

## Review Article

# Recommendations for ophthalmologic practice during the easing of COVID-19 control measures

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**ABSTRACT.**

**In the context of the COVID-19 pandemic, this paper provides recommendations for medical eye care during the easing of control measures after lockdown. The guidelines presented are based on a literature review and consensus among all Spanish Ophthalmology Societies regarding protection measures recommended for the ophthalmologic care of patients with or without confirmed COVID-19 in outpatient, inpatient, emergency and surgery settings. We recommend that all measures be adapted to the circumstances and availability of personal protective equipment at each centre and also highlight the need to periodically update recommendations as we may need to readopt more restrictive measures depending on the local epidemiology of the virus. These guidelines are designed to avoid the transmission of SARS-CoV-2 among both patients and healthcare staff as we gradually return to normal medical practice, to prevent postoperative complications and try to reduce possible deficiencies in the diagnosis, treatment and follow-up of the ophthalmic diseases. With this update (5<sup>th</sup>) the Spanish Society of Ophthalmology is placed as one of the major ophthalmology societies providing periodic and systematized recommendations for ophthalmic care during the COVID-19 pandemic.**

**Key words:** COVID-19 – eye care – eye health – lockdown easing – pandemic – personal protective equipment

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## Introduction

Coronavirus disease COVID-19 is caused by the highly transmissible SARS-CoV-2. Its mortality rate is high, especially in elderly patients with comorbidities such as immunosuppression, respiratory disease, cardiovascular disease, obesity or diabetes mellitus, and also among persons constantly exposed to the virus (Yang et al. 2020b). The COVID-19 outbreak has had a global impact and is causing a previously unknown number of deaths among younger, seemingly healthy individuals. Such deaths have been attributed to cytokine release syndrome, also known as cytokine storm, which ends up producing multi-organ failure (Mehta et al. 2020).

The symptoms of COVID-19 usually appear 2–14 days after exposure to the virus. These symptoms may include fever, chills, muscle pain, headache, sore throat, loss of sense of taste and/or smell, diarrhoea and follicular conjunctivitis (Chen et al. 2020). Complications in severe cases include pneumonia, acute respiratory distress syndrome (ARDS), kidney failure, cardiomyopathy, stroke, encephalopathy and severe thromboembolism (Guan et al. 2020). One study (Lauer et al. 2020) found that the average incubation period for COVID-19 was 5–7 days, and patients were generally infectious for several days before the onset of symptoms. Further, more than 97% of those who developed symptoms did so within 11.5 days of exposure, also supporting recommendations of 14 days of quarantine.

Current knowledge about how COVID-19 spreads is largely based on our understanding of other coronaviruses. The virus is believed to spread mainly from person to person through respiratory droplets produced when an infected person exhales, coughs, or sneezes (Parrish et al. 2020). It is also thought to be transmitted when a person touches an object or surface with the virus present and then touches the mouth, nose or eyes (Ghinai et al. 2020). In addition, viral RNA has been found in stool samples from infected patients, suggesting the possibility of transmission via the faecal-oral route (Wang et al. 2020). There is also evidence that SARS-CoV-2 is transmitted both in the asymptomatic and presymptomatic period (Bai et al. 2020).

Environmental contamination by SARS-CoV-2 is another cause for concern. In one study (Van Doremalen et al. 2020), viable SARS-CoV-2 was detected in aerosols up to 3 hr after aerosolization, although in an experimental configuration that lacked ventilation, so this does not necessarily reflect how the virus behaves in real-life conditions. This study also found that infectious viruses could survive up to 24 hr on cardboard, up to 4 hr on copper, and up to 2–3 days on plastic or stainless steel. In another study, the authors found evidence of SARS-CoV-2 RNA from personal items and environmental surfaces in hospital rooms for COVID-19 patients, but the virus could not be isolated from air samples (Santarpia et al. 2020).

SARS-CoV-2 is transmitted in respiratory sprays or droplets to the conjunctiva, as virus particles have been detected in ocular secretions. Here they can cause conjunctivitis and this may even be the first manifestation of systemic infection (AAO 2020a; Guan et al. 2020; Seah et al. 2020; Xia et al. 2020). As ophthalmological examinations are conducted at 30 cm in the case of the slit lamp or even closer for other procedures (e.g. intraocular pressure measurement, direct ophthalmoscopy, tear duct examination or instilling eye drops), they should be considered high-risk procedures and performed according to standard measures (Alecí 2020; Cheena et al. 2020; Hellewell et al. 2020; Lai et al. 2020; Li et al. 2020; Sadhu et al. 2020; Zhang et al. 2020).

Povidone–iodine effectively inactivates viruses at concentrations normally used in clinical practice. This antiseptic is effective against coronaviruses (AAO 2020b) and should be used for surgical preparation, although not in the presence of a penetrating incision or during intraocular surgery. SARS-CoV-2 is susceptible to the same alcohol-based disinfectants and sodium hypochlorite (bleach) solutions in water that are commonly used to disinfect ophthalmic instruments and office furniture. (Junk et al. 2017; Balibrea et al. 2020).

Recent reports have reviewed the possibility of the generation of aerosols that transmit the virus during phacoemulsification and pars plana

vitrectomy (Darcy et al. 2020; Harding et al. 2020). However, until we have more data available, current evidence suggests that it is unlikely that there will be sufficient virus or aerosols generated during a phacoemulsification or a pars plana vitrectomy to infect surgical personnel (Chandra et al. 2020).

There is much controversy over what constitutes PPE and what should be used by ophthalmologists performing eye examinations, particularly regarding the use of masks and goggles (CDC 2020; Lei et al. 2020; Li et al. 2020). Data on environmental virus contamination and increased awareness of transmission by asymptomatic carriers or by patients in the presymptomatic stage of a new infection support the use of protection for the mouth, nose and eyes (Hu et al. 2020; Tindale et al. 2020).

In this report, we provide guidelines and recommendations for ophthalmology practice during the easing of control measures following lockdown. The measures proposed here are designed to reduce the chances of cross-transmission between patients and healthcare personnel and to prevent postoperative complications in the management of patients with an eye condition.

## Basis for Recommendations

This document is the result of a review of the state of knowledge and consensus between the different Spanish ophthalmology societies. It includes recommendations for eye care ensuring the highest levels of safety during the gradual return to normality in the context of the COVID-19 pandemic. All measures are targeted at minimizing exposure to the SARS-CoV-2 virus, reducing the chances of cross-transmission between patients and healthcare personnel, and avoiding the development of postoperative complications. These measures are based on several basic principles derived from the evidence available in the scientific literature (Wormald 2003; Wormald & Dickersin 2013). To date, ten major international ophthalmology societies (including the Spanish Society of Ophthalmology) have provided recommendations regarding urgent patient care, social distancing, telemedicine and PPE for members on their websites (American Academy of Ophthalmology 2020a, 2020b; Nguyen et al. 2020).

### Methodology used to reach consensus on the recommendations

All Spanish scientific Ophthalmology Societies of the different subspecialties, both national and regional, helped prepare this set of recommendations. These societies are detailed in the authors' list. The two main authors (JAGF and FLO) coordinated a working group composed of one or two representatives of each society, and these authors moderated discussions of the different recommendations and proposals (detailed in Tables 1–3). In a first round of discussion, there had to be at least 75% agreement for a recommendation to be accepted. A second round was then held with the general coordinators of the different societies to discuss the final inclusion of items for which agreement was not 75%, but was greater than 66% (2/3). The confinement situation in Spain during the period (April–May, 2020) when this document was prepared precluded any face-to-face meetings, so these discussions were held via email or video conference. Finally, the definitive version of the document was validated by the board members of the Spanish Ophthalmology Society coordinated by the main author (JAGF).

### Implementation period and validity

The recommendations detailed in this paper need to be constantly updated and adapted based on the quickly evolving situation in our country (Gegúndez-Fernández et al. 2020). Many of the measures proposed are dependent on restrictions imposed by the government in each autonomous community, region, province or health area to services considered nonessential, the particular characteristics of the centres, epidemiological indicators, availability of protective equipment and access to COVID-19 tests. Once the health authorities have completed this phase of gradual stepping down of control measures, these recommendations will have to be revised.

### Variability

At the time of writing, several new outbreaks of COVID-19 are emerging in Spain. Accordingly, it is safer to assume that any patient requiring eye care could be infected with SARS-CoV-2, regardless of the diagnosis, risk

factors, or motive for care. In general, scientific approaches to estimate the risk of SARS-CoV-2 infection are still at an early stage, so the recommendations proposed here are based on the latest developments in science. As ophthalmological examinations or treatments most often require close physical proximity, these procedures must be deemed high risk for both patients and ophthalmologists and other health and nonhealth professionals in the different ophthalmology settings.

### Protection and security measures

Until accurate diagnostic tests, an effective treatment and/or an approved vaccine are available, establishing and complying with rigorous protective measures in outpatient and inpatient clinics is key both for healthcare workers and patients. (Borrelli et al. 2020) These measures include social distancing in waiting rooms and minimizing visits to and time spent in health centres; providing the necessary PPE to clinicians and face masks to patients; following disinfection guidelines recommended by preventive medicine services; and periodic diagnostic tests on healthcare professionals to optimize the distribution of tasks within the organization. We should stress that in the following months, depending on the control and prevalence of COVID-19, these measures could be deferred.

### Expected clinical–healthcare impact

Under the present circumstances, volumes of activity may be substantially reduced or have to be redistributed across longer time intervals than before the pandemic. Additional precautions required in operating rooms may also lead to longer rotation times, which may affect the number of surgeries that can be performed per session. In any case, it is recommended that the resumption of activities be carried out gradually, stratifying and prioritizing the patients that will have to be examined face-to-face (SOFCALE 2020) to adapt healthcare activity to the circumstances at each moment and stage of the gradual return to normality.

### Role of telemedicine

In the current situation, telematic means may be used for tele-assisted

**Table 1.** Checklist for use in outpatient clinics.

Area	Responsible personnel					
		Yes	No			
Reception	Managers	Safety barriers with screens and marked distances				
		One-way transit circuits				
	Nursing staff	All facilities equipped with hydroalcoholic gel dispensers				
		Patient on time for appointment				
		Patient alone or accompanied by a single person				
		Clinical-epidemiological triage done in reception area				
		Patients and companions instructed not to touch surfaces or equipment				
		Patients and companions instructed to be quiet				
		Patient and companion are wearing masks				
		Patient and companion have washed their hands with gel				
Waiting Rooms	Managers	Patients with acute conjunctivitis assigned to separate circuits and rooms				
		Waiting rooms have the minimum separation distance set				
	Cleaning staff	Basic instructions regarding behaviour and hygiene provided in waiting rooms				
		Continuous cleaning of waiting rooms				
		Consultation and Examination Rooms	Managers	Slit lamps fitted with methacrylate screens		
				Ophthalmologists	Patients stratified by eye condition into three risk categories	
			Patients needing face-to-face consultation prioritized			
			Informed consent for tele-assisted medical care obtained			
			Devices for self-examination provided in the first face-to-face consultation			
			Complementary examinations reduced to those strictly necessary			
Exams involving friction on the ocular surface avoided						
Devices used with disposable protectors						
Extreme cleaning-disinfection measures for instruments and equipment						
General	All staff		Daily self-health assessment before setting out for work			
		PCR and serological tests				
		Correct wearing of surgical mask or FFP2				
		Nitrile gloves worn				
		Goggles or face shield worn				
	Ophthalmologists	Uniform or pyjamas worn				
		Mobile phone use minimized				
		Regularly ventilation of facilities				
		Hands washed with gel after each patient or examination				
		Eye drops used to avoid contact with the eye surface or eyelids				
Cleaning staff	Use of available single-dose eye drops					
	Eye dressings applied and removed carefully					
	Hygiene and cleaning measures of all facilities have been extreme					

FFP = filtering face piece; PCR = polymerase chain reaction.

consultations through voice calls or videoconferences (Saleem et al. 2020) In patients deemed to have a low risk

of an unfavourable disease course or complications, a face-to-face appointment can be postponed.

**Table 2.** Triage checklist to identify possible exposure to SARS-CoV-2.

Question	Answer
Have you during the past 14 days had any of the following symptoms?: fever, malaise, tiredness, respiratory symptoms (dry cough, dyspnoea), loss of taste (ageusia) or smell (anosmia), diarrhoea, headache, rash on trunk or limbs	Yes / No
Do you have symptoms of conjunctivitis such as red eye, discharge, itching, burning or photophobia?	Yes / No
Have you been in contact with or lived with a family member or friend who has been diagnosed with COVID-19 or quarantined because of COVID-19 in the last 14 days?	Yes / No
Have you recovered from COVID-19 disease?	Yes / No
If you have had COVID-19, when were you told you were disease-free?	Days ago
Did you self isolate or were you isolated for 14 days?	Yes / No
Did you have any test to show that you were not contagious?	Yes / No

COVID-19 = Coronavirus Disease 2019.

## Recommendations in the Outpatient Clinics

Figure 1 shows the main protection measures recommended during confinement easing. Table 1 provides a checklist summarizing the recommendations detailed below.

### Patient recommendations

- Patients should attend their appointments unaccompanied or accompanied only by one person in the case of physical, psychological or social dependency, or children up to the age of 18 years.
- Nursing and administrative staff who are duly protected (mask, gloves, face shield or protective screens) will be in charge of the tasks to be carried out in the reception area prior to patient admission.
- Body temperature measurement with a noncontact thermometer is controversial for patients attending the clinic or centre. The absence of fever does not necessarily exclude asymptomatic carriers of COVID-19. Further, the Spanish Agency for Data

**Table 3.** Checklist for use in the surgery area.

Area	Responsible personnel	Yes	No
Preoperative	Ophthalmologists	Clinical and epidemiological triage done prior to surgery Negative SARS-CoV-2 PCR documented 48 hr before surgery Complementary informed consent for surgery provided Case assessed to avoid general anaesthesia as much as possible Outpatient regimen planned to avoid hospitalization	
	Anaesthesiologists	The preanaesthesia has been performed and the preoperative tests requested	
	Nursing staff	Triage performed on the companion on the day of surgery Patient provided with surgical mask Patient has washed hands with gel PCR and serological tests	
	All the staff	PCR and serological tests	
Operating Room	Ophthalmologists	Surgical drape placement confirmed to avoid aerosols Valved trocars used in vitreoretinal surgery OVD used on ocular surface to avoid aerosolization	
	Health personnel	PPE including pyjamas, surgical cap, shoe covers, FFP2 mask, goggles or face shields, gown, gloves	
	Nonhealth staff	Surgical mask, gloves and face shield or goggles worn	
	All the staff	Usual asepsis and antisepsis measures in surgical area have been extreme In the operating room, minimum essential staff stay on and movement is reduced	
Operating Room COVID-19	Ophthalmologists	Only urgent interventions in COVID-19 patients Surgery delayed for as long as possible or until PCR negativity Patient informed so that life risk/eye benefit can be weighed Maximum PPE used	

COVID = coronavirus disease 2019; FFP = filtering face piece; OVD = ophthalmic viscosurgical device; PCR = polymerase chain reaction; PPE = personal protective equipment; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

Protection (AEPD) has warned about a possible violation of the rights of patients. Thus, if done, temperature measurement should be carried out by healthcare personnel and the data subject to data protection regulation (AEPD 2020). Body temperature measurement will be therefore optional or follow guidelines established by the health authorities.

- Triage checklist to identify possible exposure to SARS-CoV-2 is shown in Table 2.
- If possible, triage should be conducted via a phone call the day before the appointment. In this call, patients can also be reminded of hygiene measures regarding the use

of masks. If COVID-19 is suspected for any reason, the patient will be instructed to stay home and contact their local health authority.

- Once the patient and companion (if appropriate) are admitted, they will be instructed to wash their hands with hydroalcoholic gel, and surgical masks will be provided if needed. The use of masks is also recommended in children.
- The use of elevators should be reserved for elderly, disabled or pregnant persons and if possible only one or two persons should use an elevator at a time.
- In waiting rooms, patients and companions should keep a distance of 1–2 m and will be instructed to remain

seated until they are called to enter the office. It is recommended that seats be removed or taped to maintain the safety distance. The accumulation of patients in waiting and testing rooms should be avoided at all times.

- Waiting rooms for children should be separate.
- We recommend audio/video, posters or electronic panels with basic instructions for patients.
- The number of patients scheduled for appointments should be carefully calculated to ensure that appointment times are accurate and avoid overcrowding.
- It is also advisable that clinics design patient flow circuits to minimize crossing of paths. Whenever possible, circulation should be unidirectional, so that patients access the clinic through one entrance and exit through a different one. Safety distances should be marked with lines.
- Patients will be instructed on the need to avoid touching surfaces and devices mainly in the testing and consultation areas. In the case of children, warn parents about this point. Likewise, efforts will be made to speak as little as possible in the waiting rooms and during eye examinations or treatments. Door handles or knobs must be disinfected each time they are used.
- As a general rule, all new patients with an ocular problem without symptoms of coronavirus infection will be seen. Patients with suspected or confirmed COVID-19 should be referred to the primary care services according to the clinical criteria and instructions of the different health services, or to the emergency services of reference hospitals. For successive outpatient visits, the eye condition can be stratified into three risk levels (low, medium and high) so that the follow-up of low- or medium-risk problems could be spaced out or replaced with telematic appointments. It may be useful to separate visits for certain pathologies by day, time interval or physical space, depending on the subspecialty and demand for eye care, as well as prioritizing those that will need to be attended in person. The latter should be assessed on a case-by-case basis through the medical history.
- Complementary examinations should be limited to those necessary

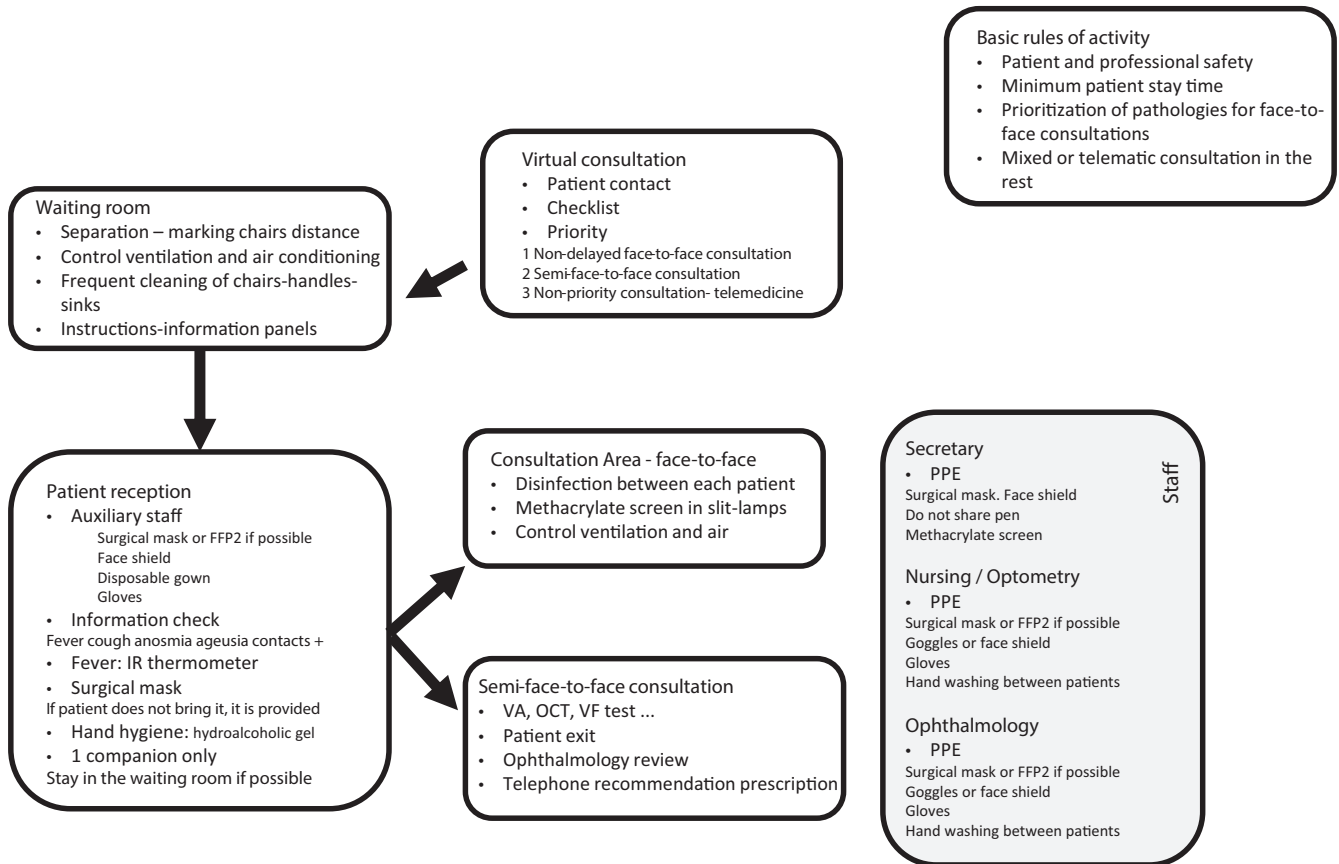


Fig. 1. Gradual reactivation model for outpatient clinics.

to make an accurate diagnosis and prescribe the appropriate treatment.

- Patients with acute symptoms of conjunctivitis should be isolated through separate circuits and zones (in hospitals generally in the emergency department) as these patients are considered COVID-19 suspects. If this is not possible and there are no guarantees of safety, they would have to be referred to the emergency department of a reference hospital. These patients need to wear a surgical mask and gloves after hand washing with hydroalcoholic gel. Likewise, the responsible clinician will use an FFP2 or FFP3 mask, gloves and, if available, a waterproof gown. Both patient and clinician should have their hair tied up or wear a surgical cap. All protections should be discarded before seeing the next patient. Patients with conjunctivitis of viral appearance should be considered and managed as COVID suspects and therefore diagnostic tests requested for SARS-CoV-2 (Cheena et al. 2020; Colavita et al. 2020).

**Recommendations regarding infrastructure and equipment**

- Extreme hygiene and cleaning measures should be implemented for floors, walls, surfaces, furniture and medical or other equipment such as computers. At the end of a session, all offices, waiting and examination rooms, halls, walkways, reception, toilets, etc. must be disinfected using the usual methods.
- Ventilate facilities.
- Reception, information and administrative areas should be protected with screens and marked safety distances maintained.
- Waiting rooms and other meeting places need to be adapted to ensure the minimum distance of 1–2 m. Seats between patients that should not be used need to be clearly marked. We also need to consider areas where patients need to wait between tests or while undergoing pupil dilation.
- There should be hydroalcoholic gel dispensers in the waiting and examination rooms.

- Each session, all items in the offices and examination rooms (furniture, devices, knobs and door handles, computer equipment, etc.) should be cleaned with 70° alcohol, dilute sodium hypochlorite or 0.5% hydrogen peroxide (Kampf et al. 2020). Between each use, chin rests and support fronts of slit lamps and other examination equipment, as well as joysticks and push buttons, instruments and test frames and lenses, should be cleaned and disinfected (ECDC 2020).
- Scanning devices, such as slit lamps, argon or YAG lasers, OCT and indirect ophthalmoscopes should be fitted with methacrylate screens. As the virus persists on plastic surfaces, between one patient and the next these screens must be cleaned on both sides with a disinfectant (alcohol, sodium hypochlorite).
- All manoeuvres or exams involving friction on the eye surface (e.g. contact pachymetry, contact or immersion biometry, ultrasound, contact examination lenses, esthesiometry,

Schirmer test, etc.) should be avoided as far as possible and replaced with a noncontact procedure.

- Pneumotometry should not be performed as the intense force of the air can cause aerosolization of tear drops to the environment (ChunchunLi et al. 2020). The use of devices with disposable protectors such as the Tonopen<sup>®</sup>, Icare<sup>®</sup> or the Goldmann tonometer is recommended. If these protectors are not available, recommended disinfection methods will be used on each device. The use of the Perkins handheld tonometer is not recommended given the extreme closeness to patients required. If used, protective goggles and FFP2 / FFP3 masks should be worn.
- Recommended disinfection measures for test glasses and frames, occluders, pinholes, prism bars or lenses, etc., should be cleaned with 70° alcohol, sodium hypochlorite or hydrogen peroxide after each use. The use of phoropters is preferable to that of trial frames and interchangeable lenses for refraction as they are easier to clean.
- While protection of self-refractometers and portable slit lamps with plastic bags is recommended, this measure should also be adapted to the particular circumstances of each case as it can greatly limit their use.

#### Recommendations for healthcare and nonhealthcare personnel

- For the safety of everyone, it is essential that any infection risk among workers be detected early. This requires daily health self-assessment before heading to the workplace. Screening tests (PCR and serological tests) should be scheduled at intervals set by occupational health experts.
- Administrative staff in contact with patients must wear a surgical mask and gloves. In reception areas and counters, protective screens preferably or the use of face shields is recommended.
- Healthcare personnel (ophthalmologists, nursing staff and optician-optometrists) should wear their normal work clothes, a disposable gown, gloves, mask and face shield or protective goggles, the examination

conditions permitting. FFP2 or FFP3 masks should be used on suspect COVID-19 cases or when the exam planned carries a risk of generating aerosols, or requires close proximity and/or contact with the eye.

- Hand washing should be a priority before and after any activity with the patient. This can be done in the same way with a hydroalcoholic gel when wearing gloves (Goktas et al. 1992; Scheithauer et al. 2016). Posters with washing guidelines in offices and waiting rooms are helpful.
- Eye drops should be instilled with gloves avoiding contact with the ocular surface or adnexa. If available, the use of single-dose eye drops is recommended.
- Safety precautions should be extreme when placing or removing eye patches and dressings.
- When examining the tear ducts or removing silicone tubes from the nostrils, FFP2/FFP3 masks and goggles or face shields should be worn.
- The use of mobile phones should be restricted as much as possible during a consultation to avoid contamination and virus transmission in this way (Olsen et al. 2020).

#### Care of patients testing positive for SARS-CoV-2

- These patients should not be attended by an ophthalmologist until they have been examined at the General Emergency Service according to the protocol of each centre.

a *Peripheral centres*: These patients should contact by telephone the health authorities of their autonomous community and follow their instructions.

b *Reference hospital centres*: For the care of these patients, an examination is first conducted in an isolated area with complete individual protection equipment (FFP2/FFP3 masks, gloves, shoe covers, surgical cap, waterproof gown and goggles or face shields) according to the preventive medicine service of each centre.

- Multidose eye drops in COVID-19 positive patients should be single-used and discarded. If possible single-dose eye drops should be available.

- Extreme protective measures should be taken in the presence of conjunctivitis.
- In the case of consultations by other specialists regarding hospitalized COVID-19 patients who present with eye problems, once the suitability of the visit has been discussed with the responsible specialist, assistance will be carried out in the patient's room or in a special COVID examination area within the 'contaminated' circuit established at each centre. If examinations are carried out in areas not equipped with conventional ophthalmic equipment, portable equipment may be used depending on their availability (slit lamps, tonometers and indirect ophthalmoscopes). Perkins-type tonometry should not be performed in these patients because of the close proximity to the face required. For this same reason, direct ophthalmoscopes should not be used to visualize the fundus. After each use, equipment will be cleaned and disinfected by staff.

#### Recommendations for telemedicine

- During the COVID-19 public health crisis, telematic consultations via the telephone, internet or videoconference have been encouraged. The possibility of carrying out certain successive reviews, both in outpatient clinics and hospitals, and exceptionally for first-time consultations, should be considered according to clinical criteria. The balance between risk/benefit, both systemic and ophthalmological, should be carefully weighed for the patient in all cases (SERV 2020).
- Non face-to-face consultations will be considered a 'procedure for Tele-assisted Medical Council'. It is convenient to obtain informed consent for tele-assisted medical care. The consent form can be previously sent by email to the patient, family member or guardian, so that it can be returned signed or, if not, accepted by telephone via voice recording systems. If consent cannot be granted in this way it may be obtained verbally.
- Although telemedicine is limited in ophthalmology because of the

complex exams and devices required, telephone consultations may be especially useful in children, given the anxiety that the current situation can generate in parents, and may help avoid unnecessary visits to the emergency services.

- It should be remembered that the follow-up of many chronic ocular diseases requires complementary tests (e.g. visual field tests, retinal imaging, optic nerve or cornea tests) and a direct eye exam. These consultations are thus not really amenable to telemedicine unless combined with some face-to-face visits. For organizational purposes, it may be useful to differentiate between consultations for glaucoma (tele-glaucoma), retina (tele-retina) or the other ophthalmological subspecialties.
- To facilitate visual self-examination during teleconsultations, resources can be provided in the first face-to-face consultation, (e.g. cards with optotypes, Amsler grid, websites of computer applications, etc.).

### Recommendations for Eye Care in the Surgery Area

Table 3 provides a checklist as a summary of the recommendations detailed below.

#### Patient recommendations

- For all patients, a checklist will be completed prior to the intervention to assess the possible presence of symptoms of COVID-19 or positive epidemiological contacts. On the day of surgery, triage should also be carried out on the accompanying person.
- Before a major surgery procedure (24–72 hr) especially if it is performed under general anaesthesia (Sainz 2011), and when there is a high risk of generating body fluid aerosols, a polymerase chain reaction (PCR) test for SARS-CoV-2 virus should be conducted. The preoperative determination of antibodies in itself does not serve to distinguish between infected individuals or those who have already had the infection. A positive IgM antibody result will not be obtained until approximately 5 days after the start

of infection, so results must be interpreted with caution. Table 4 shows the possible diagnostic implications of the results of a PCR and serological tests for SARS-CoV-2 infection (SEI 2020). It should be clarified that a positive IgM result accompanied by a negative PCR and IgG test does not only suggest early stage disease and a false negative PCR result, but could also mean a false positive IgM result and therefore the absence of disease. If the urgency of the situation does not allow for testing, the patient should be treated as infected. In any case, the guidelines issued by the central and autonomous community health advisers must be followed at all times.

- In accordance with the guidelines of each centre or hospital in coordination with the anaesthesiology services, preoperative analytical tests, COVID risk profiles, electrocardiogram, chest X-ray or chest CT should be conducted at the discretion of the anaesthesiologist.
- Complementary informed consent for surgery during the COVID-19 pandemic is needed added to specific consent for the procedure scheduled.
- Once admitted, the patient should be instructed to wash their hands with hydroalcoholic gel and they will be provided with surgical masks until they are transferred to the surgery room.
- The patient should be warned of the need to avoid touching any surfaces or devices, and to speak as little as possible during the surgical procedure.
- Surgeries requiring general anaesthesia should be limited to those strictly necessary.
- As far as possible and in patients testing negative for COVID, surgical

procedures should be carried out on an outpatient basis, thus avoiding hospital admission.

#### Recommendations regarding infrastructure and equipment

- The usual measures for other areas also apply to the surgery area in terms of maintaining conditions of hygiene and the cleaning of floors, walls, surfaces, furniture and other items.
- Asepsis and antisepsis measures in the operating room should be extreme. In preparation for surgery, the use of povidone-iodine 5% on the ocular surface has been shown effective against SARS-CoV so is assumed to also protect against SARS-CoV-2 (Kariwa et al. 2006).
- To contain the aerosols that can be generated during the use of instruments such as phacoemulsifiers, vitreotomes, lasers, burrs, cutting systems and electrical coagulation devices, or after certain procedures such as irrigation of the ocular surface with saline solution, the use of surgical fields specifically designed to act as barrier systems could be useful. If available, 3D visualization systems can provide some distance between patient and surgeon (Lovino et al. 2020).
- For vitreoretinal surgery, valved trocars should be used and viscoelastic applied to the valves to minimize the spread of particles and aerosols during air exchange.
- The preferential use of ophthalmic viscosurgical devices (OVD) is recommended for all ocular procedures that may require hydration of the ocular surface, as we understand that the likelihood of dispersing aqueous particles is reduced compared with

**Table 4.** Diagnosis of SARS-CoV-2 infection.

PCR	IgM	IgG	Diagnosis
–	–	–	Negative
+	–	–	Initial stage
+	+	–	Early stage
+	+	+	Active stage
+	–	+	Advanced stage
–	+	–	Early stage, false negative PCR?
–	+	+	Disease progression
–	–	+	Resolution stage

IgG = immunoglobulin G; IgM = immunoglobulin M; PCR = polymerase chain reaction. Reported by the Spanish Society of Immunology (SEI).



continuous profuse irrigation of the ocular surface with saline.

- If the patient is COVID-19 positive or infection is suspected, the operating room set up for these patients should maintain negative atmospheric pressure to minimize the spread of the virus outside. In addition, a high frequency of air exchange (25 times per hour) will rapidly reduce the viral load within the surgery room (Wong et al. 2020).

**Recommendations for healthcare and nonhealthcare personnel**

- It is recommended that PCR and serological tests be carried out at the frequency established by the national health system authorities.
- Nonhealthcare personnel in the surgery area must wear a surgical mask, eye protection (face shield or goggles) and gloves.
- Surgeons and nurses should take appropriate protective measures, especially when managing COVID-19 patients: surgical pyjamas, waterproof gown, disposable cap and shoe covers, surgical gloves, face protecting goggles or shields, protective mask (FFP2 or equivalent N95 or FFP3). Valve masks must not be used.
- The use of goggles and face shields is in many cases incompatible with the use of surgical microscopes and

magnifying glasses, and these also impair correct visualization of the surgical field. For oculoplastic surgery, it may be advisable to use the surgical microscope with a wide-field visualization system or to operate with protective screens without magnifying glasses until specific screens are designed for these.

- FFP2 masks should be discarded and replaced in any of the following circumstances: if damaged, moistened, dirty or contaminated (e.g. with secretions or body fluids), or when the facial seal is compromised, uncomfortable or breathing becomes difficult. It is also important to follow the manufacturer’s instructions regarding time of use and expiry date.
- In the operating room, there should only be the minimum personnel necessary and their movement should be minimized.

**Care of patients testing positive for SARS-CoV-2**

- These recommendations only apply to urgent surgical interventions. Any planned surgery will be postponed until the COVID-19 situation has improved and the patient has completed a 14-day period of home isolation after returning a negative PCR result. Guidelines for measures to be taken in emergency surgery are

provided in the algorithm shown in Fig. 2.

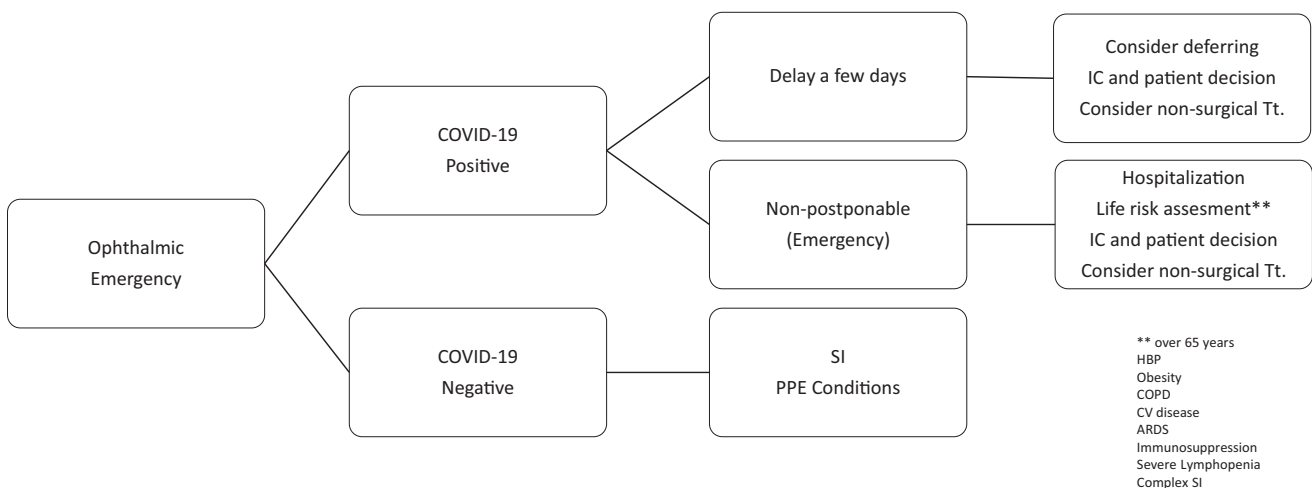
a Any intervention should be postponed ideally until the PCR result is negative. The patient should always be assessed in terms of life risk/eye benefit.

b If surgery cannot be delayed (e.g. eye perforation), the mortality risk must be evaluated, especially in hypertensive patients over 65 years of age with obesity, chronic obstructive pulmonary disease, cardiovascular disease, ARDS, immunosuppression, severe lymphopenia, or before very complex surgeries. In these scenarios, various studies have revealed high ICU (Intensive Care Units) admission rates and mortality (Lai et al. 2020; Wu et al. 2020; Yang et al. 2020a).

**Transplant regulations**

Ocular tissue transplants should be considered in terms of patient and clinician safety applying the protection measures mentioned in this document. To accept donor tissue, the recommendations issued by the National Transplant Organization (ONT 2020), reference BV-ES-20200122-5, of March 13, point 2 on ‘Tissue Donation’ need to be followed:

Regarding donation of tissues, at the current time, any confirmed



\* Adapted from Asociación Española de Cirujanos (Balibrea et al. 2020)

\*\* Factors that increase rates of admission by 45% and mortality by 20% (Lei et al. 2020)

HBP = High Blood Pressure. COPD = Chronic Obstructive Pulmonary Disease. CV = Cardiovascular. ARDS = Acute Respiratory Distress Syndrome. SI = Surgical Intervention. COVID = Coronavirus Disease 2019. PPE = Personal Protection Equipment. IC = Informed Consent. Tt = Treatment

**Fig. 2.** Algorithm for urgent surgical interventions.

cases of COVID-19 should be discarded. In all other cases, and provided that a negative result is not available within 24 hr prior to donation, it is recommended that tissue establishments screen for SARS-CoV-2. To enable screening in tissue establishments, the same samples as would be obtained for screening organ donors should be obtained and sent to the sample - if possible, upper airway sample. The positive or inconclusive result rules out tissue donation.

## Conclusions

Within the context of the global COVID-19 pandemic, all frontline healthcare workers including eye care providers are having to change priorities and set new ones. The recommendations provided in this paper for safer eye care for both patients and physicians in the postconfinement period will also be useful for clinicians and health service managers to prepare for possible further outbreaks or future pandemics. In conclusion, this paper provides detailed descriptions of measures to be taken during the phase of gradual return to normal clinical practice after lockdown, and invites all eye care providers to systematically follow these recommendations to avoid patients and care providers becoming transmission vectors of COVID-19.

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