirt**. If your hands are visibly dirty, wash them with soap and water (Figure 1).

What you will need

To make 10 litres of hand sanitiser, you will need:

Ingredients

- Alcohol: 8,333 ml (millilitres) ethanol 96%, or 7,515 ml isopropyl alcohol 99.8%
- Hydrogen peroxide 3% (417 ml)
- Emollient: glycerol (glycerine/glycerin) 98% (145 ml)
- Sterile distilled or cooled boiled water (just over 1.1 litres when using ethanol, and just over 1.9 litres when using isopropyl alcohol)

Equipment

- Container for mixing: a large, clean container or 'tank' with a minimum volume of 10 litres, with a cap or screw top (and made of glass or translucent plastic so you can see the liquid level)
- Measuring cylinders and measuring jugs
- A plastic or metal funnel
- 100 ml plastic bottles with leak-proof tops and/or 500 ml glass or plastic bottles with screw tops for distributing the hand sanitiser to handwashing stations or individual health care workers

Procedure

- Clean the working surfaces.
- Wash your hands and put on a clean lab coat or an apron.
- Gather the ingredients and place within easy reach.
- Measure and mark the 10-litre level on the outside of the mixing container.
- Place the funnel in the opening of the mixing container.
- Use the measuring jug and/or cylinder to measure and pour the alcohol (8,333 ml of ethanol 96% or 7,515 ml of isopropyl alcohol 99.8%) into the mixing container (Figure 2a).

Figure 2 Preparation of alcohol-based hand sanitisers according to WHO guidelines[1]

CHOON FU GOH

- Measure 417 ml of hydrogen peroxide using a measuring cylinder and add to the mixing container (Figure 2b).
- Measure 145 ml of glycerol using a measuring cylinder and pour it into the mixing container (Figure 2c).
- Glycerol is very viscous and will stick to the wall of the measuring cylinder; therefore, rinse the cylinder with some of the sterile distilled or cooled boiled water and empty this into the mixing container.
- Add sterile distilled or cold boiled water into the bottle or tank to the 10-litre mark (Figure 2d).
- As soon as possible after all the components have been added, firmly close the mixing container to prevent evaporation.
- Shake the mixing container gently to mix the solution (Figure 2e).
- Pour the solution into the dispensing bottles, e.g. 500 ml or 100 ml glass or plastic bottles (Figure 2f).
- Store the bottles for 72 hours before use to make sure that any microbes that may have been present in the mixing container or the new/reused bottles are destroyed.
- Label the bottles with the final concentrations of ingredients (Table 1).

Adapted from World Health Organization guidance on approved hand rub formulations[1]

Table 1 Final concentrations of ingredients in hand sanitiser

Hand sanitiser
• Ethanol 80% (or isopropyl alcohol 75%)
• Glycerol 1.45%
• Hydrogen peroxide 0.125%
• Water 18.43% (when using ethanol) or 24.43% (when using isopropyl alcohol)

Read more online
How to make 100 ml of hand sanitiser gel
bit.ly/CEHJhandgel

References

1 WHO. Guide to Local Production: WHO-recommended Handrub Formulations, **www.who.int/gpsc/information_centre/handrub-formulations/en/**

2. Osei-Asre et al. Managing *Vibrio cholerae* with a local beverage: preparation of an affordable ethanol-based hand sanitizer. Heliyon (2020):6;e03105.

How to make hand sanitiser gel

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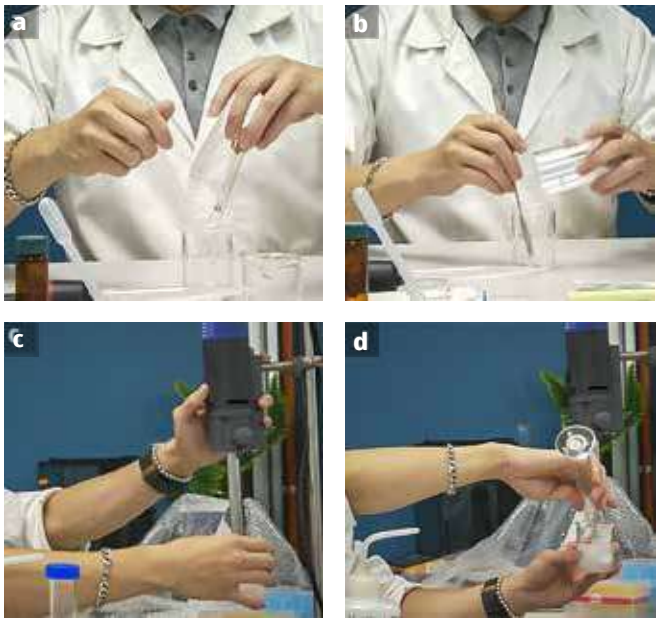
Alcohol-based hand sanitisers can be made in the form of a gel, which allows the alcohol to remain in contact for the hands for longer while hand washing/hand rubbing.

This hand sanitiser gel is suitable for use by the public and can be prepared on a small scale at home or in a laboratory, using basic equipment. For the hand gel to be effective against viruses such as SARS-CoV-2, the final product should contain 80% ethanol **or** 75% isopropyl alcohol. Ethanol is less concentrated than isopropyl alcohol, so you will need to use slightly more.

The World Health Organization recommends that hand sanitisers are used on skin with **no visible dirt**. If your hands are visibly dirty, wash them with soap and water.

Figure 1 Preparation of alcohol-based hand sanitiser gel



CHOON FU GOH

What you will need

To make 100 ml (millilitres) of hand gel, you will need:

Ingredients

- Alcohol: ethanol 96% (83.3 ml) or isopropyl alcohol 99.8% (75.2 ml)
- Emollient: glycerol/glycerine/glycerin 98% (4 ml)
- Gelling agent: hydroxypropyl methylcellulose (1 g)
- Sterile distilled or cooled boiled water (20 ml)

Equipment

- A beaker or other container for mixing (250 ml)
- Measuring cylinders and measuring jugs
- Micropipette (optional)
- Plastic or silicone spatula
- Weighing balance or electronic scales
- Electric mixer or homogeniser
- A glass or plastic dispensing bottle (minimum 100 ml in volume)

Procedure

- Clean the working surfaces.
- Wash your hands and put on a clean lab coat or an apron.
- Gather the ingredients and place within easy reach
- Graduate the final dispensing bottle by marking the level equivalent to 100 ml.
- Measure the alcohol (83.3 ml of ethanol or 75.2 ml of isopropyl alcohol) using a measuring jug or cylinder.
- Cover (to avoid evaporation) and set aside.
- Measure 20 ml of sterile distilled water or boiled cold water using a measuring jug or cylinder. Set aside until needed.
- Measure 4 ml of glycerol using a measuring cylinder or micropipette and then pour it into the beaker or container (Figure 1a). Rinse the measuring cylinder with some of the sterile distilled water or cooled boiled water to remove the remaining glycerol and pour it into the mixing container.
- Weigh 1 g of hydroxypropyl methylcellulose and disperse it gradually into the solution mixture to avoid the formation of gel lumps. Use a mixer or homogeniser to hasten the process (Figure 1b and 1c).
- Add the measured alcohol into the mixing container (Figure 1d). A mixer or homogeniser can be used to help the mixing process.
- Empty the solution into the dispensing bottle (Figure 1e). Use a plastic or silicone spatula if needed.
- Add sterile distilled water or cold boiled water into the dispensing bottle, up to the 100 ml mark.
- Place the lid on the dispensing bottle as soon as possible to prevent evaporation.
- Mix the solution by shaking the bottle gently.
- Store the solution for 72 hours before use to make sure that any microbes in the alcohol or the bottles will be destroyed.
- Label the bottle and list the final concentrations of ingredients (see Table 1).

Table 1 Final concentrations of ingredients in hand sanitiser gel

Hand sanitiser gel
• Ethanol 80% (or isopropyl alcohol 75%) • Glycerol 4% • Hydroxypropyl methylcellulose 1% • Water 15% or 20% depending on type of alcohol used

References

1 WHO. Guide to Local Production: WHO-recommended Handrub Formulations, **www.who.int/gpsc/information_centre/handrub-formulations/en/**

2. Osei-Asre et al. Managing Vibrio cholerae with a local beverage: preparation of an affordable ethanol-based hand sanitizer. Heliyon (2020):6;e03105.

The importance of planning in the face of the COVID-19 pandemic in Paraguay

Celeste Pavón de Miltos
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Rainald Duerksen
Founder-Director: Fundación Visión, Paraguay and CBM Regional Inclusive Eye Health Advisor for Latin America.

Planning, collective decision-making and care of staff members is at the heart of eye health provider Fundación Visión's approach to COVID-19 in Paraguay.

FUNDACIÓN VISIÓN

A health worker checks a patient's appointment letter before allowing her to enter the hospital. PARAGUAY

Fundación Visión is a large eye care provider in Paraguay which provides around 50% of the country's ophthalmic services. There are four hospitals, which are managed in cooperation with public, private, national and international organisations. Our response to COVID-19 has been characterised by information and training, collective decision-making, operational and financial planning, and care of staff members.

Information and training

On 4 March 2020, Paraguay issued a national plan in response to the pandemic. Based on this plan, Fundación Visión drew up an institutional protocol for COVID-19. The protocol included the definition of cases, internal and external communication plans, prevention and personal protective measures, triage of patients and employees, detection and management of suspected cases, infrastructure and care procedures, notification of cases, hospital hygiene, and the cleaning, disinfection, and sterilisation of ophthalmic materials and equipment.

"In accordance with national guidelines, Fundación Visión had to stop providing all but emergency eye services for 90 days."

On 10 March, the day the second case of COVID-19 in the country was confirmed, we began to train staff members.

From the field

Natalia Margonari, an ophthalmologist and vitreoretinal specialist, is part of the Fundación Visión retinopathy of prematurity programme team. Dr Margonari and her team drive long distances every week to visit neonatal units at regional hospitals, where they screen premature babies for retinopathy of prematurity (ROP) and provide treatment, if needed. ROP can cause irreversible blindness unless it is detected early and managed appropriately. "We are in the midst of a pandemic that affects everyone worldwide, and we have been living in quarantine – but we cannot stop our work. We are taking strict protective measures so we can continue to reach premature and low birthweight babies who are at risk of ROP and do everything we can to save their vision."

Decision making and communication

One of the biggest challenges for Fundación Visión has been the lack of predictability inherent in the pandemic; as a result, decisions are made by consensus among the board, the council and the executive team.

A COVID-19 advisory team was created, with members from the Medical, Academic Coordination, Vision Program and Operations Directorates. The team issued regular newsletters, including about patient management, evidence-based personal protective equipment (PPE), and the measures needed for offices, study rooms, and operating rooms.

Financial sustainability

In accordance with national guidelines, Fundación Visión had to stop providing all but emergency eye services for 90 days. Maintaining the same staffing levels and functionality during this time – with only minimal income – meant that the organisation would survive for only 90 days.

Therefore, in order to remain viable, we decided to reduce expenses by 80%, including suspending work for 94% of staff members for the 90-day period.

Care of staff members

Fundación Visión continued to contribute towards social health insurance for staff members who had been suspended; a payment that was subsequently taken over – and expanded on – by the government.

An emergency committee, made up of representatives from each sector, meets often to discuss the need for monetary or other aid to employees and their families. This has included donation of non-perishable food kits. Pastors and volunteers are in permanent communication with staff members and their families to provide emotional and spiritual support in these uncertain times.

Future plans

We have prepared a reactivation plan for restarting services, which will depend on the epidemiological situation and financial indicators.

Personal protective equipment for COVID-19 in eye care

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The main role of personal protective equipment (PPE) within health care settings is to reduce the potential risk of transfer of infectious microorganisms between health care workers and patients. During the pandemic, this is more important than ever.

GILBERT ARINDA

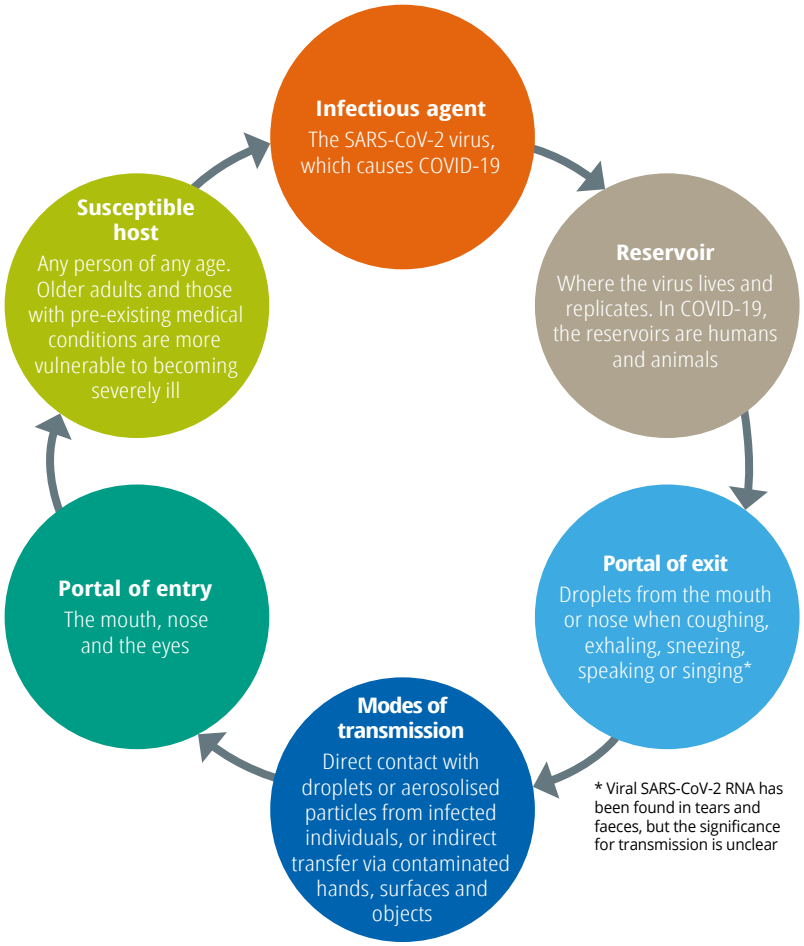
Two health care workers help each other to safely put on PPE. UGANDA

Personal protective equipment (PPE) such as gloves, aprons, long-sleeved gowns, eye goggles, face shields (or visors), surgical masks and respirator masks protect health workers and patients. PPE interrupts the chain of infection (Figure 1) by blocking the portals of exit and the portals of entry. This reduces the risk of health workers transmitting the SARS-CoV-2 virus to others, or becoming infected with the SARS-CoV-2 virus themselves.

Viral transmission

The SARS-CoV-2 virus, responsible for COVID-19, is usually transmitted via small respiratory droplets, produced when an infected person coughs, sneezes, speaks or exhales.[1] These droplets (bigger than 5 µm in diameter) contain viable viral particles and generally fall from the air within 1 metre of the contagious person.

Figure 1 The chain of infection as it applies to COVID-19



Droplet transmission takes place when the droplets make direct contact with the conjunctiva of the eyes, or the mucous membranes of the nose and mouth of another person.

Contact transmission takes place when someone touches their eyes, nose, or mouth with contaminated hands, e.g., after touching surfaces such as mobile phones, door handles or slit lamps that have already been contaminated by virus-containing droplets (or touched by someone else with contaminated hands). SARS-CoV-2 can survive on smooth surfaces for several days, but is susceptible to standard disinfectant methods.[2]

Airborne transmission involves very small droplet particles which can remain in the air for much longer and travel further than droplets before being inhaled.[1] These particles (or droplet nuclei) are less than 5 µm in diameter and can be produced during aerosol-generating procedures (AGPs) such as endotracheal intubation, upper ENT airway procedures involving suctioning, and non-invasive ventilation (e.g., continuous positive airway pressure). This poses a greater risk to health care workers, so higher levels of PPE are needed, such as a filtering face-piece respirator (e.g., N95 or FFP2 masks) and a fluid-resistant gown. AGPs should also be prioritised when allocating PPE.

There is considerable debate as to whether airborne transmission plays a role in the spread of COVID-19 outside of settings where AGPs are performed. The World Health Organization (WHO) is currently evaluating the role of airborne transmission, and recently said that it "cannot be ruled out" in settings that are crowded, closed and poorly ventilated (see **bit.ly/WHOairbornevideo**). Visit **www.who.int** for the latest updates and guidelines.

Ophthalmic surgery: which procedures pose a risk of SARS-CoV-2 transmission?

The SARS-CoV-2 virus can be present in the tear film[3]; however, the relevance of this regarding infection transmission is not yet known. The use of preoperative povidone-iodine as part of standard surgical preparation should inactivate any virus present in the tear film or on the ocular surface.[4] At present, there is no evidence for the presence of virus in the aqueous or vitreous, but the presence of intraocular virus is theoretically possible.

For phacoemulsification, aerosolisation may occur at the wound edge. However, the aqueous will have been replaced by viscoelastic, and then saline, by the time this happens, so it is unlikely that any aqueous will be present during actual phacoemulsification. Operations such as small-incision and extra-capsular cataract surgery should be low risk. The use of cautery could lead to aerosolisation of virus on the ocular surface; it should be used sparingly, followed by irrigation with saline. The PPE recommended for "Theatres where AGPs not done" in Table 1 should be adequate for such surgery.

Many oculoplastic procedures, especially if involving entry into the nasal cavity or lacrimal drainage system, should be considered high-risk, as should surgery involving general anaesthesia. The PPE recommended for "Performing an aerosol generating procedure (AGP)" in Table 1 should be used.

For up-to-date guidance on the risks of transmission during these and other ophthalmic procedures, refer to the American Academy of Ophthalmology (AAO) guidance[5] available here: **bit.ly/AAOrisk**.

The use of masks by patients is becoming more widespread in reducing the risk of transmission during a hospital visit.[6–8] However, there are concerns that a mask may direct the patient's exhaled breath up and into the surgical field during ophthalmic procedures, which carries a risk of contamination. The mask can also get in the way of cleaning the surgical area and the procedure itself. Once the surgical drape has been properly positioned, it may therefore be advisable to lower the patient mask until surgery is completed.

What PPE should we use?

Transmission of SARS-CoV-2 can be minimised by:

- Cleaning and disinfecting equipment and surfaces to prevent cross-contamination and spread.
- Washing hands.
- Protecting the eyes,[4] mouth, nose and clothes by wearing PPE according to national, local or hospital guidelines.

The American Academy of Ophthalmology (AAO) has produced guidance on the risks during eye surgery[5] (see panel) and the Royal College of Ophthalmologists, UK, has produced guidance on the type of PPE recommended in different situations,[9] depending on risk (Table 1). Visit **bit.ly/RCOpth** for up-to-date guidance.

In **low-risk** situations, where there is a risk of droplet and contact transmission only, the advice is to wear disposable gloves, eye protection (goggles or a face shield), a disposable plastic apron and a surgical mask.

In **high-risk situations** (where there is a risk of airborne transmission), the advice is to wear disposable gloves, eye protection, a disposable fluid-resistant gown and a filtering face-piece respirator (N95, FFP2 or FFP3 masks).

Non-clinical personnel

It is important to recognise that everyone in the health care setting is at potential risk of exposure to SARS-CoV-2, including receptionists, cleaners, pharmacists, administrators, patients and the people

Continues overleaf ➤

Table 1 Recommended PPE, as per UK Royal College of Ophthalmologists Guidelines

	Disposable gloves	Disposable plastic apron	Disposable fluid-resistant gown	Fluid-resistant surgical mask	Filtering face piece respirator	Eye/face protection	Slit lamp breath guard
Performing an aerosol-generating procedures (AGPs)	✓ Single use		✓ Single use		✓ Single use	✓ Single use	
High risk acute areas: theatres where AGPs performed, intensive care unit (ITU), high dependency unit (e.g., ophthalmology review of patient in ITU)	✓ Single use	✓ Single use	✓ Sessional use		✓ Sessional use	✓ Sessional use	
Theatres where AGPs not done	✓ Single use	✓ Single use	✓ Single use instead of apron if splashes are likely	✓ Single or sessional use		✓ Single or sessional use	
Working in inpatient area within two metres, e.g., ophthalmology review of ward patients	✓ Single use	✓ Single use		✓ Sessional use		✓ Sessional use	✓ If using a fixed slit lamp
Any outpatient activity (e.g., eye clinic, emergency department)	✓ Single use	✓ Single use		✓ Sessional use		✓ Sessional use	✓

Single use: disposal or decontamination of device between each patient/procedure; dispose at end of session
Sessional use: dispose at end of session, e.g., at the end of morning clinic or when leaving the care setting

who accompany them. Guidelines must be available for all these groups, which includes recommending appropriate PPE and encouraging good hand hygiene.

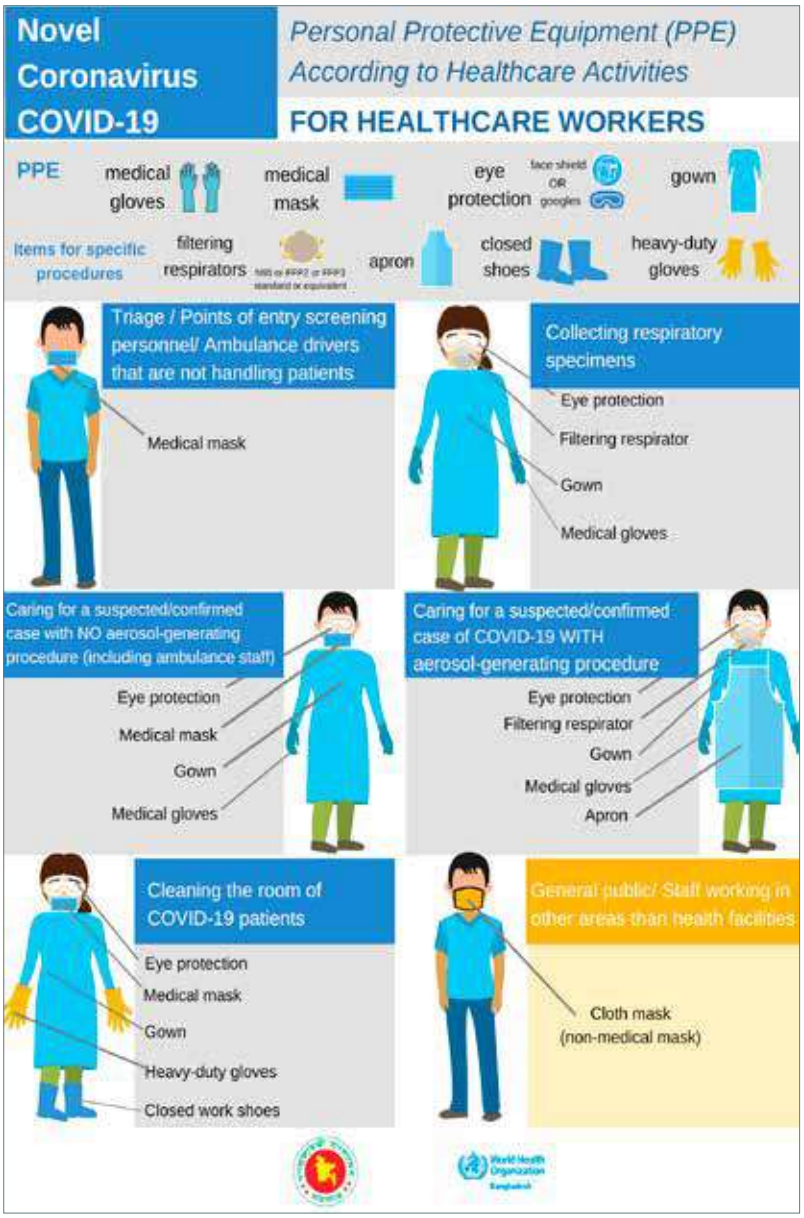
For example, cleaners should be given full PPE (mask, eye protection, gloves, gown and closed work shoes) and personnel carrying out screening and triage can be protected by enforcing distancing of at least 1 metre between them and others, and by providing a glass or plastic screen as a barrier.

The World Health Organisation (WHO) provides excellent guidance on PPE for everyone working in the health care setting.[10] **bit.ly/PPEguideCOV19**

Face masks

Never wear a mask just over your mouth and not your nose, as this exposes the mucous membranes of the nose and puts you at risk of inhaling virus-containing droplets.

Figure 2 Posters can provide useful reminders about the personal protective equipment (PPE) needed for different activities. **Note:** heavy-duty gloves must be decontaminated or changed between clinical environments, else they can be a source of contamination.



WHO BANGLADESH

Source: **bit.ly/PPEposter**

Different types of face masks are available, with varying levels of protection:

- **Fabric masks** are home-made masks, bandanas or scarves which cover the nose and mouth. The level of protection they offer the wearer is uncertain, and depends on the fabric and the fit.[11] The purpose of fabric masks is to prevent the wearer from spreading viral particles to others when coughing, sneezing, talking or breathing out, particularly on public transport. Wash fabric masks after each use to prevent them from acting as a fomite: a contaminated surface or object that can spread the virus to others.
- **Surgical masks** should be fluid-resistant to splash or spray of bodily fluids. This type of mask provides some protection against droplet transmission, but the wearer can still breathe unfiltered air around the edge of the mask. The main role of these, and fabric masks, is to reduce transmission of infectious droplets from the wearer to other people. They are suitable for areas with a **low risk** of exposure.
- **Filtering face piece (FFP) respirators.** These form a tight seal around the edge of the mask so all air passes through the filter. This type of mask is designed to protect the wearer and the people they come into contact with from infectious droplets. FFP2 or N95 masks (European and US terminology respectively) filter at least 94–95% of particles bigger than 0.3 µm in diameter. FFP3 or N99 masks filter at least 99% of particles bigger than 0.3 µm. These both meet the WHO criteria for SARS-CoV-2 and can be used in **high-risk** settings and procedures. The only reliable way to distinguish between different FFP masks is to read what is printed on them. FFP1 masks are not sufficient to protect against COVID-19.

Some countries are recommending that patients wear either surgical masks or fabric masks during their clinic visits and/or when outside their home.[6–8]

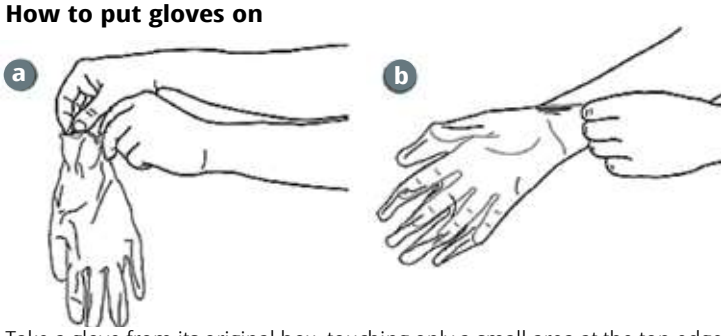
Exactly when masks are changed will depend on local shift patterns, the frequency of breaks, and PPE supply. FFP respirators can normally only be worn for a relatively short period as the filter fills up after prolonged wear. This means that breathing becomes more difficult for the wearer and the effectiveness of the filter is less certain. Check the manufacturer's instructions for each specific mask. Many FFP3 respirators should be disposed of **after a maximum of 8 hours**.

FFP respirators: a good fit is essential

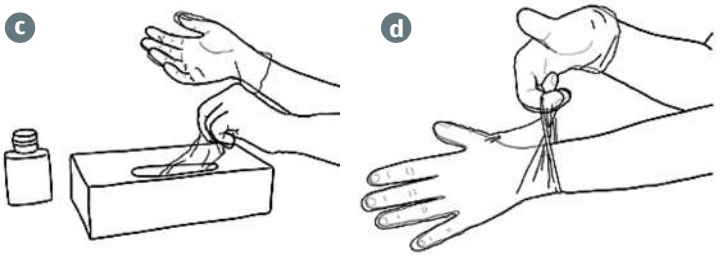
FFP respirators should be fit-tested to ensure an effective seal; if the seal is broken, air and droplets can enter around the edge of the mask. Formal fit-testing involves a health worker wearing the mask and performing different movements and breathing exercises while a strong, bitter substance is sprayed close to their face inside a hood; if they can taste the substance without the mask, but not with it, it fits. If this means of testing is not available, visually inspect that the mask fits snugly to the contours of

Figure 3 WHO guidance on putting on and taking off gloves

How to put gloves on

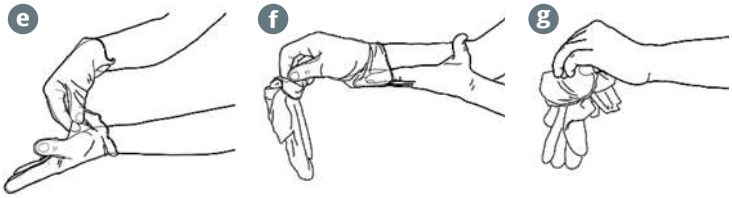


Take a glove from its original box, touching only a small area at the top edge of the cuff (**a**),corresponding to the wrist, and put it on (**b**).



Use your bare hand to take a second glove from the box, touching only the top edge (**c**). To avoid touching the skin of the forearm with the gloved hand, hook the outside of the second glove over the fingers of your gloved hand (**d**) when putting it on.

How to take gloves off



Without touching your forearm, pinch one glove at the wrist (**e**) and remove it by peeling it away from the hand, allowing the glove to turn inside out as you do so. While still holding this glove, slide the fingers of your bare hand inside the remaining glove (**f**) and roll it off your hand and over the first glove (**g**). Discard both gloves in the correct bin and wash your hands.

ADAPTED FROM THE WORLD HEALTH ORGANIZATION: BIT.LY/WHOGLOVES

the face. Observe the wearer breathing in and out to check that the movement in the shape of the mask is consistent with the breathing pattern, i.e., that the front of the mask depresses as they inhale and re-shapes as they exhale. Adjust the general fit and nose-pinching strip accordingly. One mask may not effectively fit all face shapes; ideally, each hospital should have multiple types available to increase the chance of finding one for everyone.

Facial hair

A good seal is impossible if there is facial hair (including stubble) under the edge of the mask. Some styles of beard or moustache are compatible with a good fit if they do not cross the edge of the mask. If, for cultural reasons, a person cannot remove facial hair that crosses the edge of the mask, it is recommended that their duties are temporarily reassigned. If this is not possible, an alternative option would be to wear a full head respirator.

Gloves

Use of gloves is indicated during all patient-care activities that may involve exposure to blood and all other body fluids (including contact with mucous membrane and non-intact skin), during contact precautions and outbreak situations.

COVID-19 is an outbreak situation, so glove use is advised for all patient care activities, even in situations ordinarily considered 'very low risk' and for which gloves would not usually be indicated.

Gloves do not provide complete protection

Gloves are only effective when used appropriately (Figure 3) and in combination with good hand hygiene before use and after removal. Prolonged use without adequate hand hygiene may contribute to infection transmission.

It is vital to remove and replace gloves between each patient. Medical gloves are single-use items; decontamination and reprocessing are not recommended and should be avoided, even where glove supply is limited, because there is no standardised, validated and affordable procedure for safe glove reprocessing.

Thick rubber gloves, such as those used when cleaning, should be disinfected between clinical spaces.[12] For the latest guidance, visit **bit.ly/WHOgloves**

Continues overleaf ➤

Figure 4 World Health Organization guidance on how to wear a mask safely.

WORLD HEALTH ORGANIZATION

Eye protection

In many settings, health care workers are encouraged to wear eye protection (goggles or visors/face shields) when in close contact with patients. Eye protection can be re-used.[13] After each session, clean goggles and face shields using detergent, then using hospital disinfectant. Finish by wiping with water or 70% ethanol to remove any residues.

Donning and doffing PPE

Just as important as which PPE is worn, is how to put on (don) and take off (doff) PPE safely.

Donning

Figure 5 shows the order suggested by WHO for donning PPE to avoid contact or droplet transmission:

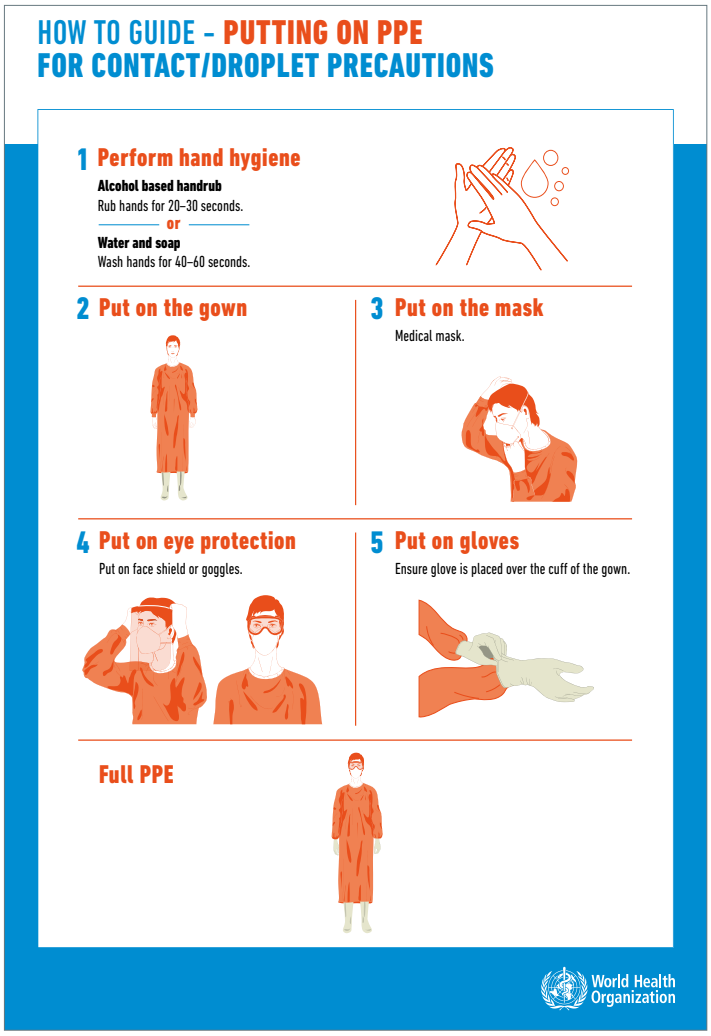
1 Perform hand hygiene
2 Put on the gown (or apron, if fluid-resistant gowns are not available)
3 Put on the surgical or respirator mask
4 Put on eye protection (goggles or visor/face shield)
5 Put on gloves. Ensure the gloves are placed over the cuff of the gloves.

Doffing

Figure 6 shows the order suggested by WHO for taking off PPE worn for contact and droplet precautions.

1 Remove gloves. Avoid touching the outside of the glove. Instead, start at the cuff and peel the glove off, so it is inside-out when you are finished.
2 Remove the gown (or apron, if fluid-resistant gowns are not available)
3 Perform hand hygiene
4 Remove eye protection (goggles or face shield)

Figure 5 How to don PPE for contact and droplet precautions



WHO

Making PPE work in your setting

Depending on the local setting and supplies, choose the best available combinations of PPE for both low- and high-risk exposure and develop a strategy or protocol for decontaminating and re-using specific PPE items if needed. All relevant staff members must be made aware of the chosen strategy and taught how to carry it out appropriately. Using the best PPE available in each setting is extremely important in reducing COVID-19 transmission.

Wearing PPE, particularly face masks, can create an additional barrier in patient care, as patients may find it difficult to engage with health care workers if they cannot see their faces. It can also become much more difficult to hear people when they are wearing masks. To assist communication between health care workers, some hospitals are using hand signals to indicate 'up', 'down', 'good', 'there's a problem', etc. across a noisy ward. It is worth considering implementing this in your unit; if you do, make sure that all staff members know what the different signals mean.

Wearing full PPE can be very uncomfortable, especially on hot days, and staff members should look out for each other and be wary if they start to feel faint and remember to take regular breaks. Hydrate before donning PPE in warm climates or warm health care environments.

As described, the reality of using PPE in a clinical setting can be very challenging, including changing equipment between patients and avoiding cross-contamination, especially if there are shortages of proper equipment. It is important to use PPE along with other infection control guidelines such as proper hand washing and waste disposal. We hope that applying these principles, in a common-sense manner, will help to keep health workers and patients safe.

What if we're running out of PPE?

There has been a global shortage of PPE during this pandemic. Many countries and districts have had to modify guidance depending on PPE availability. WHO and the Center for Disease Control (CDC) in the United States have offered helpful guidance on this.[10,13,14]

Good management of PPE supplies is essential to prevent shortages. This involves forecasting need and monitoring use and distribution. It is important to emphasise that, where possible, PPE of verified quality should always be used, via countries' official registered sources.[15] Where alternative sources are required, we

"Wearing full PPE can be very uncomfortable, especially on hot days, and staff members should look out for each other and be wary if they start to feel faint and remember to take regular breaks."

Figure 6 How to don PPE for contact and droplet precautions

WHO

5 Remove the mask (or respirator). Ensure that you touch only the straps, not the mask itself.

6 Perform hand hygiene.

Note: Hand hygiene must be performed twice: once after removing the gloves and gown, and once when everything else has been removed.

Pay extra attention to avoid contaminating yourself when removing PPE at the end of a session, e.g., by touching the outside of a face visor and then touching your face. If your hands become contaminated at any point during putting on or taking off PPE, wash them immediately. Always wash hands immediately after taking off all PPE. In a high-risk setting, where there is a risk of airborne transmission, a PPE 'buddy' should help with putting on PPE, for example, by tying the back of your gown.

Put used PPE in the correct waste or laundry collection receptacle after removal to ensure safe decontamination and disposal.

must ensure that new supply chains, which may have been developed very quickly, do not involve the exploitation of labourers.

When PPE is in short supply, follow the measures set out in your local or national guidelines. Practices that would be unacceptable in 'normal' circumstances have had to be considered due to current extenuating circumstances resulting from this pandemic.

Some PPE can be disinfected and re-used. These include goggles, face shields, fabric gowns or scrubs that can be washed and re-used.

In the current exceptional pandemic crisis, reprocessing of disposable PPE is an evolving area where research and development is ongoing and urgently needed. Reuse of any item without a reprocessing/decontamination process is considered inadequate and unsafe. Normally, cleaning before disinfection and sterilisation is required for any reprocessing methods, which is not possible for masks and respirators.

Methods for reprocessing masks or respirators are not well standardised or established but possible means of decontamination are under investigation for extreme shortages.[16]

- **Prioritise who gets which PPE**, e.g., prioritise face masks for health care providers rather than patients, or prioritise them for use only in close contact and while carrying out care activities which involve splash or spray. Prioritise glove use for healthcare workers engaged with high risk procedures or patients. If glove supplies are extremely limited, hand hygiene alone may suffice when performing very low risk procedures for which gloves are not normally indicated, for e.g., taking a patient's blood pressure, temperature or pulse – refer to WHO guidelines.[12]
- **Extend the use of PPE** for longer than is normally recommended. E.g., for FFP3 respirators, sessional use can be considered.

NOTE: Because advice is regularly being supplemented and revised, please refer to the WHO, RCOphth and AAO websites mentioned in this article for the most up-to-date recommendations.

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How to make a protective face shield or visor

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Face shields, or visors, protect the eyes, nose and mouth against droplet transmission of respiratory viruses such as COVID-19. If they are unavailable, or too expensive, here is how to make your own.

There is an increasing recognition of the importance of eye protection in reducing the risk of COVID-19 transmission and infection among health care workers, and health care workers are urged to wear eye protection when in close contact with patients.[1,2] Face shields, or visors, offer more protection than a mask and safety goggles, as they prevent viral droplets from landing on the face, from where they can more easily be transferred to the eyes, nose or mouth. However, face shields are not always available locally.

It is possible to make an eye shield using locally available materials. Face shields do not need to be sterilised, but they must be cleaned between patients. Clean with detergent first, then using hospital disinfectant. Finish by wiping with water or 70% ethanol to remove any residues.

Top tip: To avoid the shield (or your spectacles) misting up when you wear an ordinary surgical mask, tape the upper edge of the mask to your cheeks and the bridge of your nose using surgical or micropore tape.

Face shield with foam rest

For health workers who need to wear a face shield for a long period of time, we recommend this type, which has a foam rest to improve comfort on the forehead.

You will need:

- Transparent, flexible plastic film (or a clear binder)
- Strips of cloth, approximately 3–4 cm wide (Figure 1), a woven belt (Figure 2) or a broad elastic band
- Soft foam or cotton wool
- A stapler, or needle and thread/twine or adhesive glue/gum
- Scissors

Method

1 Take these measurements to make a customised face shield:

   a: From temple to temple, across the forehead (about 28–35 cm)
   b: While looking straight ahead, the distance from brow area to below the chin (about 21–25 cm, depending on the length desired)
   c: The head circumference at the widest point across the forehead (about 55–63 cm)

2 Cut the transparent, flexible film into a rectangle:

   - Width equal to **a** (the distance from temple to temple, across the forehead)
   - Height equal to **b** (the distance from the brow to below the chin, or as desired)

Figure 1 a. Face shield made from a fabric belt. **b**. The soft foam or cotton wool is wrapped in water-resistant material

SUNKANMI OGEDENGBE

SUNKANMI OGEDENGBE

Figure 2 Face shield used during indirect ophthalmoscopy examination

DUPE ADEMOLA-POPOOLA

3 Cut the strips of cloth, woven belt or elastic band as follows:
   - Strips of cloth: two lengths of 30–40 cm (long enough to tie behind the head)
   - Woven belt: **c** (the head circumference) + approximately 15 cm if a belt buckle is used, or longer if it will be tied
   - Elastic band: **c** (the head circumference) + approximately 5 cm (long enough to stitch or staple together behind the head).

4 The transparent film will fit sideways across the face. Hold it horizontally, so the shorter edges are on either side, and place on a flat, clean surface in front of you. Attach the strips of cloth, belt or elastic to the upper edge (or upper corners) using adhesive glue or gum, or by stitching or stapling them, as follows:
   - Strips of cloth: attach a strip to each of the two upper corners of the face shield and tie them together behind the head.
   - Woven belt: attach across the top of the face shield, leaving extra length on both sides so it can be secured using a belt buckle or by tying a knot at the back of the head. If the belt is too short, cut it in half and attach it to the two upper corners.
   - Elastic band: attach across the upper edge of the face shield, then bring the ends around behind the shield and sew or staple them together to form a loop. The amount of overlap depends on how tight a fit the person wants.
     Note: If you are using an elastic band, be aware that it may not fit if you wear your hair in a different style. If you change your hairstyle regularly, it would be better to use a woven belt or strips of cloth that tie at the back.

5 Cut soft foam or cotton wool in a strip, long enough to fit across the forehead (measurement **a**) and about 4 cm wide. Glue, staple or stitch this to the inside of the transparent film. If possible, cover the foam or cotton wool with a water-resistant material; this allows it to be wiped clean easily, especially if the wearer is sweating while working in a warm climate or in a warm health care environment.

The soft foam serves as a spacer and provides comfort for the forehead, makes breathing easier, and reduces mist formation if it has to be worn over a long period of time, e.g., for consultations, indirect ophthalmoscopy, or laser procedures.

Face shields for paediatric ophthalmologists

Children are not able to practice social distancing or respiratory hygiene, which is cause for concern amongst paediatric ophthalmologists. For this group of eye health workers, a face shield without a foam rest is comfortable enough, as they may only wear the shield for short periods of time.

Figure 3 An A4 plastic sheet covers the face from the forehead to below the chin

SHAFQUET MOHAMED, GREAT ORMOND STREET HOSPITAL

Figure 4 A hole punch is used to create small openings on either side, and a length of elastic is used to keep it in place

SHAFQUET MOHAMED, GREAT ORMOND STREET HOSPITAL

Figure 5 A simple face shield for spectacle wearers

SHAFQUET MOHAMED, GREAT ORMOND STREET HOSPITAL

SHAFQUET MOHAMED, GREAT ORMOND STREET HOSPITAL

To make this type of face shield, you will need:

- Transparent, flexible plastic film, A4 size (21 cm x 30 cm)
- A hole punch
- Elastic band (30–40 cm in length)

Note: It is possible to create clear plastic film by putting an empty A4 laminating pouch through an office laminating machine.

Method

- The A4 plastic film fits sideways across the face, so the width (30 cm) covers the area from the forehead to below the chin (Figure 3).
- Use the hole punch to create two holes on either side of the A4 plastic film when held horizontally, approximately 5 cm from the top and 1 cm from the side.
- Thread elastic band through both holes and tie at one end.
- Leave the other side untied until the individual tries it on and adjusts the elastic band to fit them (Figure 4).

For spectacle wearers, a quick and easy solution is to use a clear plastic binder pocket, or sleeve, and thread the arms of your spectacles through the holes, as shown in Figure 5.

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Cleaning and disinfection in health care settings during the COVID-19 outbreak

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Cleaning and disinfection of the health care environment plays an important role in reducing indirect transmission of SARS-CoV-2 – the virus responsible for COVID-19.

SARS-CoV-2 can remain viable for between eight hours and several days, depending on the type of surface.[1] Surfaces become contaminated when virus-containing droplets land on them, or when someone with contaminated hands touches these surfaces.

Decontamination of the health care environment is therefore vital. It includes cleaning, disinfection and the safe disposal of waste. In this article, we focus primarily on cleaning and disinfection; safe waste disposal will be discussed in more detail in a future issue of *Community Eye Health Journal*.

Cleaning is a process which removes contaminants, such as dust or microorganisms, and the body fluids (or organic matter) that shield them. **Disinfection** is the process by which any microorganisms that remain after cleaning are reduced to a level at which they are not harmful, which is only effective if the equipment or surface is thoroughly cleaned with a detergent solution beforehand.[2]

In the health care environment, we must clean and disinfect surfaces such as walls, floors, furniture, sinks and taps, stairway rails, touch screens, counter tops, door handles and light switches; and equipment such as torches, ophthalmoscopes, trial lenses, slit lamps, and wheelchairs, to name a few!

Standard cleaning and disinfection protocols continue to apply during the pandemic, but may have to take place more often. This article is based on guidance from the World Health Organization (**bit.ly/COV19clean**), national bodies and current research, but we also strongly recommend that you follow national guidelines.

Management of cleaning and disinfection

It is important that cleaning and disinfection practices are closely monitored, and that personnel responsible for cleaning have the correct PPE and are trained properly.

In the hospital setting, the infection control team is responsible for developing and approving cleaning and disinfection policies and strategy. Assigning cleaning duties, setting up cleaning schedules and checklists, and monitoring cleaning and disinfection practices is the responsibility of matrons, domestic supervisors and service managers.

Appropriate PPE must be worn during preparation of cleaning products and while cleaning: heavy duty gloves, face mask, eye protection (safety goggles or a face shield), a gown and closed work shoes. Note: heavy-duty gloves must be cleaned and disinfected before moving from one area to another, e.g., when moving from the outpatients waiting room to an examination room, and vice versa.

YAN ZHANG

Thorough cleaning and disinfection of equipment and surfaces is essential. CHINA

Everyone who is responsible for cleaning in the health care environment must be trained in:

- Safe disinfectant preparation
- Cleaning methods and equipment use
- Standard precautions
- Risk assessment and transmission-based precautions.

Preparation

Ideally, use fresh cloths and prepare fresh solutions of detergent and disinfectant for each cleaning shift. Rinse and dry mops and buckets between shifts. Detergents and disinfectant solutions applied from a bucket with a cloth or mop will become contaminated during cleaning and progressively less effective. Continued use of the same detergent or disinfectant solution may transfer microbes to each subsequent surface.

Always refer to the manufacturer's instructions when preparing and using disinfectants. When selecting disinfectants for use on items of equipment, check the manufacturer's guidance before you proceed.

Prepare the correct concentration of disinfectant and allow it to remain on the surface for long enough to achieve effective surface disinfection (see the manufacturer's recommendations). Concentrations with inadequate dilution during preparation (too high or too low) may reduce their effectiveness. High concentrations increase the risk of exposing people to harmful chemicals and may also damage surfaces.

Note: After cleaning equipment or an area associated with a confirmed or suspected COVID-19 patient, discard solutions and cloths **immediately**.

Although there are some indications for non-touch disinfection methods like spraying and fumigation (fogging), these techniques are not recommended for routine disinfection of indoor spaces due to potential adverse health risks for the user and other people. Refer to Table 1 for indications. **Under no circumstances should a person be sprayed with disinfectant**.

How to clean & disinfect: a guide

Cleaning

- Clean surfaces thoroughly with a neutral detergent (soap and water). Begin with the cleanest areas first, then move to the more contaminated areas. Clean surfaces that are touched less often before moving on to frequently touched surfaces.
- Take care to clean all surfaces, even if they are not visibly dirty. Scrubbing may be necessary to first remove and reduce visible dirt, debris and other organic matter (e.g., blood, secretions and excretions). Organic matter, or 'soil', can prevent direct contact of a disinfectant with a surface, so that the disinfectant can't reach or destroy the microorganisms that may be present.

Clean and disinfect surfaces more often in areas with high traffic, such as outpatient areas and rooms where staff members don and doff PPE.[3]

Use clean or disposable cloths or paper towels to apply a chemical disinfectant (a chlorine-releasing agent, or 70% ethanol or isopropanol) after cleaning to destroy any remaining microorganisms. Dispose of waste carefully, following standard procedures.

How often?

During the COVID-19 pandemic the frequency with which all routine cleaning and disinfection takes place should be increased. Give priority to frequently touched surfaces or contact points such as door handles, for example.[4]

Selection of disinfectants

Like other coronaviruses, SARS-CoV-2 is very susceptible to disinfectants. Refer to Table 1 for examples of widely used and available disinfectants. Each one has its advantages and side effects; both the scope of application and chemical characteristics of a disinfectant should be considered, alongside local guidelines, before choosing one.

Table 1 Disinfectants commonly used against the novel coronavirus in health facilities

Disinfectant	Concentration	Application scope
Chlorine-releasing disinfectant products) containing sodium chlorite, sodium hypochlorite or chlorine dioxide)	0.5% (5,000 ppm) 0.1% (1,000 ppm)	Faecal, bodily fluid or blood, vomit from infected patients, large spills Contaminated object surfaces, floors, walls, equipment surfaces*
Alcohols	70%	Object surfaces, medical equipment surfaces,*ophthalmic equipment*
Hydrogen peroxide (non-chlorine bleach)	≥ 0.5%	Fogging vapour for terminal cleaning, periodic deep cleans, or outbreak cleans of a ward environment; for enhanced cleaning

* When a chlorine-containing disinfectant or alcohol is used to disinfect the surface of medical equipment, it is important to consult your medical technicians or manufacturers. Some equipment, in particular metal equipment and electronics, may be sensitive to certain chemicals and they may cause damage.

When non-alcoholic disinfectants are applied to surfaces or equipment, wipe down with alcohol or distilled water to remove residues.

To prevent electrical shock or damaging electronics, some frequently touched surfaces (such as light switches, phones, computer and keyboards) may be disinfected using 70% alcohol.

However, it is also important to assess the risk as low, moderate, or high – based not only on the room or area but also on what patient care activities or procedures take place in that space. For example, patient waiting areas are low-risk areas (provided patients are spaced 1–2 metres apart, and there is adequate ventilation), but operating theatres are high-risk areas.

Table 2 Guidelines for cleaning and disinfection of health care surfaces and equipment

Healthcare area	Surfaces (examples)	Frequency
Reception or out-patient waiting area	Desk phones, counter tops, keyboards, touch screens	• At least twice daily with 70% ethanol/isopropanol or products specified by the manufacturer • Frequently touched surfaces to be disinfected after each patient visit
	Lifts, handrails, door/toilet handles, light switches	• As frequently as possible – at least twice daily – and whenever visibly soiled or known to be contaminated with secretions, excretions or body fluids
	Hallways, floors, (walls), furniture	• At least twice daily, whenever visibly soiled and when known to be contaminated with secretions, excretions or body fluids. • Focus on areas that are touched less frequently, then on frequently touched surfaces, then floors (last)
	Toilets and washrooms	• At least three times per day • Frequently touched surfaces, including door handles, light switches, counters, taps, then sink bowls, then toilets and finally floor (in that order) • Avoid sharing toilets between staff and patients
Screening or triage	Counters, tables, pens, clipboards, thermometer	• At least twice daily • Clean and disinfect frequently touched surfaces and surfaces that may have been exposed to respiratory droplets between each patient care episode • Clean and disinfect equipment after each use
Clinic room	Slit lamp chin rest, table, chair, ophthalmic equipment	• Clean and disinfect frequently touched surfaces and surfaces that may have been exposed to respiratory droplets between each patient care episode • Clean and disinfect equipment after each use
Inpatient rooms, wards	Beds, chairs, floors	• At least twice a day, preferably three times a day • Focus on frequently touched surfaces, starting with shared or common surfaces, then move to each patient bed. Use a new cloth for each bed if possible. Clean floors last.
Operating theatre	As per hospital policy	• As per hospital policy

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Ophthalmic practice protocols during the COVID-19 pandemic – the Aravind way

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Protocols, training and regular meetings at senior level have shaped Aravind Eye Hospital's response to the pandemic.

RENGARAJ VENKATESH, AEH PUDUCHERRY

Transparent plastic screens protect health workers and patients at Aravind Eye Hospital. INDIA

On 25 March 2020, the government in India announced a country-wide lockdown. Aravind Eye Care System closed vision centres at once and stopped offering refraction, routine outpatient services, elective surgery, and community outreach activities. Tertiary centres and secondary centres remained open for emergencies, but eye donation activities ceased following a directive from the Eye Bank Association of India.

After the first few days of uncertainty, one of the first steps we took was to put policies and protocols in place and to plan staff training. The senior doctors across Aravind Eye Care System also started to meet regularly to come up with new protocols as and when the situation demands.

We put up posters in all Aravind hospitals about the importance of hand washing and social distancing, and taught staff members about the importance of personal protective equipment (PPE) and what they needed to use, depending on what work they were doing. We check and audit this every day.

Triaging

All patients and employees must undergo temperature checks using a thermal scanner, and everybody entering the hospital must wash their hands thoroughly at a separate handwashing basin. Health care providers and patients must wear a mask as standard practice, and no-one may go with patients.

RENGARAJ VENKATESH, AEH PUDUCHERRY

A locally made foot pump allows patients to use hand sanitiser without having to touch the bottle with their hands. INDIA

We have set up a face-to-face triaging centre. Patients with emergency eye conditions, such as severe conjunctivitis, sudden loss of vision and significant trauma, are referred to a small, rotating team of doctors, refractionists and nurses. Surgery is limited to emergencies such phacolytic and phacomorphic glaucoma, corneal and orbital trauma and retinal detachment, and only essential investigations are performed.

Communication with patients

Postoperative patients, patients on long-term medication and others can ring a dedicated call centre if they need advice. We have also set up a dedicated audio-visual tele-consultation system to enable patients to have a consultation with an ophthalmologist in real time. This has proved to be successful, and we are considering making this a more permanent and robust facility in future.

Infection control practices

In addition to existing infection control practices, it is now standard practice to keep windows open to improve ventilation, clean door handles, chairs, slit lamps and computers regularly (using sodium hypocholorite (bleach) or benzalkonium chloride solution), and to disinfect hands (after hand washing) with alcohol-based hand sanitisers.

Intraocular pressure is measured by applanation tonometry only, and we clean tonometry tips and ultrasonography probes using bleach solution or alcohol swabs.

All slit lamps are fitted with a plastic shield barrier made from large x-ray plates or plastic files. Essential shops within the hospital, such the medical and optical shops, function with as few staff members as possible and offer only limited services.

The supply of protective masks, gloves and disinfectant is an ongoing challenge and is continuously monitored to ensure a smooth supply.

Restarting services at Aravind

Aravind restarted its routine outpatient facilities in early May. Only 10% of patients are accessing the facilities at the time of writing due to issues with transport. Trauma, retinal detachment surgery and intravitreal injections are continuing as usual, but we are awaiting government guidelines before we start elective surgery, including cataract surgery. If routine testing for COVID-19 before surgery becomes mandatory, there will be significant delays as we do not have access to a private testing facility; the government hospital facilities are overwhelmed.

Serving patients in the COVID-19 pandemic

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An Indian eye institute's experience of coping with the COVID-19 pandemic.

LV Prasad Eye Institute (LVPEI) has a network of 210 centres located in four states in south India. At the start of lockdown (24 March 2020) all the vision centres in the remote villages closed their doors to patients. The secondary and tertiary centres, and the centre of excellence, provided emergency care only.

Our approach to this pandemic was prioritised in the following way:

Patient preparation. We provided advice and reassurance to patients online in the form of posters (Figure 1) and a short video (**https://onlineapplicationform.lvpei.org/awareness-and-precautions/**), including, for each of the four states, phone numbers to call in case of an eye emergency.

Safety. Our centre for innovation came up with an open source design for a protective face shield, known as OS Visor, which can be made using a laser cutter. The design files can be downloaded from: **https://lvpmitra.com/osvisor**

Patient flow. We measured the temperature of all patients who walked into the centre and asked about their travel history and respiratory symptoms. Patients who did not have any symptoms indicating an eye emergency were politely requested to come back at a later date.

Triage team. The triage team consisted of an ophthalmologist (in a glass cabin and wearing personal protective equipment), who would determine whether the patient posed a risk of spreading COVID-19 and assess the need for an immediate eye examination.

Teams. The entire patient care service was divided into three teams, each consisting of ophthalmologists, receptionist, counsellors, an administrator, a pharmacist and telecounsellors. Each team visited the hospital every third day. Staff members never changed teams, thereby avoiding cross-infection.

LVPEI

Markings on the floor facilitating adequate distancing between patients. INDIA

Examination protocol. We carried out critical examinations only. Interventions that increased proximity with the patient were avoided if possible. Each staff member used a face mask and visor, and patients used face masks (Figure 2).

Services provided

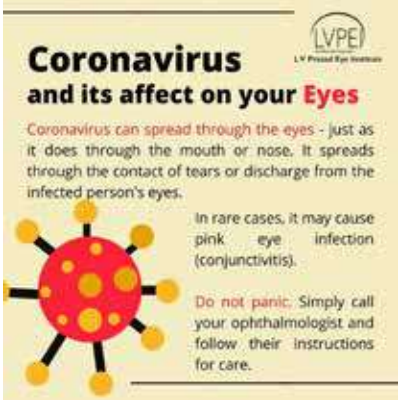
- **Child eye health.** We continued our popular screening programme for retinopathy of prematurity and provided all necessary treatments, such as lasers, intravitreal anti-VEGF injections and vitreoretinal surgery. Children with a new diagnosis of retinoblastoma, or who required a follow-up examination for retinoblastoma, were examined and treated.
- **Emergency care.** We treated everyone with acute trauma and infection. The most common procedures were repairing of open globe injuries, application of tissue adhesive for perforated corneal ulcers, vitreous biopsy and intraocular antibiotic injections for endophthalmitis, retinal detachment procedures, intravitreal injections for acute retinitis and age-related macular degeneration, and cataract extraction for lens- induced glaucoma.
- **Teleophthalmology.** Clinicians proactively made phone calls to all the patients whose appointments were cancelled and provided advice over the phone. Secure access to patients' electronic medical record (EMR) was provided to all clinicians via desktop sharing software.

Future plans

When the curve for COVID-19 flattens, we will reopen services in a staged manner, with special emphasis on the following:

- Availability of protective gear for all staff members
- Availability of consumables and medical supplies
- Clarity on number of patients to be seen in each hour
- Measures to prevent overcrowding in the waiting areas
- Making staff members available in teams
- Making available protocols for patients and staff to follow so they can remain safe through the process.

Figure 1 One of the patient awareness posters available on the LVPEI website



LVPEI

Figure 2 Slit lamp examination by an ophthalmologist wearing the OS Visor

LVPEI

Asela Abeydeera
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Telemedicine in ophthalmology during the COVID-19 pandemic

Can teleconferencing help in delivering eye care services during pandemics? A volunteer effort in Sri Lanka showed promise, but needs to be developed further in order to have an impact at national level.

In mid-March 2020, the government of Sri Lanka announced a lockdown. This meant that eye care practitioners had to minimise all non-essential eye care services such as outpatient clinics and hospital admissions. In the absence of regular eye clinics, many patients became desperate to find care and treatment for their eye ailments.

Based on concerns raised by patients during a few telephone calls, we recognised the need for a teleconferencing intervention to deliver the services. We used social media applications such as Facebook and WhatsApp to contact and bring on board the members of the Sri Lankan Association of Community Ophthalmologists (SLACO). Together, we launched a Facebook page (**www.facebook.com/The-Eye-Patient**) to provide information about common eye ailments, and measures to take, so that patients could refer to it during the lockdown.

Our Facebook posts reached thousands of people from different parts of the country who were seeking help. We encouraged them to submit close-up images of the affected eye(s). In a few instances, with the consent of the patients, optometrists in remote areas volunteered to record a short voice/video clip along with the pictures. A member of our team was usually able to speak to the patient over the phone.

A total of 29 patients got in touch with us via the Facebook page. Their complaints included:

- Red-eye with tearing and discharge, resembling viral conjunctivitis
- Lumps on the eyelids: chalazia, cysts of Zeiss, or cysts of Moll
- Ocular trauma: chemical and mechanical injuries to the eye
- Complications after cataract surgery, such as pain, irritation, and reduced vision
- Itching and red eye, suggestive of allergy
- Swollen eyelids with itching, suggestive of severe blepharitis
- Acute, severe pain and red eye, suggestive of corneal ulcer or endophthalmitis.

Images submitted via the Sri Lankan Association of Community Ophthalmologists' Facebook page

Figure 1 Multiple chalazia

CHAMPIKA SOORIYARACHCHI

Figure 2 Severe blepharitis

KUMARI RATNAYAKE

Figure 3 Blepharitis

KUMARI RATNAYAKE

Figure 4 Viral conjunctivitis

KELUM PRASANNA

Figure 5 Chalazion and allergic conjunctivitis

MAJOR BANDARA

How we addressed these complaints

1. We first ruled out the possibility of there being an ophthalmic manifestation of COVID-19. We noted the history and other clinical features.
2. For cases of trauma and acute endophthalmitis, we suggested an urgent referral to a public sector hospital or eye unit.
3. For chalazion, allergies, blepharitis and conjunctivitis, we prescribed eye drops (that were available free of charge whenever possible) after the teleconsultation.
4. For patients with glaucoma, we supplied eye drops.
5. For those who lost or broke spectacles, or needed them for reading, we supplied free spectacles.
6. We provided health advice or reassurance for delayed cataract surgery or the absence of glaucoma treatment.
7. We referred patients who needed refraction and a spectacle prescription to local optometrists.

According to public health experts, the COVID-19 pandemic will last from several months to a few years. This means that physical distancing and restrictions to services will limit access to eye care services.

Although the numbers were low, the ophthalmologists involved in this initiative were satisfied that patients had received appropriate care.

SLACO now plans to extend this initiave nationally, by:

- Launching an eye care helpline (voice calls in three languages).
- Making the public aware through social media, YouTube and mass media.

We hope that the lessons learnt from this intervention can be used to improve access to eye care services in Sri Lanka; for example, by developing a systematic teleophthalmology model. This could include video consultations, with primary health care or primary eye care workers carrying out basic examinations at primary-level health institutions. This could reduce the number of people who need to visit public health care institutions, thereby reducing delays and long waiting times in the future.

Reeta Gurung
CEO: Tilganga Institute of Ophthalmology, Kathmandu Nepal.

Eyecare at Tilganga Institute of Ophthalmology during COVID–19 pandemic

Covid-19 is having profound repercussions on eye care service delivery across the world. Hospitals in low- or middle-income countries need to adapt quickly to prevent its spread. We share some of our learnings and challenges to help others cope with this pandemic.

DINESH POKHAREL

A patient entering the triage area at Tilganga Institute of Ophthalmology. NEPAL

The COVID-19 pandemic has had profound repercussions for eye care delivery at all hospitals in Nepal, including the Tilganga Institute of Ophthalmology (TIO) in Kathmandu.

Nepal reported its first case on 13 January 2020 and the second case on 23 March, and the government announced a complete lockdown the following day.

The ten-week gap between the first and second case gave us time to prepare for the pandemic. We started taking the following preventive measures – to ensure safety of our staff and patients – before Nepal went into a complete lockdown.

- We set up a triage area at the hospital and now use a thermal gun to measure the temperature of all patients and staff members as they come in; doing so helps us to manage patients who come to the hospital without appointments (fewer than a hundred per day).
- We segregate patients depending on their travel history and symptoms and see patients with a positive travel history and symptoms in a separate clinic, near the triage area. This avoids the need for these patients to visit the main outpatient department. A separate pharmacy is also set up for them.
- We prepare alcohol-based sanitiser in the hospital as per the World Health Organization's guidelines. Everyone has to sanitise their hands before entering the hospital premises.
- We put up posters on Covid-19 prevention within the hospital. Some of the messages on our walls include: "Do not come to the hospital unless it is necessary," "Maintain a physical distance of three feet," "Please sanitise your hands here," etc.
- We shared a mobile phone number with our patients via our website, local newspapers and online news websites so they could call us for advice. Although this was not a toll-free service, the consultation was free.
- We divided our medical and paramedical staff members into six groups. Each group comes to the hospital only once a week to minimise their exposure to asymptomatic COVID patients.
- All staff members coming in contact with patients wear full personal protective equipment (PPE), including face shields and N95 masks, all of which are made locally. We sanitise and sterilise the examining equipment and instruments after each use.
- We postponed all surgical procedures except for emergency services such as perforating injuries, infants with retinopathy of prematurity, oncology, emergency retinal surgery, and therapeutic grafts.

Staff member at TIO having her temperature measured with thermal gun. NEPAL

DINESH POKHAREL

Some of the challenges we continue to face during the lockdown are

- Keeping staff members safe
- Motivating personnel to come and work in the current situation
- Keeping the public safe
- Financial viability. Ensuring that the institution can function without patients is our biggest concern. While we pay personnel their basic salaries, extra perks are on hold for the time being. All budgets and expenses related to staff training, travel, and hospitality are also on hold.

Lessons learnt

- **Preparedness.** Preparation is the key to get over the crisis. We were in a better position than our peers in other countries because we had more time to prepare ourselves.
- **Morale.** To keep the morale of the medical staff high, it was important that we looked after them well. This included providing personal protective equipment, transport to work, and food.
- **Long-term financial viability.** We started financial prudence measures as soon as possible.
- **Regular communication.** The board, management and staff members communicated regularly.

Changing ophthalmic practice during the COVID-19 pandemic in Uganda

Raheel Rizwan Kanji
Ophthalmology resident: Mbarara University of Science & Technology, Mbarara, Uganda, Kenya.

Simon Arunga
Ophthalmologist: Mbarara University of Science & Technology, Mbarara, Uganda, Kenya.

Ophthalmologists in Mbarara, Uganda explain how they have adapted their eye services during the pandemic.

BERNARD BEINOMUGISHA

A patient washes hands before accessing the clinic building at MURHEC. UGANDA

Mbarara University and Referral Hospital Eye Centre (MURHEC) is a government-owned tertiary referral eye unit that provides eye care to the South Western part of Uganda, providing over 10,000 consultations per year. It also offers residency training in ophthalmology and currently has 20 residents.

Patient care

Patient care services have been scaled down. We have had to turn away many patients (except emergencies and priority cases) and give longer appointments for chronic care cases. All elective surgery has been cancelled. This has seen a drop in consultations from 100 patients per day to less than 20.

We introduced a triage desk and a checklist which helps to assess which patient can be seen. The triage checklist is administered verbally and covers the following areas:

- Any history of fever, flu-like symptoms, cough or any upper respiratory symptom (these patients are immediately sent to the emergency department)
- Presenting complaint: patients with a history of acute loss of vision, sensitivity to light, eye pain, trauma, and severe acute discharge are considered as emergency cases and allowed to see a clinician.

We introduced mandatory hand washing facilities outside the main entrance and require everyone entering the building (including staff members) to wash their hands with soap and water before they enter.

BERNARD BEINOMUGISHA

A clinician behind a protective shield examines a patient on the slit lamp. UGANDA

In addition, we introduced alcohol hand sanitiser dispenser stations at different points within the building.

Staffing

Staffing has been reduced by three-quarters: from 32 full-time staff members to a rota of 8, consisting of a supervising head nurse, a cleaner, a receptionist, an optometrist, an ophthalmic nurse (who also helps in administering anaesthesia and surgical scrub in theatre), a clinical officer and an on-call resident under the supervision of a specialist/consultant.

We have put several measures in place to maximise staff sensitisation and protection:

- Staff received training on COVID-19 and infection control
- The Ministry of Health and the Uganda Medical Association have shared information and resources. Other sources of information include the online Zoom conference hosted by the International Centre for Eye Health (ICEH) and Royal College of Ophthalmologists recently: [**https://www.cehjournal.org/news/covid-19-and-ophthalmology-in-african-eye-units-conference-recordings-now-available/**]
- Personnel have been provided with face masks (disposable) and disposable gloves.
- Protective shields (locally made) have been added to the slit lamps as breath guards, to minimise close contact between the ophthalmologist and patients.
- Clinicians were encouraged to minimise procedures that may require close contact with patients, such as direct ophthalmoscopy.

Residency training

Following a directive by Uganda's president to close all schools, residency training was halted. The residents were sent into recess to use this time to work on their master's research protocols. The more senior residents are available to support clinic work.

Research activities

All ongoing clinical research that is not related to COVID-19 has been paused following a directive from the Uganda National Council of Science and Technology.

COVID-19 numbers and models: misleading us, or leading us out of misery?

Heiko Philippin
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Karin M Knoll
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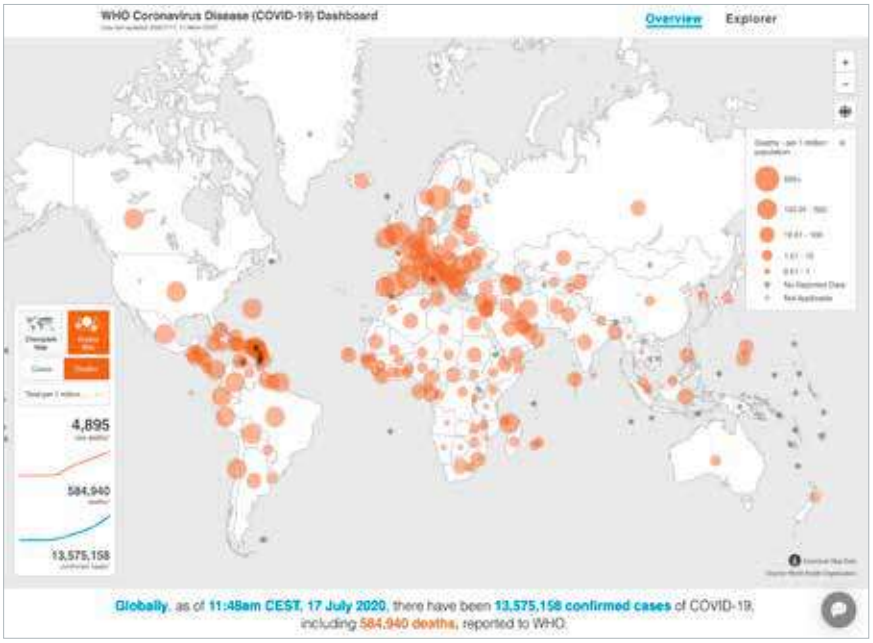
Assistant Professor: MRC Tropical Epidemiology Group, London School of Hygiene & Tropical Medicine, UK.

The majority of the world's population is affected to some degree or another by the COVID-19 pandemic and measures to curb its spread. Newspapers and social media bombard us with numbers, graphs, and predictions every day, but what do these numbers really tell us?



WHO CORONAVIRUS DISEASE (COVID-19) DASHBOARD. GENEVA: WORLD HEALTH ORGANIZATION, 2020. AVAILABLE ONLINE: HTTPS://COVID19.WHO.INT/

The World Health Organization map shows how countries are affected by COVID-19.

COVID-19 numbers and statistics have been dominating our news since the beginning of 2020. Although they fail to tell the story of the individual hardship and grief that many are dealing with, they can provide a bigger picture of the situation and assist in planning.

How many people worldwide have been infected with COVID-19?

A common number which is reported is the count of positive test results for SARS-CoV-2. The number is collected by hospitals, laboratories or individual doctors and sent to national health agencies. A global overview is provided by the World Health Organization (**https://covid19.who.int/**) and other data portals. Newspapers publish daily updates and often countries are compared, or even ranked, by this number.

"If little testing is being done, a country may have few positive test results but might still have many infected individuals."

However, this number of positive test results is not the same as the actual number of people infected with SARS-CoV-2. An unknown number of undetected infections exists in every country as:

- Some people who are infected do not have symptoms and are not tested
- Some people with symptoms do not have the opportunity to be tested. This could be due to a lack of testing kits or rules about who should be tested (e.g., different age and risk groups), and when they should be tested (e.g., immediately when showing symptoms or when hospitalised for COVID-19).

If little testing is being done, a country may have few positive test results but might still have many infected individuals.

It is also misleading to compare countries by the total number of people testing positive, because there are differences in **population size**.

Example: at a certain point during the pandemic, Honduras and Ireland both reported a total of 25,000 people with positive test results. However, when the number of tests in each country was compared with its population size, there were around **500** positive tests per 100,000 people in Ireland (population of about 5 million), compared with just **250** positive tests per 100,000 people in Honduras (population 10 million).

How many people have died from COVID-19?

International comparisons of the number of COVID-19 deaths can be just as misleading, as countries use different definitions and policies regarding which deceased persons are counted. Some countries include only people who died of COVID-19 in hospital and tested positive for SARS-CoV-2, whereas others also include people who died outside the hospital or were suspected of having COVID-19. These definitions and policies may change over time within a country.

The so-called **excess mortality** can be helpful in finding out about the true impact of COVID-19 on death. Excess mortality looks at the number of *additional* deaths during a certain time period compared to the

Continues overleaf ➤

average number of deaths in the same period in previous years. Additional deaths may be directly attributed to COVID-19, but also indirectly if people with other conditions (such as heart attacks or strokes) did not receive the treatment they would normally have received. Excess mortality may be more meaningful than looking at the number of deaths reported to be directly due to COVID-19, as it does not depend on how COVID-19 deaths are recorded.

As we have seen, the number of positive test results or official COVID-19 deaths do not provide an accurate picture of the spread of the virus in a country. However, if the context and limitations are considered, they still provide a useful overview of the situation.

What can models tell us?

Mathematical models aim to help us predict the effect of preventive measures and what may happen as an epidemic develops. These models can be informed by existing knowledge about the disease and the virus responsible, assumptions about how people are likely to behave, and data about the current situation, e.g., the number of people who are infected, have recovered, or have died.

The accuracy of these predictions will improve as the quality of the available data improves, and as we learn more about the virus, the disease it causes, and how people behave.

Mathematical modelling is useful because it can rapidly estimate the effects of different interventions, e.g., what might happen in a pandemic if the transmission of a virus is reduced by social distancing.[1] However, for emerging diseases such as COVID-19, very little data exist initially, and modellers have to rely on untested assumptions. Scientists therefore model many different scenarios, based on different sets of assumptions, which also accounts for the wide range of possible outcomes we read about.

"Overall, the number of people with a positive test result, and the number who have died, show only a part of the whole picture of the virus spread in a country."

How do infectious diseases spread?

The spread of any infectious disease can be illustrated using established mathematical models. In the early phase of an epidemic or pandemic, growth is exponential. This means that it spreads slowly at first, but increases very rapidly later on.

Example: If one person with COVID-19 could infect three people a week, then there could be 3 new infections after one week, 9 infections after two weeks, 27 infections after three weeks, and 81 after four weeks. Six weeks later (after 10 weeks), there could be 59,049 infections!

As the virus spreads, more and more people become infected, recover, and – hopefully – develop some level

Understanding the dynamics of an epidemic

The Susceptible-Infectious-Recovered (SIR) model (Figure 1) shows how the SARS-CoV-2 virus spreads through a community or group of people.

During an outbreak, people can be grouped into three categories. Everybody starts in the group of persons who are susceptible and can be infected by the virus (grey shaded area). With time, more and more people become infected (orange shaded area). Protective measures such as social distancing or hand washing can slow down the spread. The third category (green) are people who have either recovered from the infection, or died.

Some of the parameters used in models have to be estimated; so predictions from models can therefore only be made with limited confidence. For example, the number of people who developed immunity against COVID-19 grew slower than anticipated in many regions.

Figure 1 Susceptible-Infected-Recovered (SIR) model, showing how the pandemic develops over time

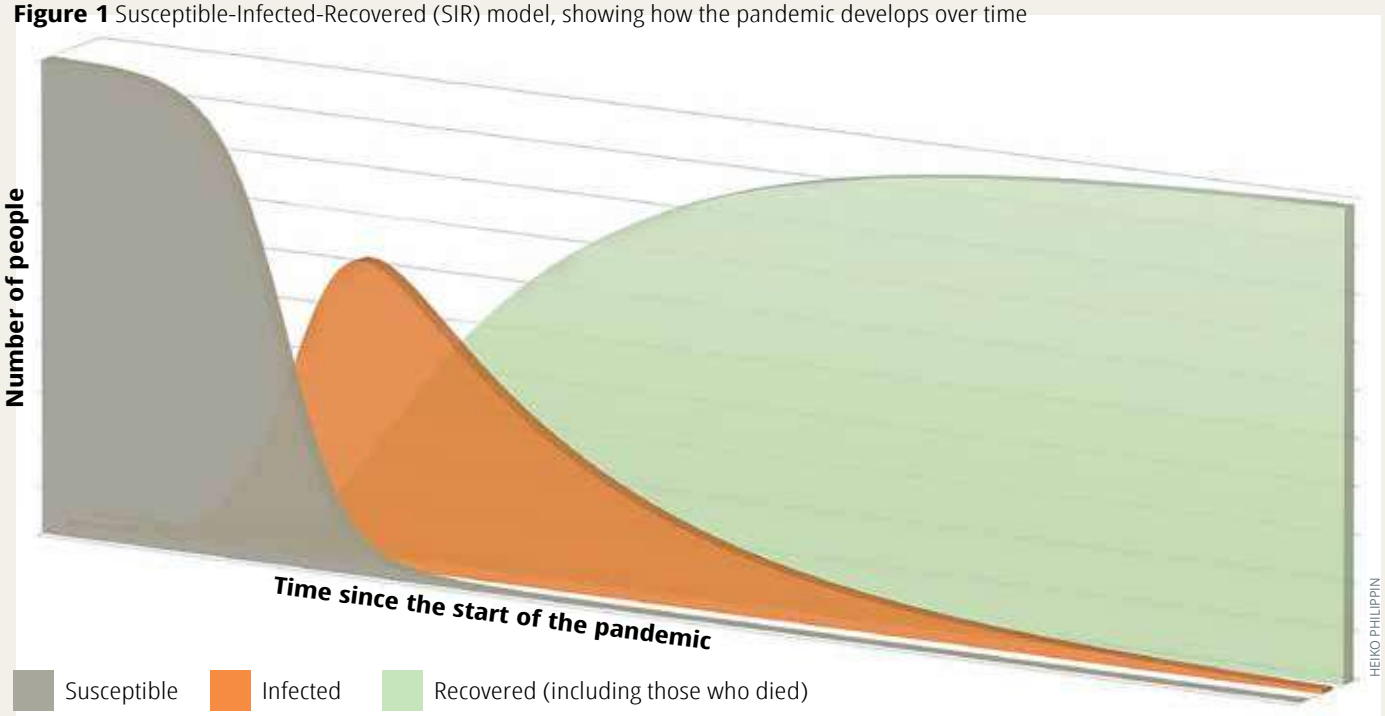
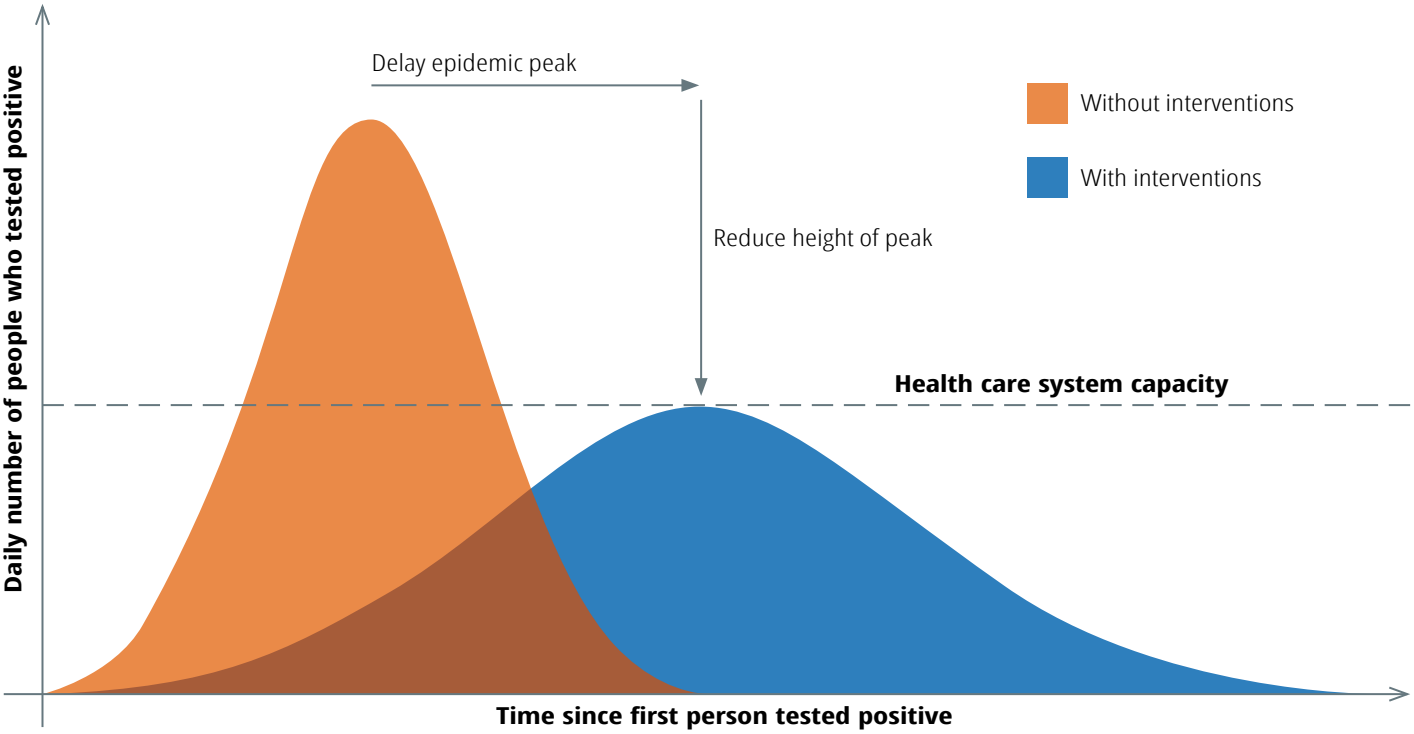


Figure 2 Modelling the impact of protective measures against the spread of COVID-19. Delaying and reducing the height of the peak (blue) ensures that the health system capacity is not exceeded.



of immunity. This reduces the number of people who are susceptible to infection. If there are low numbers of susceptible people in the population, then the chances of an infected individual coming into contact with susceptible individuals is reduced, in turn reducing the chances of onward transmission. This is known as herd immunity, an effect which has been observed less than anticipated during the SARS-CoV-2 pandemic so far. Using these categories of susceptible, infectious and recovered (or removed) people, a simplified model of a pandemic can be calculated (see panel). More testing for SARS-CoV-2 infection will help to provide better predictions of current and future scenarios.

Containing viral spread and breaking chains of transmission

In the context of the COVID-19 pandemic, the number of beds and health care personnel available to care for COVID-19 patients in intensive care units is known as the **health system capacity**, represented by the dashed horizontal line in Figure 2. The health system may become overwhelmed if the number of patients exceeds this, which increases the risk of patients dying from the disease. In order to manage the situation, the rate at which the virus spreads can be reduced by implementing protective measures that **reduce the risk of transmission** (e.g., thorough hand washing with soap and water and wearing a face covering in public) or **interrupt transmission** (e.g., by putting in place social isolation measures such as quarantine, or lock-down, in addition to other measures).

Slowing down the spread of the virus with these protective measures reduces the number of people infected at any one time, which changes the infection curve. Compare the curves in Figure 2. The blue curve (with interventions) is noticeably flatter and wider than the orange curve (without interventions). This is why it is sometimes referred to as "flattening the curve" of cases.

Even with a flattened curve, anyone who has not yet had COVID-19 will only be protected against the virus for as long as the protective measures or interventions continue. When measures are lifted, the virus can spread once again; this will only change once effective and affordable vaccines become available to most members of the community.

Supporting complex decisions

Though of utmost importance, trying to reduce the number of patients who are severely ill at any one time is just one aspect in the management of the pandemic. It is intertwined with other factors which are important for the population as a whole. For example, a total lockdown can also have a detrimental effect on mental health or the ability of people to financially sustain themselves.

It is difficult to decide what level of preventive measures to take, and to maintain a balance between these and the overall functioning of society.[2,3,4] A balanced and gradual exit strategy setting out when and how to reduce protective measures is necessary to avoid a new increase of infections (i.e., a second 'wave' or 'peak' in the blue curve, instead of the gradual reduction in infections currently shown in Figure 2); e.g., when preventive measures are not sufficient to prevent transmission, or if the virus is re-introduced from outside the community. Such decisions can be informed by data from test results and other sources as well as models based on these data.

In summary, a reliable set of data and mathematical models can help substantially to guide some of the complex decisions in this COVID-19 pandemic and – ultimately – to ease individual hardship.

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Zithromax® donation for trachoma elimination during the COVID-19 pandemic

Paul Emerson
ITI Director: International Trachoma Initiative.

PJ Hooper
Deputy Director: International Trachoma Initiative.

Global commitment to the elimination of trachoma remains strong despite COVID-19.

COURTESY OF ITI ©

The first shipment of Zithromax® ever to be sent to the island state Nauru, in Micronesia, arrived at their Public Health Eye Mini Dispensary on March 27, 2020.

Following the declaration of COVID-19 as a global pandemic in March 2020 and the subsequent recommendation by WHO that community-based activities for Neglected Tropical Diseases (NTDs) be put on hold (bit.ly/cov19ntd), most planned trachoma mass drug administration (MDA) activities have halted around the world. A small number of countries began trachoma MDA in the early months of 2020, but more than 95% of planned MDA activities for trachoma elimination in 2020 have been postponed, or are anticipated to be postponed, in the coming months.

The priorities of all ministries of health across the globe have shifted to focus on the pandemic. NTD personnel in some endemic countries have been redeployed to COVID-19 response activities because of their expertise in at-scale programming and community-based delivery. Because of the effect on programme delivery and human resource allocation, it is currently not possible to predict when countries will be able to safely resume the community-based activities planned for this year; however, ITI and Pfizer's commitment to a world free from trachoma is unwavering. ITI and its partners stand ready to resume Zithromax® donation shipments and MDA implementation when countries determine that they are ready to restart.

"These unprecedented circumstances require flexibility and adaptability from country programmes and their donors."

Zithromax® availability is not a limiting factor for trachoma interventions in 2020, but disruption to the usual shipment routes may be a challenge in ensuring timely delivery. ITI will need to know when a country plans to resume distributions as soon as the plan is made since air freight availability may be reduced and require more advance notice.

As we have seen, everything is subject to change, but at the moment we don't anticipate any interruption of supply for trachoma elimination activities in 2021. ITI is forecasting the 2021 demand in the usual way and will process applications for Zithromax® for use in 2021 treatments as normal, using our existing decision-making guidelines.

The process of trachoma elimination is a multi-year commitment. There is not much evidence from the field to suggest that delaying one round of MDA by 6–18 months would have any substantive effect on the elimination timeline, but this may not hold true in areas with high baseline prevalence, in which there is presumably more transmission. Mathematical modelling can be used to determine the risk to the programme as a result of skipping a round of MDA. If such modelling provides evidence of a need for catch-up rounds in certain circumstances, and countries wish to pursue such an approach with their partners, we will consider that in the Zithromax® donation requests. Likewise, if there are interim guidelines from WHO on catch-up rounds or additional targeted treatments in certain circumstances, we would also apply those guidelines when considering Zithromax® donation requests.

These unprecedented circumstances require flexibility and adaptability from country programmes and their donors. ITI and Pfizer are committed to a world free of blinding trachoma, and to working with WHO, countries, and all implementing partners to ensure that the goals of the global elimination programme are met despite this disruption.

Test your knowledge and understanding

This page is designed to help you to test your own understanding of the concepts covered in this issue, and to reflect on what you have learnt.

RENGARAJ VENKATESH, AEH PUDUCHERRY

We hope that you will also discuss the questions with your colleagues and other members of the eye care team, perhaps in a journal club. To complete the activities online – and get instant feedback – please visit **www.cehjournal.org**

Tick ALL that are TRUE

Question 1

Consider clinic layout, triage, patient flow and basic safety when there are many people with COVID-19 in the area or country. Which statements are TRUE?

- ☐ **a.** The number of consultations should be reduced to allow a distance of 1–2 metres between patients in waiting areas
- ☐ **b.** It is important that all patients who come to an eye unit get a full clinical assessment
- ☐ **c.** Investigations such as visual field assessment and OCT scans should only be performed when considered highly important
- ☐ **d.** Routine, non-urgent work should be postponed or deferred
- ☐ **e.** Checking the temperature of patients on arrival to a unit may help to identify patients with COVID-19

Question 2

Consider personal protective equipment and hand washing. Which statements are TRUE?

- ☐ **a.** PPE removes all risk of SARS-CoV-2 infection
- ☐ **b.** Putting on and taking off PPE correctly is as important as which type of PPE is used
- ☐ **c.** Using hand sanitiser or hand rub can replace hand washing in hospital
- ☐ **d.** Proper use of PPE removes the need to use hand rub or wash hands
- ☐ **e.** Facial hair, such as beards may need to be removed to get a good seal when using a filtering face piece respirator mask (FFP mask)

Question 3

People with disabilities require extra care and support during the pandemic. Which statements are TRUE?

- ☐ **a.** One of the main reasons why people with disabilities develop mental health problems is the stigma, discrimination and social exclusion they experience from people around them
- ☐ **b.** Face masks may intimidate some patients and impede communication, so an extra effort may need to be made
- ☐ **c.** If patients with disabilities have difficulty keeping to COVID-19 guidance then they should not be seen, even if they present with an emergency eye condition
- ☐ **d.** Most people who become infected with SARS-CoV-2 are symptomatic and many become severely ill
- ☐ **e.** Some people with cognitive disabilities cannot avoid touching their eyes

Question 4

Which statements are TRUE?

- ☐ **a.** The excess mortality refers to the increased number of deaths from COVID-19
- ☐ **b.** Eye care workers need to consider their own mental health during what may be a very stressful situation
- ☐ **c.** Testing everyone admitted to hospital for COVID-19 is a useful way of finding out how many people in the country are infected
- ☐ **d.** Most people who become infected with SARS-CoV-2 are symptomatic and many become severely ill
- ☐ **e.** When there are many people infected with the SARS-CoV-2 virus, it is important to close all eye care services to stop the spread of infection

ANSWERS

1. a, c, d, and e are true. b. When there is a high level of infection in the community, consider deferring patients with non-urgent eye conditions or seeing patients by video or telephone consultation; this will reduce the risk of spreading the SARS-CoV-2 virus.
2. b and e are true. a. PPE can help reduce the spread of infection but does not remove all risk. c. If hands are visibly dirty, wash them with soap and water first.
3. a, b, d, and e are true. c. Patients who struggle to keep to COVID-19 guidance due to physical or mental disabilities should be given the support they need to be safe.
4. b is true. a. Excess mortality is the increase in the number of deaths (of any cause) compared to the number in a similar period in previous years. c. Testing only those people who come to hospital will give an inaccurate picture: many people can be positive for COVID-19 without showing any symptoms, and some may avoid coming to hospital due to transport difficulties or fear about contracting the virus. e. It is important that we help stop patients going blind, even during COVID-19. Patients with serious eye conditions, which may be vision or even life threatening, should still be seen.

Community Eye Health Journal

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SCAN ME

International Centre for Eye Health

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

From the editor's desk

It is doubtful whether anything could have prepared the world for the impact of COVID-19. Measures to reduce the risk of transmission have not only disrupted our daily lives, but also the way eye care is delivered. The need for eye care has not gone away, however, nor has our resolve, as the *Community Eye Health Journal* team, to support the people responsible for delivering eye health worldwide. This special issue on COVID-19 is for you.

It has been a privilege to work with so many experienced authors, reviewers and editors during the past four months; I am deeply grateful for the many long hours you have put into this issue, often while juggling other work commitments and family responsibilities.

A big thank you also to our supporting organisations (see p. 3); without you, none of this would be possible! We are also grateful to CBM for an additional grant that has allowed us to produce and distribute additional COVID-19 content – making this a 40-page double issue.

The pandemic has changed the way we publish new articles. If you are a member of our mailing list (**www.cehjournal.org/subscribe**), follow us on social media (@CEHJournal) or use our new app (**bit.ly/CEHJ-app**), you may already have seen that we are now publishing articles online as soon as they are ready; we hope this will support you in this time of rapid change.

For more COVID-19 content, including case studies and instructions for making your own hand sanitiser gel, download the CEHJ App from **bit.ly/CEHJ-app** or visit our website: **www.cehjournal.org**

Elmien Wolvaardt

International Centre for Eye Health updates

The *Community Eye Health Journal* is published by the International Centre for Eye Health (ICEH), based at the London School of Hygiene & Tropical Medicine (LSHTM) in London, UK. We offer the highly regarded MSc in Public Health for Eye Care, a one-year residential programme for future eye health leaders that has been running for several decades. Our alumni live and work around the globe, with many becoming prominent eye health leaders, including at the World Health Organization.

In recent months, several alumni in Latin America have come together to analyse the existing evidence on COVID-19 and the eye. Their publication can be accessed at **https://pubmed.ncbi.nlm.nih.gov/32490972**.

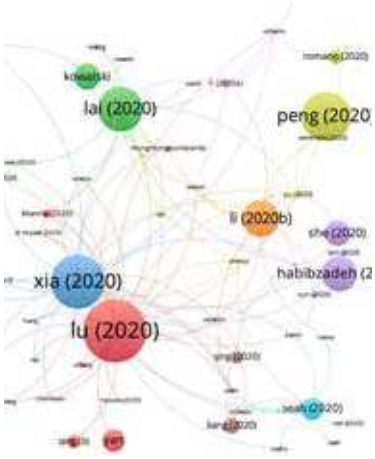

Figure 1 One of the figures in the study by Alberto LUJ et al., showing the connections between the publications they included in the study. The bubble size is proportional to the number of times a study was cited. Colours permit tracing each citation to its source.

For updates, follow @CEHJournal and @ICEH on Twitter and on Facebook.

Courses

Free online courses. The ICEH Open Education for Eye Care programme offers a series of online courses in key topics in public health eye care, relevant for all ophthalmic and medical health workers/providers. All the courses are free to access. The next runs of each online course will be announced in September 2020, with a new course on retinopathy of prematurity (ROP) launching later in 2020. Certification is also available.

For more information, visit **http://iceh.lshtm.ac.uk/oer/**

MSc Public Health for Eye Care, London School of Hygiene & Tropical Medicine. Fully funded scholarships are available for Commonwealth country nationals. For more information visit **www.lshtm.ac.uk/study/masters/mscphec.html** or email **romulo.fabunan@lsthm.ac.uk**

Small Incision Cataract Surgery Training at Lions Medical Training Centre in Nairobi, Kenya. Email **training@lionsloresho.org** or call/message +254 728 970 601 or +254 733 619 191.

London School of Hygiene & Tropical Medicine updates

LSHTM experts are involved in many different aspects of COVID-19 research and provide guidance to decision makers worldwide. Discover COVID-19 research tools, news, events and free online courses at **lshtm.ac.uk/coronavirus** or subscribe to the new **LSHTM Viral podcast to hear more about the science behind the outbreak and the global response. Listen to LSHTM Viral wherever you get your podcasts.**

For daily updates, follow @LSHTM on Twitter, Facebook and Instagram, or search for the 'London School of Hygiene & Tropical Medicine' on LinkedIn.

IAPB Updates

The World Sight Day photo competition is back, with the theme, "Hope in Sight". The international photo competition, open to amateurs and professionals, has a special category for COVID-19 this year. The competition includes a cash prize of US $1,000 and a DSLR camera. Submit your entries at **http://photocomp.iapb.org**

The Eye Health Heroes 2020 development programme is open to eye health professionals under the age of 35. Find out more and nominate a hero at **https://www.iapb.org/EHH2020s**