

# Restarting Essential Surgery in the Era of COVID-19

## A Cautious Data Driven Approach Based on the Literature and Local Data

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On March 11, 2020 the World Health Organization declared the coronavirus (COVID-19) outbreak a global pandemic.<sup>1</sup> In efforts to increase bed capacity, conserve vital medical resources, safeguard our patients, and protect frontline healthcare workers (HCWs), elective surgery across the United States came to a halt. Several states have mandated operating room (OR) closures for nonessential elective invasive procedures.<sup>2,3</sup> Although we have not completely passed the first wave of the virus, and there is uncertainty of how long the pandemic will last, we are now being tasked with reopening our ORs for cases that were deferred. Less urgent elective cases will need to resume too at some point because elective surgery does not mean nonessential surgery. We believe it is reasonable to start asking: how can we do this in a safe and coordinated fashion?

Even if the daily count of new COVID-19 cases continues to decline, there will still be a constant concern that any surgical patient may be harboring severe acute respiratory syndrome coronavirus 2, the virus that causes COVID-19. This is based on studies showing that some patients with COVID-19 have mild or no symptoms, and yet may be contagious or at risk for perioperative illness. As we reintroduce elective surgery, we need a new set of safety practices for providers and patients. In addition, patient selection during this period will be critical. Limited data from China have shown that outcomes of occult COVID-19 positive patients who undergo surgery are poor; 44% of patients required intensive care unit (ICU) admission and 25% died.<sup>4</sup> Patient selection must also consider the potential burden on hospital resources.

In this article, we will discuss how we plan to restart elective surgery in our hospital. We will review local data and published literature as the basis for our recommendations. Although these recommendations may not apply to all institutions, our goal is to inform potential strategies that other hospital systems similarly restarting elective surgery may wish to consider.

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### RISK CALCULATION FROM LOCAL DATA/ PUBLISHED LITERATURE

Our internal data suggest that the negative predictive value of a single nasopharyngeal polymerase chain reaction (PCR) test for COVID-19 is 99%. Our data demonstrate that only 1.3% of patients with a negative test had a subsequent test that was positive within 48 hours. However, in other geographic regions this may be higher, such as in China, where the rate was reported to be approximately 15%.<sup>5</sup>

Within the community, the prevalence of COVID-19 in asymptomatic patients will vary by region but in general is likely around 1%.<sup>6</sup> Emerging data from our institution confirms this low percentage; testing of all patients admitted to our Labor and Delivery unit found 1.4% of patients tested positive while asymptomatic.

Transmissibility in asymptomatic patients is likely low except with aerosolizing-generating procedures (AGPs) or prolonged exposure to COVID-19 positive patients. In a review of contact tracing for a patient from California, 2 of 17 HCWs involved in AGPs became infected after providing care to a COVID-19 patient.<sup>7</sup> Moreover, in a case report from Singapore, 0 (0/35) HCWs developed infection after exposure to AGPs while wearing standard surgical masks.<sup>8</sup> Using these 2 studies, we estimate for the highest risk care, AGPs, that transmission risk for a COVID-19 positive patient would be  $2/(17+35)$  or 3.8%.

One can then calculate patient/provider risk using the most conservative of estimates:

- The patient risk of being COVID-19 positive and undergoing surgery would be:  $0.014$  (asymptomatic community rate)  $\times$   $0.15$  (false negative test rate from China) =  $0.0021 = 1:476$ .
- The risk to a provider combines the risk of a patient being positive multiplied by the risk of transmission:  $0.014 \times 0.15 \times 0.038$  (transmissibility rate) =  $0.0000798 = 0.008\% = 1:12,500$ .

Our risks may be lower given our conservative estimates of all 3 assumptions. Substituting our local enterprise rate of 1.3% for patients with a negative test having a subsequent test that was positive within 48 hours, our risks would be:

- Patient risk:  $0.014 \times 0.013 = 0.00018 = 1:5,555$
- Provider risk:  $0.014 \times 0.013 \times 0.038 = 0.0000069 = 1:145,000$

Given these estimates, we propose the following interim safety practices for patients with no known COVID-19 infection being considered for surgery:

1. Asymptomatic Patients: Only patients without respiratory symptoms unexplained by concurrent illness will be offered elective surgery during the restart. If possible, surgery will be deferred for COVID-19 positive patients.

**TABLE 1.** BWH Institutional NSQIP Data 2017–2019 for Unplanned Intubation and on Ventilator >48 h

Surgery Specialty	Unplanned Intubation Rate	On Ventilator >48 h Rate
General surgery (n = 2725)	0.2%	0.04%
Vascular surgery (n = 345)	2.6%	0.3%
Neurosurgery (n = 1132)	0.2%	0.3%
Orthopedic surgery (n = 1565)	0.3%	0.06%
Thoracic surgery (n = 702)	2.0%	0.4%
ASA score		
ASA 1 (n = 114)	0%	0%
ASA 2 (n = 2308)	0.04%	0%
ASA 3 (n = 4848)	0.5%	0.1%
ASA 4 (n = 233)	4.3%	0.9%

ASA indicates American Society of Anesthesiologists.

2. Testing: We recommend that whenever possible, all elective surgery patients should be tested within 24–48 hours before surgery by a single nasopharyngeal swab PCR test. Patients will need to self-quarantine between the time of their test and their surgery.
3. Intraoperative practice: The risk of an asymptomatic, single-test negative patient being infected with COVID-19 is low, and the risk of that patient inadvertently infecting OR personnel is even lower especially when wearing adequate personal protective equipment (PPE). The question during this transition period of potential community COVID-19 presence is: should there be additional safety practices for providers performing elective surgical procedures? The Centers for Disease Control and Prevention recommend wearing N95 respirators and eye protection during AGPs for all patients, regardless of COVID-19 test results if the community prevalence for COVID-19 is high. Otherwise, standard precautions are adequate for asymptomatic test negative patients. We believe our community prevalence of COVID-19 is low based on our testing of asymptomatic labor and delivery patients but will confirm this in additional populations. For surgery involving the airway, N95 respirators may be worn by all personnel, although their benefit after intubation and during a procedure in a COVID-19 negative patient is not clear. Other recommendations are fluid as guidelines/community prevalence/testing capacity change. Each hospital will need to define additional safety measures including use of enhanced PPE for non-AGPs and use of an air-exchange pause. The pause is recommended by the Centers for Disease Control and Prevention where a room has a 99% air turnover before standard precautions are used after an AGP.
4. Case selection: Analysis of our institutional data from the National Surgery Quality Improvement Program shows that the American Society of Anesthesiologists (ASA) physical status and specialty can impact which patients might need additional ventilation/ICU resources after surgery (Table 1). ASA I-III patients for General/Neuro/Orthopedic surgery confers minimal risk of requiring specialized ventilation services while ASA III cases in Vascular/Thoracic surgery had higher risks. If ICU care is a limiting factor, this can be taken into account. In addition to considering patient factors, some procedures are more time dependent and serious compared to others. To address these issues, we asked our surgeons to rank their procedures into 4 priorities: (1) should be done within 2 weeks, (2) should be done within 6 weeks, (3) has a critical time window, and (4) is essential but not time dependent. The priority scores were collected into an

OR depot. As resources allow, the OR slots are released to the services for scheduling. As we get further from the peak of the crisis, and increase our personnel, PPE, ventilators, and hospital capacity, we will be able to expand access to additional “lower priority” procedures.

5. Location: We must ensure that patients admitted after surgery will be safe in our hospitals. Therefore, we recommend all asymptomatic COVID-19 negative surgery patients be co-located with other COVID-19 negative patients.

We propose the following interim safety practices for patients who were previously infected with COVID-19 being considered for surgery:

1. Time: Patients who have had COVID-19 infection should not be considered for elective surgery for at least 1 month after the onset of symptoms. There needs to be complete resolution of respiratory symptoms and documentation of infection clearance by repeat PCR testing. The rationale for this delay is that nasopharyngeal PCRs can continue to be positive for up to 28 days or longer after the onset of infection.<sup>8–10</sup>
2. Asymptomatic patients: Additional tests on pulmonary function/imaging can be considered.
3. Testing: After 1 month, the patient should have 2 negative tests from nasopharyngeal swabs at least 24 hours apart. Within 24–48 hours of surgery, the patient will require a negative COVID test.

## POSTOPERATIVE CHECK

We recommend setting up a system where every patient operated on in this transition period is assessed at a standard time postoperatively for respiratory symptoms. Because the timing of an occult COVID-19 infection is usually within 5.2 days of exposure,<sup>4</sup> we recommend follow-up assessment 7–10 days postoperatively to gather data on the performance of our safety protocols.

## CONCLUSIONS

As new COVID-19 cases in our hospital continue to decline, we will begin to reopen our ORs for elective surgery. Several factors must be taken into account before restarting surgery such as availability of vital resources, appropriate staffing, and new safety parameters. To protect our patients and staff, we recommend: (1) only operating on asymptomatic patients, (2) COVID-19 testing 24–48 hours before surgery and only proceeding with elective surgery if the test is negative, (3) selecting appropriate PPE for intubation/extubation for anesthesia staff depending on the community prevalence of COVID-19 and using additional PPE in some specialties performing surgery on the airway (for non-AGPs, standard precautions can be considered), (4) air exchange pause for a 99% turnover, (5) starting surgery on high priority cases and those with lower risk of requiring prolonged intubation, (6) co-locating of COVID-19 negative patients, and (7) audits of safety practices.

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