

## Steps to Define Optimal Timing for Elective Surgery after COVID-19

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Causing severe respiratory infection, the SARS-CoV-2 virus was first discovered in Wuhan, China, and has changed the world [1]. The COVID-19 pandemic resulted in city lockdowns and travel bans as the world attempted to determine what was causing the highly contagious virus to become so deadly. Hospitals were overwhelmed with patients with COVID-19, prompting officials to cancel or postpone elective surgeries until they could get the disease under control. After more than 2 years battling this devastating disease, the medical community finally gained a better understanding of the virus. Vaccinations and effective treatments became available for the general public. The census for patients hospitalized with COVID-19 eventually decreased to the point that elective surgeries could resume. As we continue to catch up on the backlog of surgical cases, an important question is: When is the appropriate time to perform an elective procedure if the patient previously had COVID-19?

### Evidence

Early studies demonstrated that the postoperative case mortality rate was as high as 27% for patients with a diagnosis of COVID-19 [2]. These thoracic surgery patients were asymptomatic before the procedure. Another study also showed an increase in mortality of patients with COVID-19 early on with an odds ratio approaching 8 [3]. Khonsari, et al. stratified patients into groups based on the timing of the positive test in relation to the date of the elective surgery and showed that patients who were positive more than 5 days before surgery and patients who were positive within 5 days of surgery had higher mortality and pulmonary complications than patients who were negative for COVID-19.

Unfortunately, after the initial pandemic wave subsided and elective surgeries gradually resumed, several other variants emerged, causing additional strain on the health care system. First, the Delta variant was more infectious and caused more severe illness than the original strain. Currently, we are experiencing the Omicron variant, which is once again more infectious

than previous strains, although it seems to have less severe pulmonary complications. Nevertheless, as the virus continues to mutate, the battle against the pandemic has changed health care providers' attitudes and has led to some degree of "mental fatigue" when dealing with the disease. Hospital policies initially focused on ensuring that the patient had a negative COVID-19 test for elective surgeries and equipping operating room (OR) staff with appropriate personal protective equipment. However, these policies overlooked whether there were negative effects for patients who were previously positive for COVID-19. These patients had mild or insidious symptoms when they presented for elective surgeries [4].

### Conflict

The intensive care units (ICUs) and ORs have been navigating the complicated management of the COVID-19 pandemic for more than 2 years. With ICUs and floor beds occupied with patients with COVID-19, there are limited resources for elective postoperative admissions. This has created a dilemma that has led to a backlog of many urgent cases such as tumors and cardiovascular diseases requiring surgical attention. Once hospitals increase to full capacity again, when will be the right time for patients who previously tested positive for COVID-19 to proceed with surgery [5]?

Most hospitals rely on elective surgeries as a revenue stream. Months of postponing or canceling elective surgeries led to an incredible loss of revenue for most hospitals. Nationwide, it is estimated that \$1.53 billion was lost from postponing elective pediatric surgeries during the 4 months when COVID-19 first hit in 2020 [6]. For instance, "Dr. Mazzaferro and his coworkers calculated the net revenues of three hospitals in their health care system during the first surge of COVID-19 cases from March to July 2020, compared with the same period in 2019. A total of more than \$99 million of net revenue was lost from all surgical departments and \$58 million from the department of surgery in the first wave [6]." When the Delta and Omicron variants spiked, elective surgeries were not completely stopped

and much less revenue was lost. As we continue to make up time for elective surgeries, we will encounter patients who had COVID-19 recently. Moreover, it is not uncommon to see patients who are scheduled for elective surgery present with mild symptoms and test positive for COVID-19. Should we cancel or postpone these cases? It is important to determine how to manage patients who have had COVID-19 recently and navigate the preoperative evaluation without harm.

A large observational study was performed using data from the GlobalSurg-COVIDSurg collaborative of patients undergoing non-cardiac surgery. The study evaluated patients undergoing elective surgeries in an international multicenter trial [7]. Of 140,000 patients, 2.2% had a preoperative COVID-19 diagnosis. Patients were divided into groups based on the time from their COVID-19 diagnosis to their surgical date. Groups of 0 to 2 weeks, 3 to 4 weeks, 5 to 6 weeks, and  $\geq 7$  weeks were observed. The primary outcome was 30-day mortality. Secondary outcomes included cardiac and respiratory complications. The mortality rate decreased from 9.1% (0-2 week) to 2% ( $\geq 7$  week). The noninfectious group mortality rate was 1.5%. The only group that was not significantly different from a mortality standpoint was the group that had surgery  $\geq 7$  weeks after the COVID-19 diagnosis. As for pulmonary complications, a similar trend was noted as the 30-day mortality. Patients who were asymptomatic and  $\geq 7$  weeks from a COVID-19 diagnosis had similar rates of complications as patients who were negative. The findings were consistent across all age groups, American Society of Anesthesiologists classification, and surgical risk stratification [7].

Based on currently available information (most of which has been obtained from the initial COVID-19 wave), patients with an active infection should not undergo elective surgery. For emergent or urgent operations, patients should proceed with the understanding that they are at an increased risk of mortality and pulmonary complications. For time-sensitive operations, it is preferred that the procedure be delayed until the patient is asymptomatic. For elective surgeries, if patients were asymptomatic during the time of infection, it is reasonable to wait only 4 weeks. Current data recommend scheduling an elective surgery at least 7 to 8 weeks after a SARS-CoV-2 infection. This delay would result in a comparable risk of mortality and pulmonary complications as someone who was not infected with SARS-CoV-2 [7,8].

## Recommendations

With the Omicron variant causing more upper respiratory symptoms than lower respiratory symptoms, it may be reasonable to follow pediatric literature recommendations for the time to delay an elective case. Studies have shown that patients with

an upper respiratory infection (URI) have increased airway reactivity that may last anywhere from 2 to 6 weeks after the infection. Tait, et al. showed that adverse events and complications are highest during the first 4 weeks after an URI [9]. As we gain knowledge on COVID-19, hospitals should follow best practices in stratifying the risk of individual COVID-positive patients without delaying the surgery [10]: 1) For fully vaccinated and chronic COVID-positive carriers, infectious disease services should be consulted for recommendations and 2) For unvaccinated patients who present with a positive COVID-19 test and mild or insidious symptoms, postponing the elective procedures for 7 weeks might be the appropriate strategy to reduce the risk of pulmonary complications. Much still remains unknown about the effects of COVID-19 on the body, particularly regarding children and teenagers and the risks for patients who become infected after COVID-19 vaccination [11]. As our understanding of COVID-19 continues to evolve and new variants emerge, it is reasonable to amend recommendations on the timeline of elective surgery for COVID-positive patients. New recommendations should be based on an interdisciplinary approach and take into account what is best for the patient while ensuring that time-sensitive procedures are not delayed.

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