



Review

Covid-19 and surgery: Challenging issues in the face of new normal – A narrative review



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ABSTRACT

This review aims to outline the current perspectives of surgery in the COVID 19 pandemic associated with the pitfalls in implementing the emerging guidelines to continue patient care without compromising safety, both from the surgeons' and the patients' points of view. The fight between the surgeon and the pandemic will be a dragging one since the post-pandemic influx of surgical patients coupled with the 'new normal' practices to prevent COVID 19 spread requires pertinent resources, well-trained personnel, and co-operation among different departments. Emergency surgeries and cancer care have continued all this while, undoubtedly, with unwanted delays and distress. While we continue to prepare ourselves and work in a whole new environment, surgeons are facing the increased chances of litigations and compromised safety. We review what we have come to understand about safe surgical practices during and after the pandemic and the unanswered questions.

1. Introduction

The global impact of the COVID 19 pandemic has challenged the healthcare system worldwide to provide quality care while restricting transmission to non-COVID 19 patients and health care workers (HCW). Since surgery exposes the healthcare team to blood and body fluids of infected patients, surgical specialties have been struggling all this while trying to strike a balance between the evolving guidelines of sick patient management who need surgical care and protecting themselves and their HCW from undue exposure. The path to this struggle has not always been easy. It has opened up newer hospital management paradigms, surgical care, and postoperative management, including intensive care. It has also made us bend ways to develop newer guidelines without evidence or minimal or insignificant evidence. In learning newer ways of adjusting to the situation, surgeons have come across pitfalls in areas that were not expected or planned but have only made us wiser and sometimes at the cost of exposing the HCW to infection transmission threat. This narrative review aims to highlight important areas of surgical practice that are witnessing unprecedented change and, at the same time, how pitfalls can silently creep up in these altered practices.

2. Perspectives

2.1. Outpatient clinics

Since the beginning, the foremost strategy has been to limit direct and close physical interaction between people, including doctors and patients. It has been suggested that the virus spreads mainly via microdroplets (as small as 10 microns), which are generated during a speech while fomite is another route of transmission, although not as significant as aerosols [1]. Non-urgent visits to the hospital have been encouraged to the extent that the option of visitors waiting in their cars in centers where there is not enough space for social distancing has been suggested [2]. Tele-consultation is an effective strategy for optimizing the use of resources and decreasing contagion [3]. Hollander et al. [4] have termed it an excellent instrument for "forward triage", which, in essence, is sorting patients before they reach a hospital. Fever clinics are also aimed at segregating patients who attend hospitals. The objective of all such practice is to decrease admission for non-urgent cases. Although the sole responsibility of segregating patients into essential and non-essential surgical services lies with the surgeon, it may be challenging to make. On the one hand, it can reduce the influx of patients and their attendants in the hospital, but on the other hand, there is data to suggest that this has led to patients presenting in more advanced conditions, which

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directly has multiplied morbidity [5].

2.2. Elective surgery

Essential surgical services have been defined as those that cannot reasonably be delayed for more than eight weeks without causing significant harm to the patient or progression of disease/disability [4]. As easy as it seems, this judgment is difficult even in simple conditions such as cholecystectomy for calculus cholecystitis. The patient may get acute attacks of cholecystitis, obstructive jaundice, cholangitis, or even worse, pancreatitis during the extended waiting period, which can significantly increase morbidity, hospitalization and complicate the decision to operate and subsequent postoperative outcome. Hence, a clear demarcation of essential, semi-essential, and non-essential surgeries is not always possible. Each case needs to be judged based on the guidelines, patient's condition, local resources, and turnaround time, and surgeries should be done in full compliance with the available recommendations. The 75th percentile of the incubation period before developing symptoms of COVID-19 is seven days, and the maximum estimated incubation period is approximately 14 days. Thus it is recommended that measures to decrease COVID-19 incidence should be taken for at least 14 days before planning for surgery unless in life or limb-threatening conditions.

2.3. Cancer surgery

The implied time constraint in cancer management, one of the biggest killers, made it undeniable for treatment during the pandemic. Most guidelines recommend that, if possible, these patients should be offered alternate therapy, such as neoadjuvant chemotherapy [6]. However, the multimodality treatment of cancer needs multiple visits, follow up visits, and hence enhanced exposure and increased chances of contracting the viral infection, both by the HCW and the vulnerable, immunosuppressed cancer patients. As the patients may harbour asymptomatic infection, testing them at every visit will burden the already overwhelmed resources especially in resource-poor settings, and cause intense mental agony to the already suffering patient. However, unfortunately, there are no set standards to accurately weigh the benefits of this practice against its hazards as of today. The main determinants of decision making for cancer treatment included patient- and tumor-related factors, the current status of COVID pandemic in that region, and availability of resources. Virtual tumour board should be arranged for shared decision making, including all the stakeholders, such as the patient, family members of the patient, surgical oncologist, medical oncologist, and radiation oncologist for shared decision making. The final decision should be documented clearly in the case file. Teleconsultation should be used for those who have completed treatment or those who are disease-free. Patients who present with onco-surgical emergencies should be operated with all precautions and recommendations laid for any surgical emergency. Decisions regarding elective surgeries for cancer should be made depending upon type, stage, biology, availability of non-surgical treatment options, and resources available in the treating center [7]. Non-surgical treatment should be considered whenever possible in consultation with medical and radiation oncology; however, surgery should be offered to those patients where non-surgical options are not available or delay in surgery will threaten the patient's life [7]. Elective surgery should be postponed in patients with less aggressive and slowly growing cancers [7]. It applies to all common cancers as each cancer treatment remains a challenge.

2.4. Emergency surgery

Indications of emergency surgery remain the same during this pandemic as before, but a balance between timely treatment and protection of HCW from the virus is essential [8]. A narrow surgical time window may not give us the benefit of having a reverse transcriptase-polymerase chain reaction (RT-PCR) test report before

surgery, and these patients should be treated as potentially infected. CECT chest can help these patients due to urgent surgical intervention without the RT-PCR report [9]. Full compliance with tertiary protection regulations and other precautions mentioned should be complied with [10]. Mention may be made here that despite full precautions, all operating room (OR) staff, anesthetists, and the surgeons have been infected from patients who later turned out to be positive on testing [11]. It should make us rethink whether we are truly aware of all possible viral transmission modes and are implementing adequate strategies to combat this difficult situation.

Moreover, what it does tell us is that since surgical care involves a team approach, all members such as doctors, nurses, technicians, attendants, physician assistants, as well as janitors and housekeeping staff should be trained to prevent the spread of the virus from OR and post-operative rooms. It is for the team's safety and the hospital services at large that such understanding is significant. It includes, in addition to the proper way of donning and doffing personal protective equipment (PPE), the correct way of disposal of the used items, sterilization of the surgical equipment, and cleaning of the theatre after every case, which needs to be grounded in the daily practice of OR staff. All necessary equipment should be made available before the start, and minimum personnel should be present inside the OR [12,13]. The surgeon should enter the OR 15 minutes after intubation, duration of the surgery should be kept minimum, and lengthy and complex procedures should be avoided [12]. Minimum gap of 1 hour should be there between two cases. After completion of the surgery, HCWs should follow a well-planned exit sequence from the OR. The surgical team should leave first, followed by the patient after extubation, then the anesthesia team, and, last of all, the cleaning and sterilization crew [12]. Transportation of patients should be via a pre-defined route to avoid unnecessary exposure.

Operating room air pressure should be changed from positive to negative or can be switched off 30 minutes before and restarting 30 minutes after sanitization at the end of surgery. Disposable items should be used as far as possible. High-efficiency particulate air (HEPA) filters and smoke evacuation devices should come easy for the working personnel. General anesthesia poses a high risk to HCWs as it is an aerosol-generating procedure, therefore whenever possible regional anesthesia is preferred. Guidelines laid down by the airway and anesthesia societies should be followed for intubation [14]. Limiting the use of most surgeon-friendly but aerosol-producing gadgets such as electrocautery, laser, and ultrasonic scalpels might increase the operative time and prove exhausting for the surgeons. This sudden shift in the working protocol is difficult to cope with and needs behavioral change for a better outcome.

2.5. Minimally invasive surgery

A perceived threat that the virus may be found in tissue and body fluids and concentrated virus-aerosol can occur due to pneumoperitoneum [15] has suggested limiting its use. Despite available information, appropriate precautions are of utmost importance when laparoscopic techniques are used to reduce the length of hospital stay and faster recovery. Practices that may be of help include small port incisions to prevent gas leakage, low CO₂ insufflation pressure [16], and careful evacuation of smoke by using filtration systems [17]. When no smoke evacuation system is at hand, it is best not to opt for laparoscopy. Direct use of suction applied to trocars may be an option [16] but at the cost of efficiency and safety. Proper desufflation can decrease the chances of infection transmission. The patient should lie flat, and the least dependent port should be used for desufflation. Controlled smoke evacuation should be done by a designated team member, using the port's side-channel [18]. The use of drains should be kept minimal. Fascial closure is a must after desufflation, and the use of any suture closure device allowing gas leakage should be avoided. Specimen removal, either hand-assisted or with a wound protection device, should

be done only after desufflation [18]. For endoscopic procedures, the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) recommends wearing full PPE while doing endoscopy, and use of surgical energy should be minimized, endoscopic mucosal resection and endoluminal procedures should be avoided if possible, and endoscopic equipment and instruments should be properly cleaned and sanitized after use [19].

2.6. Optimal patient care

2.6.1. Phase I-Preoperative period

National surgical quality improvement program (NSQIP) defines preoperative laboratory testing and work up as 30 days before surgery. In the presence of delay in surgery due to COVID-19 or other reasons beyond 30 days, preoperative workup and reassessment of comorbidities should be done [41]. Teleconsultations should be used for guiding patients for the same to prevent hospital visits and exposure to COVID-19. There should be a composite assessment and sound clinical judgment to decide clinical appropriateness and surgical prioritization. The consent form needs to be revised for COVID-19, and informed consent should be taken regarding hospital acquisition of COVID-19. Office, clinic, waiting room should have six feet distancing of chairs. Older patients, frail, and COVID-19 positive should be reviewed on a priority basis. Evaluation and discussion should be done for patients' need for rehabilitation medicine and skilled nursing facility before surgery. The preoperative clinic should consider screening all patients before the appointment for COVID-19 disease, including temperature checks and routine screening of all staff and others working in the facility. All healthcare providers and staff to follow CDC norms for wearing PPE, and while dealing with aerosol-generating procedures (AGPs). Similarly, all patients should wear cloth face masks.

2.6.2. Phase II-Immediate preoperative period

Anesthesia, surgery, and nursing checklist need to be revised for the COVID status of the patient, and optimum precautions should be taken.

2.6.3. Phase III-Intraoperative period

Ensure revised time outs are being followed concerning COVID risk, COVID results, and PPE guidelines. A briefing should be done inside the OR before starting surgery. Guidelines laid down by the society of anaesthesiologists should be followed during intubation [42]. Adequate waiting time and movement of team members should be planned [12, 13]. Specimen retrieval guidelines should be followed [18].

2.6.4. Phase IV -postoperative care

Since postoperative patients are in an inflammatory state and prone to developing pulmonary complications such as atelectasis, pneumonia, and thrombo-embolism that can mimic symptoms of COVID 19 infection, they should be closely monitored and tested by RT-PCR in the event they develop symptoms. It has been observed that RT-PCR has a high variation in the false-negative rate, which implies that the interpretation of RT-PCR should be made with caution, particularly early in the course of infection. RT-PCR alone should not be the basis to rule out infection if there is high clinical suspicion. We should carefully consider the clinical and epidemiological situations [20]. A particular challenge to HCW safety is our current lack of understanding of the virus's transmissibility duration in either asymptomatic or symptomatic patients [21]. SARS-CoV-2 RNA continues to be detected in upper respiratory tracts of patients recovered from COVID-19 for 12 weeks [22]. According to recent CDC recommendations, isolation can be discontinued ten days following onset of symptoms, because the replication-competent virus has not been detected ten days following onset of symptoms [23]. There is evidence that even after respiratory samples are negative for virus in patients who have recovered from a COVID-19 illness, viral RNA remains in the stool for more than 30 days. The clinical significance of fecal RNA is not well understood [24]. Postoperative care such as the

liberal use of 2 to 3 antiemetics to control nausea and vomiting more aggressively might help decrease contamination and reduce the risk of spread [2]. Administration of high-flow supplemental oxygen should be avoided because of concerns of aerosol generation. If necessary, low flow supplemental oxygen should be provided through a nasal cannula [2]. Every effort to adhere to enhanced recovery protocols should be made for standardized postoperative care and optimize lengths of hospital stay, efficiency, and complications.

2.6.5. Phase V—Post-discharge period

After discharge from the hospital, follow-ups may be done through telemedicine or video calls to reduce unnecessary hospital visits. The availability of post-acute care facilities, such as rehabilitation medicine and skilled nursing, should be made. These patients may need early re-intervention (with testing and adequate protection for HCW) in case of any complication as evidence suggests that patients operated upon in the month before the infection clinically manifested demonstrate a severe disease course in 75% of cases [16]. Even patients who recover have a higher risk of future infection and a more complicated recovery pattern [14]. The patient's attendants need to be trained in picking up subtle signs of unusual recovery and report immediately.

3. Pitfalls

Virtual consultation obviates the need for physical interaction between the patient and the doctor and reduces the risk of disease transmission. A survey conducted by American Well [25] reports that some barriers exist with teleconsultation. In times of need, many people want a physical interaction with the physician. Patients also like to see their physician through teleconsultation, vis-a-vis someone with whom they do not have a previously established relationship. Patients may be unaware that they have teleconsultation as an option and do not know how to access it. Cost barriers to establishing a broad-based telecommunication platform can be significant, especially in resource-poor settings.

Several practical issues can crop up during such practice. The interactive communication has some regulations as it involves providing sensitive information and also monetary transactions. Secondly, providing telemedicine services in different centers may be difficult as these may vary on the quality of facility, resources, and workforce. Moreover, the referral services can be complicated as it may not be easy to book referral services in the same hospital or between hospitals. Thirdly, the issues of licensure, facility accreditation, and certification and reimbursement are also uncertain. Lastly, and most importantly, is the issue of privacy and data protection [26]. According to Portnoy et al. [27], educating HCWs, doctors, and patients about telemedicine's importance during the pandemic, helping people understand how it works, and reducing costs can help remove these barriers.

The primary purpose of isolating COVID-19 positive patients is to reduce the risk of infection transmission to family members, the community, and the hospital staff. Accordingly, many hospitals have divided medical facilities into a dedicated COVID-19 and non-COVID-19 zones and a testing protocol for all admitted patients. However, two situations need attention. In one, the patient treated as non-COVID-19 may have an attendant who turns out to be COVID-19 positive. As the patient and attendant both remain in the non-COVID-19 zone, where HCWs are likely to be working without full PPE, this attendant is potentially at risk of spreading the infection to other patients (in a large facility) and HCWs. Even if the hospital reserves the policy for testing all attendants, situations where different attendants visit the patient during hospital stay (typical in a large healthcare facility), may still threaten infection transmission. Similar episodes were experienced by the authors in two instances in their hospital (unpublished data), resulting in the quarantine of many HCWs and other patients in the ward who all had been primary contacts straining the already compromised workforce. The second possibility is a non-COVID-19 patient who turns out to be positive during his/her hospital stay. If the patient remains asymptomatic, it

is challenging to judge when and how the patient becomes positive. Mandatory testing of all attendants visiting the patient in the hospital and all inpatients regularly is a daunting task. Moreover, local resources and workforce reserves should also be considered in this context.

Conventionally, informed consent for surgery focuses on risks and expected benefits, the likely outcome of the proposed procedure, and alternative options. According to a report by The Canadian Medical Protective Association [28], over a recent 5-year period, 65% of medico-legal cases involving informed consent disputes were of surgical procedures, and only 21% of these cases have been decided in favor of the surgeon. Therefore, it is essential to know whether patients are aware of this impact and proceed or postpone their surgery during this pandemic. In the current crisis, postponement may initiate some queries related to morbidity, the medico-legal impact of which is unknown.

In this pandemic where many hospitals have turned out to be hot-spots of COVID-19 infection, is it justified to suggest that COVID-19 has become a healthcare-associated infection, though temporarily? Do we need to tell the patient of such a probability during admission? There is an increasing perception among health authorities that the risk of infection with COVID-19 should be a part of informed consent for surgery [29]. Ferguson et al. recommend to include five additional points while discussing “enhanced informed consent” with the patients. Firstly, there is a lack of information on the risks of routine procedures during the pandemic. Secondly, there is an increased risk of acquiring SARS-CoV-2 from the hospital. A significant third point is the changed day-to-day hospital operations, which may alter the patient’s perioperative experience. Due to visitor restriction policies, the patients might not be able to communicate with their family members, or there is a possibility that postoperative care might be delivered in general nursing units with staff that is not well trained to look after postoperative patients. Another significant issue that should be discussed is a possible altered outcome resulting from a shortage of resources due to the pandemic. Lastly, the surgeons should respect the patient’s wishes and dignity amidst considerable uncertainties that the pandemic has introduced in an evolving public-health crisis [29].

Many guidelines recommend postponing elective surgeries but rightly advocate to consider malignancy as semi-urgency where alternative treatment is not possible. Long hours of surgery with wearing full PPE will lead to burnout of the surgical team. Patients with malignancies are already immunocompromised, which may increase the risk of COVID-19 infection. An intensive care unit bed may not be available in an already compromised hospital resource, which can compromise postoperative care following a lengthy surgery. Voluntary blood donation and the availability of blood and blood products may be not as per expectation. Moreover, operated patients are under metabolic stress and temporarily immunocompromised due to surgery, which puts them at increased risk of acquiring SARS-CoV-2 infection [30].

A retrospective study done by Wang et al. reported that 41.3% of their patients had the hospital-related transmission of COVID-19, out of which the majority were HCWs [31]. It calls for regular staff rotation, testing, and designating COVID-19 and non-COVID-19 areas in the hospital, which are necessary measures to limit spread. Doubling or cross-covering of duty rotas anticipating staff absence due to sickness or quarantine, reducing doctor-to-patient ratios in some parts of the hospital, and strengthening surgical teams by recruiting retired surgeons, clinical academics, or final-year medical students are some of the possible approaches to meet the crisis. However, this model works only until the community transmission reaches a critical threshold when the hospital designation does not matter [32]. Nevertheless, we do not have sufficient data to suggest that HCWs are a source of infection and have led to the hospital or even community spread. The lockdown was imposed in many countries worldwide, exempting the health care industry, and no guidelines were developed on how to protect HCWs who are at increased risk of infection. The Centre for Disease Control and Prevention (CDC) reports that health care workers account for at least 11% of reported SARS-CoV-2 infection [33]. However, no

risk-stratification has been done for HCWs. According to Larochelle et al. there is no robust data on the occupational risk of COVID-19 [34]. The authors propose a framework of risk stratification based on the risk of occupational exposure to COVID-19 and death risk. Persons with a high risk of occupational exposure and death should consider staying at home, while those with high risk in one domain and medium risk in the other should discuss with their physician. Stress and fatigue in otherwise healthy HCWs are challenging issues. HCWs returning to work after recovery from a COVID-19 infection may be at risk of physical and emotional exhaustion [35].

A review governance committee should be made to clarify, interpret, and iterate policies, make real-time decisions and initiate and communicate all planning. Its members should be from different disciplines, and it should conduct meetings at least daily to solve problems. It should retrieve data on the availability of resources and their utilization, COVID-19 awareness data amongst HCWs and community, management of COVID-19 patients, and errors during management, complications, and the means to rectify those. The committee should set priorities and ensure adequate strategies for newly diagnosed patients and staff. These include isolation of infected staff and ensuring replacement, optimum patient assessment, and clearing the backlog. Convenient planning should be done so that patients can access healthcare facilities easily.

There has been a trend from an operative to delayed-operative management of surgical conditions such as intestinal perforation, intestinal obstruction, or intra-abdominal inflammation [36]. However, it is still a question of whether to wait and watch management in acute surgical conditions should increase and be the norm [37]. As of now, we rely on extrapolating the evidence from outcomes of elective surgical patients infected with COVID 19 [36]. The cancellation of elective operations creates a massive pile-up of patients. There are no robust data available to calculate the number of operations postponed and how this backlog will be dealt with after the pandemic. Approximately 330 million operations are done worldwide annually. With an average of about six million procedures per week internationally [38], the total number of patients affected is increasing at a concerning pace. We have minimal idea about these cancellations or how to reopen these services [39]. Andrea et al. have very well pointed out the concern in their article on how to avoid ‘a crisis after a crisis’ [40]. We have to take care that our workforce does not get exhausted once the elective surgeries start in the later pandemic stages. Data on the effects of surgical cancellation on psycho-social and physical health are lacking, but surely it will damage the health and wellbeing and will increase the risk of shortened life span in countries of all income, and more so, in the poor and marginalized communities.

4. Conclusion

The profound effect of the pandemic has left HCWs and the health-care industry worldwide in a critical situation. In the altered situation, the crucial things lacking are a management model and adequate training to deliver in an unsafe environment, while continuously protecting oneself. Surgeons are always under stress while operating and managing increased medico-legal issues. Most of the current guidelines are based more on observation or experience than on a high level of evidence. Telemedicine has gained worldwide acceptance but comes at the cost of denying physical examination. Postoperative care has become more challenging. Although care of cancer patients has been prioritized, these patients theoretically have a higher chance of getting infected. Training the OR team and keeping a regular check on their practices is essential. Amongst all these challenges, the world is getting used to a “new normal”. Only time will tell whether we have to get used to it for good.

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Author contribution

Farhanul Huda was responsible for conceptualising the study and did the review of literature.

Praveen Kumar, Sudhir Kumar Singh and Saumya Agarwal were involved in data collection, interpretation of studies and drafting of the manuscript.

Somprakas Basu was involved in conceptualisation of the study, critically analysing literature and expert input in synthesis of knowledge and finalising the content of the manuscript.

All authors have seen and approved the final manuscript.

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