



SAGES and EAES recommendations for minimally invasive surgery during COVID-19 pandemic

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Abstract

The unprecedented pandemic of COVID-19 has impacted many lives and affects the whole healthcare systems globally. In addition to the considerable workload challenges, surgeons are faced with a number of uncertainties regarding their own safety, practice, and overall patient care. This guide has been drafted at short notice to advise on specific issues related to surgical service provision and the safety of minimally invasive surgery during the COVID-19 pandemic. Although laparoscopy can theoretically lead to aerosolization of blood borne viruses, there is no evidence available to confirm this is the case with COVID-19. The ultimate decision on the approach should be made after considering the proven benefits of laparoscopic techniques versus the potential theoretical risks of aerosolization. Nevertheless, erring on the side of safety would warrant treating the coronavirus as exhibiting similar aerosolization properties and all members of the OR staff should use personal protective equipment (PPE) in all surgical procedures during the pandemic regardless of known or suspected COVID status. Pneumoperitoneum should be safely evacuated via a filtration system before closure, trocar removal, specimen extraction, or conversion to open. All emergent endoscopic procedures performed during the pandemic should be considered as high risk and PPE must be used by all endoscopy staff.

Keywords COVID-19 · Surgery · Laparoscopy

COVID-19 has demonstrated a propensity to spread at an exponential rate in several countries, significantly impacting many lives and significantly affecting the healthcare practice and healthcare professionals. The Society of American

Gastrointestinal and Endoscopic Surgeons (SAGES) and The European Association for Endoscopic Surgeons (EAES) are committed to the protection and care of patients, supporting

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their members surgeons and staff, and all who are served by the medical community at large.

These joint recommendations draw on a number of sources including the limited available literature on the topic but more immediately from practicing surgeons across Europe, Asia, North America, and beyond. This guide is subject to update and we will continue to monitor emerging evidence and support novel research to address clinical and scientific gaps in this topic.

Through this prism, the following recommendations are being made with the aim that they can be of support to the surgical community in general and Minimally Invasive Surgery (MIS) in particular, by addressing a number of uncertainties regarding the surgical practice, staff safety, and overall patient care. The recommendations are summarized in Table 1 and depicted in an infographic diagram (Fig. 1).

Rationalization of service

All elective surgical and endoscopic cases should be postponed at the current time. These decisions however should be made locally, based on COVID-19 burden and in the context of medical, logistical, and organizational considerations. There are different levels of urgency related to patient needs, and judgment is required to discern between them. However, as the numbers of COVID-19 patients requiring care is expected to escalate over the next few weeks, the surgical care of patients should be limited to those whose needs are imminently life threatening. These may include patients with malignancy that could progress or with active symptoms that require urgent care. All others should be delayed until after the peak of the pandemic is seen. This minimizes the risk to both patient and health care team, as well as minimizes utilization of necessary resources, such as beds, ventilators, and personal protective equipment (PPE).

All non-essential hospital or office staff should be allowed to stay home and telework. All in-person educational sessions should be cancelled and could be replaced by online resources. The minimum number of necessary providers should attend patients during rounds and other encounters. Adherence to hand washing, antiseptic foaming, and appropriate use of PPE should be strictly enforced. When necessary, in-person surgical consultation should be performed by decision makers only.

All non-urgent in-person clinic/office visits should be cancelled or postponed, unless needed to triage active symptoms or manage wound care. All patient visits should be handled remotely when possible, and in person only when absolutely necessary. Access to clinics should be maintained for those special circumstances to avoid patients seeking care in the Emergency Department (ED). Only a minimum of required support personnel should be present for these visits, and PPE should again be appropriately utilized. When in critical need, consideration should be given to redeploying OR resources for intensive care needs.

Multidisciplinary team (MDT) meetings should be held virtually as possible and/or limited to core team members only, including surgeon, pathologist, Clinical Nurse Specialist, radiologist, oncologist, and coordinator. The MDT is responsible for the decision making and classifying the patient's priority level of need for surgery.

Procedural considerations

1. There is very little evidence regarding the relative risks of minimally invasive surgery (MIS) versus the conventional open approach, specific to COVID-19. We will therefore continue to monitor emerging evidence and support novel research to address these issues.

Table 1 Summary of the main recommendations on COVID-19 and surgery

1. Suspension of non-essential surgical care during the immediate phases of the COVID-19 pandemic
2. Testing all patients before surgery is desirable
3. Consent discussion with patients to cover the risk of COVID-19 exposure and the potential consequences
4. Dedicated COVID-19 OR must be used during the pandemic with a minimum number of staff members during the procedure
5. All members of the OR/endoscopy staff should use PPE in all procedures during the pandemic regardless of known or suspected COVID status
6. A closed smoke evacuation/filtration system with Ultra Low Particulate Air Filtration (ULPA) capability should be used during MIS
7. Minimize the use of energy sources (risk of aerosolization) during surgery and endoscopy
8. All pneumoperitoneum should be safely evacuated from the port attached to the filtration device before closure, trocar removal, specimen extraction, or conversion to open
9. Since patients can present with gastrointestinal manifestations of COVID-19, all emergent endoscopic procedures performed in the current environment should be considered as high risk
10. Advanced endoscopic procedures that require additional insufflation and or energy sources should be avoided

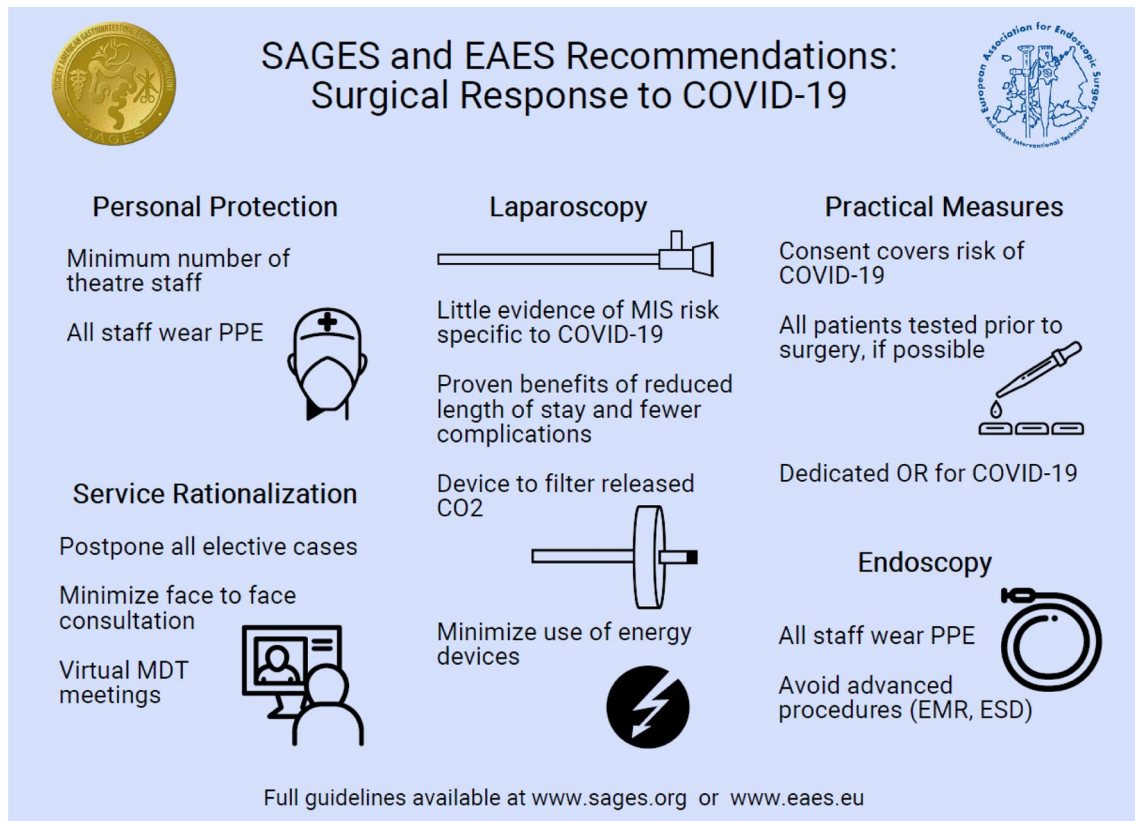


Fig. 1 Infographic illustration of SAGES/EAES recommendations for COVID-19 and surgery

- It is strongly recommended, however, that consideration be given to the possibility of viral contamination to staff during open, laparoscopic, or robotic surgery and that protective measures are strictly employed for OR staff safety and to maintain a functioning workforce.
- Although previous research has shown that laparoscopy can lead to aerosolization of blood borne viruses, [1–3] there is no evidence to indicate that this effect is seen with COVID-19, nor that it would be isolated to MIS procedures. Nevertheless, erring on the side of safety would warrant treating the coronavirus as exhibiting similar aerosolization properties. For MIS procedures, use of devices to filter released CO₂ for aerosolized particles should be strongly considered.
- Proven benefits of MIS of reduced length of stay and complications [4–7] should be strongly considered in these patients, in addition to the potential for ultrafiltration of the majority of aerosolized particles. Filtration of aerosolized particles may be more difficult during open surgery [8, 9].
- There may also be enhanced risk of viral exposure to proceduralists/endoscopists from endoscopy and airway procedures. When these procedures are necessary, strict use of PPE should be considered for the whole team, fol-

lowing Centers for Disease Control (CDC, <https://www.cdc.gov>) or WHO (<https://www.who.int>) guidelines for droplet or airborne precautions. The PPE should include, at a minimum, N95 masks and face shields [10, 11].

Practical measures for surgery

- Consent discussion with patients must cover the risk of COVID-19 exposure and the potential consequences.
- If readily available and practical, surgical patients should be tested pre-operatively for COVID-19 and delay of surgery or additional protective measures enacted as appropriate for COVID-positive patients.
- If needed and possible, intubation and extubation should take place within a negative pressure room (<https://www.asahq.org/in-the-spotlight/coronavirus-covid-19-information>, <https://icmanaesthescovid-19.org>; [12, 13]).
- Operating rooms for presumed, suspected, or confirmed COVID-19-positive patients should be appropriately filtered and ventilated and, if possible, should be different than rooms used for other emergent surgical patients.
- Only those considered essential staff should be participating in the surgical case and unless there is an emer-

- gency, there should be minimal exchange of room staff [14].
6. All members of the OR staff should use PPE as recommended by national or international organizations, including the WHO or CDC. These recommendations may be modified by local hospital policy, as necessary. Appropriate gowns and face shields should be utilized. These measures should be used in all surgical procedures during the pandemic regardless of known or suspected COVID status. Placement and removal of PPE in should be done according to CDC guidelines (link to CDC <https://www.cdc.gov> [15])
 7. Electrosurgery units should be set to the lowest possible settings for the desired effect. Use of monopolar electrosurgery, ultrasonic dissectors, and advanced bipolar devices should be minimized, as these can lead to particle aerosolization [16–22], and if available, monopolar diathermy pencils with attached smoke evacuators should be used.
 8. Surgical equipment used during procedures with COVID-19-positive or person under investigation (PUI)/suspected COVID patients should be cleaned separately from other surgical equipment.
3. Since the virus has been found in multiple cells in the gastrointestinal tract and all fluids including saliva, enteric contents, stool, and blood, surgical energy should be minimized [29, 30].
 4. Endoscopic procedures that require additional insufflation of CO₂ or room air by additional sources should be avoided if possible until we have better knowledge about the aerosolization properties of the virus. This would include many of the endoscopic mucosal resection (EMR) and endoluminal procedures.
 5. Removal of caps on endoscopes could release fluid and/or air and should be avoided.
 6. Endoscopic equipment used during procedures with COVID-19-positive or PUI patients should be cleaned separately from other endoscopic equipment.

Practical measures for laparoscopy

1. Incisions for ports should be as small as possible to allow for the passage of ports but not allow for leakage around ports.
2. CO₂ insufflation pressure should be kept to a minimum and an ultrafiltration (smoke evacuation system or filtration) should be used, if available.
3. At the end of surgery or before converting to open surgery or removal of trocars, the pneumoperitoneum should be carefully released [23] and should be safely evacuated via a filtration system in case of aerosol formed during the operation [9, 24, 25].

Practical measures for endoscopy

1. The ability to control aerosolized virus during endoscopic procedures is lacking, so all members in the endoscopy suite or operating room should wear appropriate PPE, including gowns and face shields. Placement and removal of PPE should be done according to CDC guidelines [15, 26, 27].
2. Since patients can present with gastrointestinal manifestations of COVID-19, all emergent endoscopic procedures performed in the current environment should be considered as high risk [10, 26–28].

Conclusions

The surgical management of patients with suspected or known or COVID-19 requires specific considerations for theater staff and patient safety. Although specific evidence to COVID-19 and the risk for aerosol transmission during laparoscopy is lacking, every effort must be made to minimize this potential risk during surgery to protect staff and maintain a functioning workforce that can continue to care for our patients.

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Compliance with ethical standards

Disclosures Nader Francis, Jonathan Dort, Eugene Cho, Liane Feldman, Deborah Keller, Rob Lim, Dean Mikami, Edward Phillips, Konstantinos Spaniolas, Shawn Tsuda, Kevin Wasco, Tan Arulampalam, Markar Sheraz, Salvador Morales, Andrea Pietrabissa, Horacio Asbun, and Aurora Pryor have no conflicts of interest or financial ties to disclose.

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