



Practical Implications of Novel Coronavirus COVID-19 on Hospital Operations, Board Certification, and Medical Education in Surgery in the USA

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Introduction

Novel coronavirus disease, COVID-19, caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), was first detected in Wuhan, China. It is highly virulent, having spread to Iran, Europe, and eventually North America, causing an unprecedented global crisis. Hospitals have filled rapidly with patients with COVID-19 requiring treatment, thereby imposing a strain on healthcare staffing needs and the supply of personal protective equipment (PPE). The strain on resources has forced hospitals to implement unprecedented changes, such as cancellation of elective operations and non-essential clinic visits. Surgical training has also been significantly impacted by these changes in healthcare, and surgery residents have been deployed to other services and units to provide much needed care. In addition to changes to daily life,

such as social distancing, surgeons and surgical trainees have been forced to evaluate many elements of their clinical practice and surgical training, respectively.

To help address current issues faced by surgeons today, the Society for Surgery of the Alimentary Tract (SSAT) hosted a global webinar on April 1, 2020, just as the COVID-19 pandemic was escalating in the USA. After introductory remarks by webinar director Maria Altieri MD, Chair of the SSAT Resident & Fellow Education Committee Motaz Qadan, MD, PhD, and SSAT President Mark Callery, MD, thought leaders in Medicine and Surgery provided much needed clarity, reassurance, and guidance, as well as updates and possible solutions. These points of view are shared below and are available through the SSAT Resident's Corner at <https://ssat.com/residents/webinars.cgi>.

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Scientific Elements of the COVID-19 Pathogen and Associated Illness (Ross McKinney, Jr., MD)

The primary mode of spread of COVID-19 is through droplets that typically travel 3 to 5 ft from the infected person. Other modes of spread for viruses include aerosols, membrane-to-membrane, fecal-oral, and fomite spread; the relative role of each of those modes as related to COVID-19 is still being determined. SARS-CoV-2 viral aerosols generated using a nebulizer have been found to be viable for up to 3 h. On surfaces, the virus is viable for 4 h on copper, 24 h on cardboard, and 72 h on stainless steel and plastic.¹ Clinically, upon contracting COVID-19, it takes on average 3 days before a polymerase chain reaction (PCR) test is able to detect the virus, at which point an infected person is contagious. The average time is 5 days of infection before an individual begins

to become mildly symptomatic, although it can be as long as 14 days. The symptoms include fevers in 83–98% of patients, cough in 46–82% of patients, and myalgias in 11–44% of patients.² Of all patients in “mild” symptom phase, up to 20% will progress to requiring hospitalization at an average of 8–9 days after symptom onset. Of hospitalized patients, 20–30% will eventually develop acute respiratory distress syndrome (ARDS) requiring mechanical ventilation and further intensive care unit support. Approximately 1–8% of patients eventually succumb to their disease, primarily from oxygen deprivation or cardiomyopathy, approximately 3 weeks following infection (Fig. 1).

Presently, there is no vaccine for coronavirus. The fastest route to develop a vaccine will probably be through the use of virus-derived DNA. However, the need to demonstrate the safety and production of antibodies, its clinical efficacy, and manufacturing and distribution means that it will be another 18 months at least prior to realistically have vaccination available population-wide. There is no current or prior experience with COVID-19, but if it behaves like the previously known coronavirus strains that cause common cold symptoms, there may be an abatement in disease prevalence during spring and summer seasons.³ As such, a second peak in the fall, as was previously observed with Spanish influenza, is possible. After the current pandemic, it is still unknown if COVID-19 will become endemic (persist at a lower level), will become a seasonal virus (likely spreading between hemispheres), or will be controlled and eliminated by medicines and/or a vaccine.

Challenges in Healthcare (Cornelia L. Griggs, MD)

The biggest challenges faced in this pandemic can be broadly categorized as operational, technological, and knowledge-

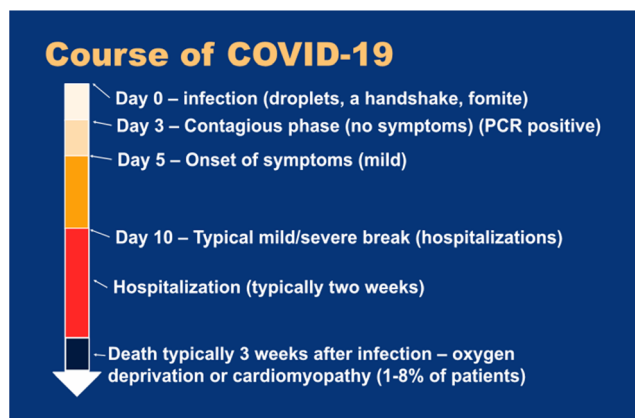


Fig. 1 Clinical trajectory of patients with coronavirus disease 2019

based. One of the most visible equipment shortages seen throughout this pandemic is the shortage of PPE (surgical and N95 masks and protective gowns), in addition to shortages in medications (sedatives and paralytics) and equipment (ventilators, dialysis machines, and hospital beds). An operational challenge is the variation in degree of shortages by region and present inability to pair supply with demand. This challenge subsequently led to a strain on healthcare personnel, who are now being redeployed to new specialties and departments beyond their expertise for critical shortage cover, all while battling anxiety from poorly defined exposure to patients with COVID-19 and subsequent transmission to themselves and their families and friends.

This pandemic has also posed a technological challenge to practitioners, who have been forced to rapidly transition to telemedicine for many elements of clinical care. During this pandemic, practitioners and non-practitioners alike have been pushed to be innovative. Anesthesiologists are utilizing intubation “boxes” to minimize aerosolization, companies are using 3-dimensional (3D) machines to print N95 masks, and Departments of Surgery across the nation are restructuring teams and distributing skills to facilitate care such as establishing a “Surgical Workforce Access Team”. Such teams are capable of providing access and hemodynamic line support in emergency rooms and intensive care units to free up necessary personnel who are better suited to triaging more patients in those units.

Finally, the pandemic that has arisen from this novel and unique pathogen represents a knowledge challenge that has never been faced before, including whether COVID-19 transmission occurs solely through droplets or is an airborne disease. Intubated patients with the disease have also posed challenges to critical care paradigms. Institutional protocols continue to rapidly evolve based on new data that continue to be published. In turn, the scientific community has been pushed to navigate the peer review system to publish desperately needed studies, data, and early experiences expeditiously, all while maintaining scientific rigor traditionally associated with the US healthcare system.

Operational Logistics in the Management of Surgical Patients (Paresh C. Shah, MD)

Among the operational issues associated with spread of COVID-19 is baseline infection status of surgical patients with COVID-19 and associated repercussions. While undetectable in blood and urine, viral particles can be detected in sputum, upper airway tracts, and feces for at least 14 days after onset of symptoms. Surgeons have to constantly balance patient needs against contagion risk from aerosol-generating procedures such as endoscopy, bronchoscopy, tracheostomy, bowel resection, and lung resections, among others. This

balance may be accentuated with laparoscopic surgery if additional measures that prevent further aerosolization of viral particles are not taken. The concern originally stems from historic data with hepatitis where active virus could be detected in smoke plumes from electrocautery within evacuated carbon dioxide.^{4, 5} While surgeons should take every precaution to minimize any potential risk of transmission to themselves or staff, it is important to recognize that there is no COVID-19-specific data that aerosolized virus in cauterized plumes or laparoscopic gases is present let alone viable or transmissible. Among best practices for laparoscopy that should be implemented in COVID-19 unknown patients include:

- (1) Low pressure pneumoperitoneum—use the minimum pressure that allows safe conduct of the operation, 10–12 mm/Hg is usually sufficient
- (2) Sealing all trocar/port valves except those used for insufflation and smoke evacuation.
- (3) Use of an active smoke evacuation system with in line or receptacle filter.
- (4) Evacuating carbon dioxide pneumoperitoneum through a 0.1- μ m filtered filter prior to trocar removal/specimen extraction.

Although not formally established in national guidelines, it is the policy of several institutions that all operating room staff should use N95 masks and face shields for any endoscopic procedures or operations involving the airway, respiratory tract, and gastrointestinal tract in COVID-19-unknown patients for all laparoscopic and open operations. For patients with an established diagnosis of COVID-19 infection, intubation of the patient should occur in a negative pressure room with N95 masks; after intubation, the surgical staff should likely use N95 masks to perform even low risk, non-aerosolizing surgery.

While these recommendations help attenuate the risk of COVID-19 transmission for staff and patients, the best service surgeons can provide is to keep patients out of the hospital whenever possible. If patients require hospitalization, time in the hospital should be minimized. In keeping with recommendations provided by the American College of Surgeons (ACS), a decision has been made at many institutions to postpone elective operations. The primary drivers for this policy include a need to manage PPE supply, but most importantly, to manage staff and resource supply. There is also some preliminary evidence from experience in other countries that active COVID-19 infection may be associated with increased risk of postoperative complications. In order to account for urgent, emergent, and even cancer and transplant operations, a definition of “elective” that has been proposed includes any operation that can be deferred for up to 3 months without compromising outcomes – although definitions have varied

considerably.⁶ Additional guidelines have been provided on a national level by numerous societies to better aid surgeons in triaging operations in months to come.^{6–9}

Pre-operative testing will become critical as the virus reaches community prevalence (as it has in many areas in the USA). RT-PCR testing within 24 h of surgery is being utilized by some centers. As serology assays become available, it is likely that they will become part of routine pre-op assessment for all patients to assess both active infection and acquired immunity.

The Impact of COVID-19 on the American Board of Surgery (Jo Buyske, MD)

The mission of the American Board of Surgery (ABS) includes an overarching objective of protecting the public and enhancing the profession. We do this through tools of oversight of resident training and supervision, administration of specialty examinations, and initial confirmation and maintenance of certification. The ABS role in the coming months is to minimize concerns trainees have about examinations and certification processes, so trainees can appropriately focus on resource-stricken patient-care and self-care throughout the pandemic. To that effect, the ABS has cancelled certifying examinations scheduled for April and May 2020. Tentatively, these examinations will be rescheduled to the fall. Alternative examination formats, including virtual platforms, are currently being explored. While the ABS has closed their physical office to comply with a statewide order from Pennsylvania officials, all ABS staff are currently working from home to support diplomates and trainees in their normal capacity.

In order to support surgical trainees, the ABS has established that for chief residents completing training in 2020, non-voluntary offsite time that is used for clinical or educational purposes can be included as clinical time. Additionally, the ABS will accept 44 weeks of clinical time (including the non-voluntary time) for the 2019–2020 academic year, without the need for pre-approval, permission, or justification. The ABS will accept a similar 10% decrease in total operative case numbers without the need for further documentation (765 total cases). However, the ABS has expressed that residents should assess their own progress towards the standard requirements and should make a remediation proposal for gaps that should be addressed with their program directors.

With respect to documentation related to the certification process, the ABS has changed processes such that all signatures and other qualifying examination-related application approvals required from program directors can now be able to be completed online. Program directors are also entrusted, as they always have been, to make a decision about the readiness

of residents for independent practice. Should any resident fall below the 90% mark for cases or the 44-week mark for time in training, program directors can petition the ABS using information gathered from the Clinical Competency Committee, other evaluations, entrustable professional activities, or other supporting comments. To support diplomates, the ABS has extended reporting deadlines for maintenance of certification and continuous certification, with a preexisting grace year at diplomates' disposal. As the pandemic evolves over the next few months, the ABS will be ready to deploy alternative assessment methods such as virtual oral examinations and approaches such as competency-based training as necessary.

Challenges, Opportunities, and Innovations in Surgical Education Resulting from the COVID-19 Pandemic (Ajit K. Sachdeva, MD)

The COVID-19 pandemic and its impact on surgical care and on healthcare in general have significantly affected the training and well-being of surgery residents. Given the cancellations of elective surgery cases, the operative experiences of residents have declined considerably. Also, surgery residents have been deployed routinely to various other units of healthcare facilities to provide much needed care to COVID-19 patients. In addition, new models for delivery of surgical care have resulted in residents assuming new roles within surgical settings. Traditional in-person conferences have been conducted remotely through the use of new electronic platforms and systems. Reassimilation of surgery residents into training programs and the possible negative impact on the surgical skills of residents who have been out of surgical settings for a period of time remain a challenge. The new responsibilities and concerns of surgery residents in the rapidly changing environment of healthcare have created additional stress among residents.

The American College of Surgeons (ACS) Division of Education has taken several steps to address these challenges, provide guidance to surgical educators and surgical trainees, make available online surgical education programs, identify new opportunities and creative solutions, and pursue innovations that would not only address surgical training in the current environment but also transform surgical training for the future.

A major effort of the ACS Division of Education has been to focus on three linked but separate areas in surgical training through the ACS Academy of Master Surgeon Educators. The goal is to define challenges and opportunities and foster innovation in surgical training across all surgical specialties. The first area of focus is to collect, share, and document experiences from institutions in the midst of the COVID-19 surge. Institutions based on the East and West Coasts are

experiencing the highest number of cases, and lessons learned from their experiences will be invaluable for other institutions preparing for a surge. The Academy will be evaluating and posting helpful materials and documents on the Academy's website in the coming weeks and disseminating these resources through regular communications. The second area of focus is the spectrum of novel teaching and assessment methods and innovative educational approaches that are being used successfully across various institutions. Review of these resources should help foster even greater innovation in surgical training. Use of new technologies has permitted institutions to conduct major teaching conferences virtually. The early successes with these virtual methods may result in the adoption of such methods in the long term, even after the COVID-19 pandemic comes under control. The ACS Division of Education is also pursuing new and innovative simulation-based training methods to support the efforts of surgical educators and surgical trainees. Dialogue is underway with simulation and technology companies to share emerging training needs so that these companies may help in addressing these needs through development of new tools. The Academy will continue to collect vital resources and share them with the larger surgical community and will support the development and implementation of new training methods. The third area of focus is to administer scientifically validated surveys to various institutions, surgery departments, surgical trainees, and constituent groups involved with surgery residency training to collect, analyze, and disseminate information on the impact of the COVID-19 pandemic, both in the short and the longer term. All three areas of focus will address residents' well-being and propose strategies to support surgery residents during this difficult period. The Academy will also focus on the phase beyond the current pandemic to harness opportunities involved with the reassimilation of residents into the surgical environments. The experiences with surgery residency training during the COVID-19 pandemic should help in preparing surgery departments and institutions for future crises and emergencies and chart a new course for surgery residency training.

There is a real need for the surgical profession to address the immediate challenges and concerns and at the same time maintain a positive, long-term outlook in regard to surgical training of the future. National organizations and various constituent groups must work together and coordinate efforts to yield optimal outcomes. The ACS Division of Education remains committed to this cause and looks forward to such collaboration and coordination.

Conclusion

The SSAT hopes that this diverse group of topics has provided clarification, reassurance, guidelines, and answers based on

the distinguished authors' experiences in their current environments, areas of expertise, and institutions. To view the full webinar, please visit the SSAT Resident and Fellow Corner's Webinar series at <https://ssat.com/residents/webinars.cgi>.

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