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**PERIOPERATIVE RECOMMENDATIONS FOR THE MANAGEMENT
OF PATIENTS INFECTED WITH COVID-19
FROM THE SPANISH ASSOCIATION OF SURGERY (AEC)**

Given the important repercussions of the current pandemic caused by COVID-19, the AEC committee of Surgical Infections prepared these recommendations based on **9 questions** that will likely come up in your surgical practice. Extra-respiratory manifestations by COVID-19 are rare and usually limited to nonspecific symptoms (nausea, vomiting, epigastric pain...) in exceptional cases iatrogenic hepatotoxicity caused by currently used treatments.

As in other circumstances where surgeons have had to treat patients with highly transmissible or highly morbid infections, the AEC agrees that surgeons should tend to all potentially surgical patients, ideally by volunteering, but the current magnitude of this pandemic is hindering that, including the transfers to tertiary care centers. However, the current situation does not exclude the authorities of their obligations to give logistic support and to provide surgeons with all materials needed to conduct surgeries under these circumstances. Evaluations by the entire surgical team should be done and *“has to take into account the available equipment and/or materials to conduct high infectious risk procedures as well as the therapeutic benefit of that procedure”*. In the OR, the number of the entire team members should be the minimum possible to conduct the procedure and should be done by the most experienced team members or with the most training.

The only possible scenario that should be contemplated are urgent surgeries or elective surgeries that cannot be postponed. On the former, most cases will be of an infectious nature, in which a confirmed COVID-19 infection may pose a contraindication to the surgery depending on the setting and the overall state of the patient. The indication for an urgent surgery will be individualized and should be based on a highly accurate diagnosis. In many cases a non-operative approach should be considered, particularly on diagnoses that have a safe non-

operative option e.g. antibiotic treatment of a young patient with early acute appendicitis, conservative management of some acute cholecystitis, etc.). On the latter, given the declared pandemic, regulatory healthcare agencies will distribute resources accordingly and non-urgent procedures should be limited to a maximum, prioritizing pathologies that require prompt surgical intervention e.g. oncologic surgery. Again, two important factors have to be taken into account: overall state of the patient and the possibility of intra-hospital transmission. Although there is no published data, it seems that in Italy there has been an elevated incidence of respiratory complications and transmission on patients that underwent interventions in the past weeks. Most of them were oncologic patients who quickly developed severe SARS-Co-V2 with a high mortality rate. As with many urgent procedures, confirmed infection with COVID-19 can be considered a surgical contraindication specially in oncologic patients, immunosuppressed, or with comorbidities associated with a high surgical morbidity (especially respiratory comorbidities).

1 - Which precautions should be taken when intervening in a patient who has confirmed COVID-19?

In the setting of a confirmed positive patient, Protective Personal Equipment (PPE) should be worn underneath standard surgical wear to ensure proper protection of the surgical team. When a patient has a high suspicion of COVID-19 infection but has not been confirmed, it should be assumed that the patient is positive and the same measures as with a confirmed patient should be undertaken. There are many different types of PPE, we will discuss the minimum basic equipment needed to conduct a procedure safely.

Protective Personal Equipment (PPE)

PPE will be necessary in any procedure where there is “close contact” with the patient, which includes: surgical intervention as well as other OR procedures i.e. intubation, regional anesthesia, establishing an IV access, ect.

Necessary equipment:

1. Impermeable gown (Level 4)
2. Mask: Conventional surgical masks do not protect from aerosols. N95, or FFP2/FFP3 (filter 96 and 99% respectively) masks are required. Non valve masks are preferred as valve masks do not protect the patients from our own pathogens, if only valve masks are available, a standard surgical mask has to be used on top.
3. Eye wear: if aerosols will be produced during the procedure (we have to assume that they will be produced, depending on the procedure), it is fundamental to completely cover the eye with protective glasses, if not available, partial coverage to protect from splashing or direct contact is recommended.
4. Face shields: These do not protect from aerosols, but is necessary when there is a splash risk (blood, gastric contents, or other fluids). Face shields are particularly important when handling the airway. They can be an alternative to protective glasses or can be worn on top of them. If prescription glasses are worn they stay in place, and face shields should be worn on top.
5. Gloves: A pair of long nitrile gloves is sufficient.
6. It is convenient that all personnel with long hair completely pull their hair back and tie it securely and low to aid with wearing and fitting their PPE. Beards should be shaven to favor proper fitting and functionality of the masks.
7. Foot wear should be exclusive to the area of activity and should not have holes or perforations
8. Once all PPE equipment is worn, all standard sterile wear will be worn on top of PPE. Hand washing will be done with an alcohol based solution on top of the nitrile gloves and then standard sterile gown and gloves will be placed on top.

Step by step instructions on how to wear PPE (Annex 1)

It is fundamental that the entire surgical team has completed prior training on wearing and removing PPE prior to performing a procedure. Equally important is the group collaboration of all team members between themselves. There should be trained reserve personnel (for all members) readily available in case of an unexpected event e.g. PPE is not tolerated by any of the team members, dizziness or overheating ensues, etc.

STEPS:

1- Remove all personal objects from scrub pockets as well as watches, earrings, jewelry, etc. prior to wearing PPE

2- Wash hands with an alcohol based solution

3- Impermeable gown is opened, arms placed with its ends at the level of your palm, velcro closed and then its tied around the waist making sure there are no loose strings that can get caught and tying a knot that can be easily accessed.

4- Next the mask is placed. For adequate fixation it should be held by its convexity, applied to the chin, elastic straps passed behind the head. We recommend crossing the straps for a more tight fit. Then the metallic bridge is adjusted over the bridge of the nose. Ensure that there is a proper seal around the face with no air gaps.

5- Place surgical cap if one has not been previously placed

6- Eyewear or face shield placement. If it has an adjustable head band, it should be adjusted approximately to the size of your head to minimize posterior manipulation after placement. First place over the eyes and then pass the posterior fixation behind the head. Make sure that your mask does not get caught and moves it from proper position. If the mask has been properly placed with a good seal, there should be no fogging of the face shield or glasses.

7- Put on a pair of nitrile gloves covering the ends of the gown.

8- Mask: if a valve mask is being used a standard surgical mask should be placed on top

9- Hand wash with alcohol based solution on top of nitrile gloves

10- Enter the OR

11- Placement of sterile surgical gown using standard technique

12- Placement of sterile gloves using standard technique

Step by step instructions on how to remove PPE

When removing PPE it is fundamental to do it in a slow and calm fashion preventing sudden movements and under the supervision of a trained colleague. Ideally it should be removed one person at a time, away from the patient and close to the door. There should be a designated large container to dispose of all PPE as well as an alcohol based disinfectant for hands and surfaces. It can be helpful to have a designated “dirty” OR for removal of PPE with sufficient space.

- 1- Remove sterile gown and gloves using standard technique avoiding touching the external part and rolling it inward and removing the sterile gloves inside out leaving the base gloves in place.
- 2- Disinfect base gloves (Using Trifectant®, Vikron®, potassium peroxymonosulfate, potassium hydrogen sulfate or similar virucidal agent)
- 3- Remove face shield grasping it from the back and ducking your head out of the shield
- 4- Disinfect base gloves (Using Trifectant®, Vikron®, potassium peroxymonosulfate, potassium hydrogen sulfate or similar virucidal agent)

- 5- Remove base gloves. Grasp first glove externally on the palm side and pull away inside out. Place clean finger inside of the second glove and pull out. Place gloves inside the container, they should not be thrown into the container as it should be close by, and they should not touch anything other than the inside of the container.
- 6- Hand wash with alcohol based solution
- 7- Remove impermeable gown. First undo the knot with two fingers if possible. Then without touching your neck place traction on the top of the gown to undo the velcro. Remove the gown touching only its inner portion folding it onto itself so that the outer part is completely covered and making sure that there are no loose strings that touch anything. Place inside of the container.
- 8- Hand wash with alcohol based solution
- 9- Eyeware or face shield removal: Ducking the head with eyes and mouth closed. Grab the adjustable head piece or the ends of the glasses posteriorly and remove carefully making sure it does not touch your face, place on a tray for disinfection if reusable or discard in the container.
- 10- Hand wash with alcohol based solution
- 11- Mask removal: Again, ducking the head with eyes and mouth closed the elastic bands or strings are undone and the mask is pulled forward and downward. The anterior part of the mask should NOT be touched as it may be contaminated and the mask should be disposed in the container only by touching the strings.
- 12- Hand wash with alcohol based solution
- 13- Step out of the OR
- 14- Disinfect footwear either by applying disinfectant or by careful removal of footwear and disinfection by immersion

15- Complete standard surgical hand washing up to elbows.

16- Careful revision of scrubs to assess for an inadvertent contamination.

17- Full body shower is recommended after finalizing the process.

2- Is there a preferred surgical approach in these patients?

We only have preliminary data and reported experiences are limited to case reports or case series. As of today general recommendations for surgery on patients with highly transmissible viral infections by way of fluids are minimally invasive approaches to minimize exposure of fluids to the surgical team. COVID-19 transmission is both by fluid and aerosol and fecal/oral transmission has not been ruled out. Thus aerosolization of particles and fluid has to be taken into account; currently evidence of the presence of virus in the pneumoperitoneum during laparoscopy is limited to a single experience with Hepatitis B virus.

During gastrointestinal surgery the use of the electrocautery and opening the GI tract can generate aerosols. Laparoscopy adds a physical barrier between the surgical team and a possible source of infection, limiting occupational exposure as well as cross contamination. Hand assisted surgery can be entertained with a properly sealed hand port if this adjunct will reduce surgical time without compromising oncologic or functional results. All equipment should be exhaustively revised to ensure proper functioning during the case. Effort should be taken to reduce the amount and size of trocars as well as the incision used to place the trocars. Central negative pressure systems should be established and smoke should be evacuated only once. Constant pressure insufflation systems can be used and it is recommended that if an additional incision is required for assistance, that the pneumoperitoneum is fully evacuated.

In relation to elective surgeries in China, NOSES or TaTME have been done for colorectal cancer under extreme precautions. It is important to remember that the creation of stomas (temporary or permanent), are a possible focus of transmission that should be taken into account by hospital personnel as well as family members.

However during your preoperative planning, you should **USE THE SURGICAL APPROACH THAT IS MOST BENEFICIAL TO THE PATIENT INDEPENDENTLY OF THEIR COVID-19 INFECTION.** If laparoscopy is to be used as the surgical approach, protective

measures should be undertaken to protect the airway and mucosal membranes (masks and eye protection) and caution should be taken not to have direct exposure during moments of gas release (smoke evacuation or final exsufflation). Though there is no evidence regarding smoke filters, if available, it is advisable to use smoke filters on each trocar.

3- What should a surgeon do if he or she suspects that they may be infected with COVID-19?

Any healthcare worker that has been in close contact with a patient under investigation, suspected or confirmed infection with COVID-19 should immediately report it to their designated hospital team to properly channel these suspicions based on their current hospital policy.

In the setting of a community acquired infection protocols regarding active or passive surveillance should be followed.

CLASSIFICATION OF CONTACT IN THE HOSPITAL SETTING:

1. Close contact with a patient that has suspected/confirmed COVID-19 with proper use of PPE
2. Close contact with a patient that has suspected/confirmed COVID-19 without proper use of PPE
3. Casual contact with a patient that has suspected/confirmed COVID-19 without proper use of PPE
4. International healthcare assistance given in areas with sustained local transmission of COVID-19

Close contact is defined as:

- Any person who has cared for a symptomatic patient with suspected or confirmed COVID-19: Healthcare workers who have not used PPE, family members or anyone else who has had similar physical contact.
- Any person who has been in the same place, within two meters, of a patient who had been symptomatic in that location (household members, visitors).

The designated hospital team will evaluate each case individually and stratify its risk, which then has to be reported to the public health authorities of its respective Autonomous Community (i.e State department). To perform a proper evaluation, these aspects have to be taken into consideration:

- A- Type of exposure (procedures that generate aerosols such as aspiration of the respiratory tract, intubation, bronchoscopy, CPR, accidents in the lab)
- B- Time of exposure (more than 15 minutes at a distance of less than two meters).
- C- The department where the exposure happened in regards to the level of assistance that was provided to the patient (units with vulnerable patients, hematology, ICU, oncology, burn units, etc.)

How to proceed:

1. Close contact with a patient that has suspected/confirmed COVID-19 with proper use of PPE: The healthcare worker shall continue with normal activities and passive surveillance will be done for developing symptoms.

2. Close contact with a patient that has suspected/confirmed COVID-19 without proper use of PPE:

- A. High risk exposure: the healthcare worker will be relieved of their duties for 14 days, or consideration can be taken to transfer the worker to another area of the hospital. They should remain available during the entire period of active surveillance. They should refrain from social activities and non-essential travel.
- B. Low risk exposure: the healthcare worker shall continue with normal activities with active vigilance will be done to assess for developing symptoms.

3. Casual contact with a patient that has suspected/confirmed COVID-19 without proper use of PPE: The healthcare worker shall continue with normal activities and passive surveillance will be done for developing symptoms.

4. International healthcare assistance given in areas with sustained local transmission of COVID-19: The designated hospital team will assess the type of contact and in conjunction with their respective Autonomous Community (State department) to where they return to will proceed

as stated in points 1-3. As a general rule and as currently indicated, unless symptoms ensue, no testing should be done.

Summary: If the healthcare worker, in this case the surgeon, once notifies the exposure and has been evaluated by the designated hospital team, does not have symptoms and has been considered a low risk exposure, we are currently recommending that the surgeon continues with normal activities checking their temperature twice daily and continuing with urgent and elective cases using appropriate protective measures. In any circumstance, if symptoms ensue, it will be notified to the designated hospital team ASAP or per the established route put forth by each Autonomous Community (i.e. State). The healthcare worker shall be relieved of their duties and protocol to notify the Public Health department should be activated and shall be considered under investigation. Established hospital policies on PPE shall be followed. In general any situation where there may be a risk of aerosol transmission, N95, FFP2 or FFP3 masks are recommended. In all other cases, local recommendations should be followed depending on availability.

4- What precautions should be taken when examining a patient that has a suspected or confirmed COVID-19 infection?

Entry to a surgical service has two routes: ER and elective admission. Both routes shall have predetermined triage areas as per hospital policy.

It is important to divide patients in two groups: suspected and confirmed. Although measures to evaluate these groups are the same, patients with confirmed COVID-19 may require different treatment modalities.

We summarize important aspects to take into consideration in each step:

- 1. Chart review:** To be done extensively and in an area away from the patient.
- 2. Case discussion with the physician responsible for the patient:** Prior to examining the patient, gather all information not present in the chart, obtain information from the family members by telephone if possible.
- 3. Preparation:** First, go to the area next to the room where the patient is located along with auxiliary and nursing staff that will aid in the placement of PPE. All personal belonging should be kept in a secure location, hair should be pulled back, scrub top tucked in, and if the scrub pants are too long, they should be tucked in the socks. Foot ware should not have holes or perforations. Once ready, the placement of PPE begins as established by hospital protocol. We

recommend starting with the cap, then mask, followed by internal gloves, gown, external gloves, lastly eyewear or face shield. Once PPE is properly worn you should enter the room and take the shortest route possible towards the patient avoiding touching or manipulating objects.

4. History taking: It is important to identify yourself as the patient will not recognize anyone wearing PPE. There may be noise contamination due to all ancillary equipment thus try to be concise and clear.

5. Physical exam: Standard abdominal examination should be done with exception of auscultation where due to circumstances; it may be difficult to perform. It's important to plan ahead if wounds or mucosal membranes are to be examined to ensure that you bring all material that you will need (gauzes, lubricant, sterile gloves, etc.)

6. Dirty zone: Once exploration of the patient is complete, we will go towards the designated area where the ancillary and nursing staff are waiting for us to help with removal of the PPE as virucidal agents are used during each step of the PPE removal followed by complete hand washing with antiseptic. We have to be extremely careful in this step to prevent exposure.

7. Medical area: Once finished, we should discuss findings with the physician responsible for the patient and we should discuss with family members via telephone to minimize exposure.

8. Consent: We should document on the chart the procedure, risks and benefits as normally done but it should be written that a signature cannot be taken due to security reasons (This should be discussed with your hospital's legal team and should follow hospital policy).

5. Is it necessary to test for COVID-19 patients that will undergo elective procedures that cannot be postponed?

NO.

Patients that will undergo a procedure will follow the same protocol as any other patient. In situations like this one it is important to use available equipment with judgment, to prevent patient stigmatization and unnecessary alarming situations

6. Which protocol should be followed in the case of a biological exposure?

For an exposure without PPE to a patient under investigation, suspected or confirmed infection by COVID-19, whether known at the time of exposure or known post-exposure, that

personnel should be considered as a close contact and will be managed according to hospital policy. All healthcare workers exposed should immediately report it to their designated hospital team to manage the situation according to their current hospital policy. Up to date there are no specific studies on post exposure prophylaxis (PEP) to COVID-19. One retrospective study from Park et al. from 2019 on PEP to MERS in a limited number of healthcare workers showed good results using a combination of antivirals (lopinavir/ritonavir plus ribavirin). It's worth saying that this study had bias that favored PEP. As of today, there is no evidence to recommend PEP for COVID-19.

7. Is it necessary to add COVID-19 treatment to patients that require antibiotics?

Not necessarily. Treatment should follow the same indications as for all COVID-19 infected patients. It is fundamental to keep in mind that guidelines are changing almost on a daily basis and they should be reviewed frequently. Only CONFIRMED cases should be treated and it should be written in the chart that the patient gave verbal consent (again, this should be done according to hospital policy). Currently we are using hydroxychloroquine and lopinavir/ritonavir. In elderly patients and/or polypharmacy patients we prefer only hydroxychloroquine but in the case of liver disease it is avoided. The most severely ill patients ALSO receive treatments with interferon/Tocilizumab. Remdesavir has been considered.

Other complementary measures include oxygen, avoiding corticosteroids and nebulizing treatments. With respect to the use of medications that alter the expression and/or function of Angiotensin converting enzyme 2, data is preliminary and no strong recommendations can be given at this time. The use of NSAIDS such as ibuprofen can be questioned, there is no evidence in humans that favors the infection or that it causes a worst outcome. When managing intrabdominal infections, standard protocols should not be changed, although possible interactions with antiviral medications should be investigated. We suggest the use of online registries e.g. www.covid19-druginteractions.org where interactions can be consulted easily and up to date.

8. Are there any clinical parameters or markers that can assist in differentiating systemic manifestations of COVID-19 and intrabdominal sepsis?

Recent data suggests that COVID-19 causes diffuse alveolar damage associated with direct damage to pneumocytes in contrast to other infections that cause damage by an

enhanced inflammatory response with endothelial damage. Furthermore, it unleashes a cascade of cytokinins similar to bacterial sepsis or even as in hemophagocytic lymphohistiocytosis.

All this translates to a nonspecific respiratory picture with frequent fevers specially in severe cases. We cannot forget that up to 10% of patients can present with GI symptoms such as diarrhea or nausea.

When evaluating laboratory results, there is no rise in WBC as seen in bacterial sepsis, nor a increase in neutrophils. What has been observed is that there is decreased lymphocytes in approximately 80% of patients and mildly decreased platelets in cases with the worst prognosis. It is also frequent to see a nonspecific rise in D-Dimers. It is important to note that procalcitonin is not elevated in COVID-19 patients, studies done have shown that 95% of patients have a procalcitonin less than 0.5 ng/mL. This point is important with respect to sepsis where it is a fundamental marker of systemic bacterial infections. On the other hand, C reactive protein, just as in sepsis, can have a direct correlation with severity of disease and prognosis, finding that it is more elevated in patients with hypoxemia and in patients that die from the disease.

9. OR protocol

Firstly, a thorough timeout must be done that includes the COVID-19 status of the patient. In regards to anesthesia, The AEC follows the recommendations of the Sociedad Española de Anestesiología, Reanimación y Terapéutica del Dolor (SEDAR).

Within the OR these factors should be considered:

We recommend a designated OR and all of its materials within to the exclusive treatment of COVID-19 patients for the duration of the pandemic. Ideally it should be away from other Operating Rooms and an established circuit for the transport of these patients from isolation to the OR and back has to be done in an organized, planned and in an uninterrupted fashion.

- 1- The use of AAMI level 4 gowns
- 2- Surgical approach as previously stated

- 3- Avoid sharp objects to a maximum, manipulation will be done with instruments, never directly with the hands
- 4- Use verbal cues for transferring instruments, avoid hand to hand transfers, use the mayo tray or a magnetic sheet.
- 5- Do not place sharp objects on the mayo tray unless previously deemed a neutral zone.
- 6- Maximize the use of alternative cutting mechanisms such as the electrocautery
- 7- Prioritize the use of mechanical sutures
- 8- Follow the previously stated recommendations on exsufflation during laparoscopy to minimize aerosol exposure.
- 9- Dispose of sharp objects in a designated container

Immediately after the procedure:

- 1- The patient should be transferred to an isolation room in recovery or alternatively the patient can recover in the same designated OR prior to returning to their isolation room or ICU.
- 2- Extensive cleaning of the room (allow a minimum of 1hr between cases) with decontamination of all surfaces, screens, cables, monitors, anesthesia machine, ect.
- 3- All medication, devices, intubation equipment that was not used should be discarded.
- 4- Vaporized hydrogen peroxide should be used to decontaminate the OR.
- 5- Postoperative prescriptions should be tailored to each patient and in accordance with established hospital protocols.

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