




Recommendations for Surgery During the Novel Coronavirus (COVID-19) Epidemic

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Abstract

The whole world is going through an unprecedented period during the pandemic of COVID-19. This pandemic has affected all aspects of daily life with far-reaching implications, especially in most aspects of healthcare. Practice of surgery across the globe is in a standstill as of now. When we restart surgical practices across world, we have to bring new protocols and practices in place to combat the transmission. This article discusses the major changes in surgical practice, which need to be brought in. This article is based on scientific information about transmission of virus and experiences of some of the authors from China, a country which successfully dealt with and contained the virus outbreak.

Keywords COVID 19 · Coronavirus · Practice of surgery

Background

In December 2019, a series of patients with pneumonia caused by the novel coronavirus (COVID-19) emerged in Wuhan, Hubei, China [1]. The COVID-19 epidemic has spread very quickly. Even as we write this manuscript,

nearly 500,000 confirmed cases have been identified worldwide, and nearly 25,000 people have died [2]. Experience from China demonstrates that with highly effective contact tracing and case isolation, outbreaks of COVID-19 can be brought under control within 3 months [3]. Healthcare workers are on the front lines of caring for patients with COVID-19 and have very high risk of exposure to the virus. Shortages of protective equipment and knowledge regarding COVID-19 are causing infections in healthcare workers [4]. As of February 11, 2020, more than 1700 healthcare workers have been infected in China [5]. In Italy, 2026 (9%) of the COVID-19 cases (as of March 15) occurred in healthcare workers [6]. However, there was no documented infection in 31 medical teams comprised of more than 42,000 doctors and nurses sent from other provinces to Hubei [7]. This strongly suggests that adequate knowledge about disease transmission and use of protective gear and infection control protocols are essential to prevent spread of infection among healthcare workers.

Although surgeons are not frontline health workers, several series of infections emerged from operating theaters in China [5]. The purpose of this article is to provide recommendations to surgeons and other healthcare workers involved in perioperative care to improve staff and patient safety during this pandemic. These recommendations are derived from some of the authors' practices

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and various national guidelines for health professionals. At this stage, one of the immediate priorities for countries, where community spread is a serious threat, is to prevent its spread from patient to patient and to healthcare workers.

Outpatient Management

Most hospitals have to cancel or reduce nonurgent outpatient visits as part of their COVID-19 containment strategy. Surgeons should prioritize urgent or emergency visits and procedures. Elective and nonurgent admissions should be rescheduled [8]. Patients who will face life-threatening consequences if treatment is delayed should be prioritized for outpatient visit, phone call, or virtual consultation by a member of the surgical team [9]. From China's experience, it is advisable to set up a separate triage area or fever clinic to screen for respiratory symptoms in any surgical patient. Patients with respiratory symptoms should call before they leave home, so staff can be prepared to care for them when they arrive [10]. Any patient with respiratory symptoms and flu-like symptoms should visit the fever clinic in advance. Patients with suspected or confirmed COVID-19 should be assigned private rooms with door closed [11] and should be provided surgical face masks or face masks without exhalation valve. Social distancing is essential within clinics and hospitals. Doctors and patients should stay 6 ft apart except during examinations; it may be necessary to forego all but the most essential elements of the physical exam to minimize risk of transmission.

In addition to collecting routine disease-related information, staff should take a detailed epidemiologic history. Relevant questions include recent travel history (of patient and family) and contact history with people from endemic regions. The staff should also screen for common symptoms of COVID-19 such as fever, dry cough, and dyspnea. According to the Chinese national guidelines, it is recommended that blood test for COVID-19 and chest CT scan should be used as routine examinations for patients requiring admission. Even in other countries, it is desirable to test for COVID-19 among all patients being admitted to hospital for surgery.

If there is a history of suspicious symptoms or contact, the patient should be assessed in a designated COVID-19 clinic in accordance with strict infection control principles. It is critical to bear in mind that some patients can be highly contagious even when they have mild or no symptoms [12, 13]. After a highly suspected or confirmed case is identified, the patient should be isolated and reported to the infection control department immediately.

Hierarchical Prevention and Control of Inpatients

Surgical patients may be classified into three risk categories for COVID-19: confirmed and suspected patients, high-risk patients, and low-risk patients. They are defined as follows:

- (1) Confirmed and suspected patients: COVID-19 was confirmed when real-time reverse transcriptase (RT)-PCR diagnostic panels or serological (IgM and IgG) test results was positive. The definition of suspected cases falls into two categories. The first category will have contact history and meet any two of the clinical manifestations (fever and respiratory symptoms) with the typical findings of COVID-19 in the chest CT scan. The total number of white blood cells in the early stage of the disease is normal or decreased, and the lymphocyte count is reduced. The second category is without a clear epidemiological history and shows three of the clinical manifestations (fever and/or respiratory symptoms, with the typical findings in the chest CT. The blood count will be as described above [14].
- (2) High-risk patients: Patients who had traveled to high-risk areas or contacted patients with confirmed or suspected COVID-19 (who have developed fever and/or symptoms of acute respiratory illness within 14 days).
- (3) Low-risk patients: Patients with no history of close contact with confirmed and suspected COVID-19 patients and with no fever or respiratory symptoms and without CT manifestations of COVID-19 within 14 days.

Confirmed and suspected patients have a higher risk of severe events that may require admission to the intensive care unit, ventilation support, and death [15]. Elective surgeries for these patients should be rescheduled, and they should be assessed daily. For high-risk patients, surgeons should consider both medical and logistical needs. For low-risk patients, elective surgeries should not be abandoned unless there are constrained health resources. For cancer patients who have to delay surgery, alternative treatment approaches to delay surgery can be considered, such as neoadjuvant chemotherapy or additional chemotherapy [16].

The risk level of all surgical patients should be evaluated before, or immediately after, admission to hospital. The treating team should evaluate the patient's risk level daily. High-risk, confirmed, and suspected patients must be kept in a single room, and all the necessary disinfection and isolation measures should be implemented. Emergency isolation wards need to be set up in all hospitals to treat newly admitted high-risk, confirmed, and suspected patients.

Prevention Measures for Healthcare Workers

Given the limited supply of personal protective equipment (PPE) in many centers, their use by healthcare workers should be determined by the risk level of each patient [17]. Healthcare workers must take prevention measures in strict accordance with the epidemic assessment level [18]. From the experiences of some hospitals in Wuhan, surgeons are at high risk of infection. In times of extreme shortages, alternatives to PPEs may need to be considered.

- (1) When entering the ward of low-risk or high-risk patients for daily activities and rounds, primary protection (disposable surgical cap, surgical mask, work uniform and disposable latex gloves or/and disposable isolation clothing if necessary) is needed.
- (2) When carrying out routine activities and rounds with confirmed and suspected patient wards, secondary protection (disposable surgical cap, N95 mask, work uniform, disposable medical protective uniform, disposable latex gloves and goggles) should be used.
- (3) For special procedures such as collecting airway samples, tracheal intubation, airway care, and sputum suction, tertiary protection measures (disposable surgical cap, N95 mask, work uniform, disposable medical protective uniform, disposable latex gloves, full-face respiratory protective devices or powered air-purifying respirator) should be implemented as aerosol or spray may occur in airborne infection isolation rooms.

Healthcare workers shall strictly follow the procedures for putting on and taking off personal protective gear, and it is forbidden to wear PPEs when one leaves the contaminated area. Sanitation and disinfection need to be implemented according to the regionalized zoning management system and patient epidemic classification, and different PPE should be worn according to the working area.

Protocols for Emergency Surgery

Surgeons, anesthesiologists, and nurses need to be trained in the use of PPE. Surgeons should schedule surgery based on the severity of threat to the patient's life and health. During the epidemic, need for emergency surgery should be considered as a priority for admission.

All suspected patients who need emergency surgery need to complete COVID-19 blood test and chest CT scan before admission; pharyngeal swab sampling should be completed before surgery. Patients should be placed in the transitional area while waiting for results. All surgery should be performed in a quick and efficient manner [19]. After admission, different protocols will be applied based on the COVID-19 risk level of patients.

- (1) For confirmed and suspected patients, surgeons need to report to the hospital's epidemic management department (if any), infection control department, and operating theater before surgery and then transfer to a negative pressure operating theater via a path. Tertiary protection measures are needed for anesthesia and surgical procedures. After the operation, patients are transferred to the isolation area.
- (2) For high-risk patients, after the preoperative preparation is completed, the anesthesiologist, nurse, and surgeon should follow tertiary protection measures for anesthesia and surgical procedures. After the operation, the patients are returned to the original isolation ward according to the original transfer route.
- (3) For low-risk patients, the general protection measures are needed for anesthesia and surgical procedures. After the operation, patients are transferred to the original ward according to the original transfer route.

Protocols for Elective Surgery

The logistics of triage for cancer surgery is challenging. From the recommendations of the Society of Surgical Oncology, decisions must be made on an individual case basis considering the biology of each cancer, alternative treatment options, and waiting time for rescheduled surgery. The American College of Surgeons (ACS) advises to postpone nonurgent surgeries during the beginning of the pandemic of COVID-19. They have classified surgeries into various tiers according to the urgency of surgery. Up to Tier 2b (most elective surgeries like hernia), they are advising postponing of surgery. For Tier 3a and 3b, where most cancer surgeries will fall, ACS is not advising postponement at the moment though it may change [16].

Patients undergoing elective surgery should be given reasonable recommendations regarding follow-up, and patient should be shifted to high care facility if COVID-19 is suspected, and test should be ordered. According to guidelines from the Indian Council of Medical Research, all high-risk patients undergoing elective surgery (All symptomatic contacts of laboratory-confirmed cases and asymptomatic direct and high-risk contacts of a confirmed case should be tested once between day 5 and day 14 of coming in his/her contact) should undergo PCR test for COVID-19 before surgery [20].

- (1) If the patient's RT PCR test is twice negative, according to the patient's current epidemic level, surgeons can proceed with surgical protocols.
- (2) If the patient's RT PCR test is positive, then the patient needs to be transferred to the isolation ward to complete the preoperative preparation. Elective surgery should be deferred until the patient recovers. If we have to operate

emergently on such patients for any reasons, all the precautions mentioned earlier for operating COVID-19-positive cases as emergency should be strictly followed. The tertiary protection measures should be taken during the anesthesia and operation. After the operation, patients are returned to the isolation area.

Management During Surgery (Suspected Emergency and Test Positive Elective Cases)

During the operation, all objects that come in contact with patients including blood, secretions, and excreta should be considered as potentially contaminated. In particular, medical staff in operating theater should avoid exposure to aerosols generated while using electrosurgical equipment. There are many examples that viruses do survive in surgical smoke created by electrosurgical instruments [21, 22]. Though it is not proven that coronavirus can be transmitted via surgical smoke, it may be worthwhile to take precaution until we have evidence it does not. To reduce the hazards, surgical smoke should be minimized by suction device, and electrosurgical equipment should be used at the lowest effective power. In suspected cases, laparoscopy should be avoided as pneumoperitoneum high-pressure trocar leaks enhance the risk of exposure to aerosol to operating theater staff. Surgeons and nurses should avoid injuries such as stab wounds and needle stick injuries. All PPE is only used in the isolated area, and it is forbidden to leave the isolated area while wearing PPE.

Some airborne transmission happened in Wuhan because healthcare workers initially had little knowledge of the virus. After using the strict management measures for operating theater, airborne transmission ceased.

Postoperative Management

In the operating theater, laminar air flow is used, and air supply should be closed after operation. Peroxyacetic acid air is used for fumigation. The operating theater should be cleaned and disinfected and high-efficiency filter changed. Cleansing should be done using detergent and water followed by use of with 1000 ppm bleach solution for all hard surfaces in the operating theater. The disinfection time should be longer than 30 min. The operating theater should be closed for at least 2 h, and the next operation should be performed after laminar flow and ventilation being turned on [23].

For high-risk patients who develop cough with fever after surgery, a chest CT scan and RT PCR test should be performed. For suspected or confirmed patients, adequate oxygen therapy and nebulization should be given after surgery. Surgeons should pay attention to nutritional treatment and organ support treatment for postoperative patients. In patients

with suspected or confirmed COVID-19, there is a greater risk of complications such as deep vein thrombosis (DVT) and secondary pulmonary infections.

For confirmed COVID-19 patients, once the temperature returns to normal for more than 3 days, the respiratory symptoms are significantly relieved, and the inflammation is clearly absorbed, the isolation can be released when the RT PCR and antibody test is negative on two consecutive occasions (sampling interval ≥ 24 h). Doctors then can transfer them to the general ward for treatment or discharge.

Conclusion

With the increasing number of COVID-19 cases worldwide, there is an ongoing need for infection prevention and control. These principles are essential for both patient care and staff safety. In this paper, we outline an approach for the management of surgical patients in the context of the COVID-19 pandemic. There is an urgent need for additional data to further identify risk factors for transmission during, before, and after surgery as well as to determine the optimal timing of surgery in these patients. The general principles outlined in this report will need to be considered in light of the local context, available resources, and the current activity of COVID-19.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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