



Surgery During a Pandemic Guidelines



Cole S. Brown^a, Andrew M. Cameron, MD, PhD^{b,*}

^aThe University of North Carolina, 115 E Longview Street, Chapel Hill, NC 27516, USA; ^bDepartment of Surgery, The Johns Hopkins University School of Medicine, 720 Rutland Avenue, Ross 765, Baltimore, MD 21205, USA

Keywords

• COVID-19 • Pandemic • Health care systems • Elective surgery • Triage

Key points

- COVID-19 presented an unexpected and catastrophic burden to many hospitals and health care systems.
- Immediate government-mandated cessation of elective care had widespread ramifications.
- Resumption of elective care as the pandemic receded required guidelines for operationalization.

INTRODUCTION: COVID-19S IMPACT ON HEALTH CARE SYSTEMS: SHUTDOWN OF ELECTIVE PROCEDURES

As Covid19 spread throughout Asia and Europe, the United States observed in some countries the deadly results of health care systems overwhelmed [1]. As a result, the strategy to “flatten the curve” through social distancing was effectuated largely to prevent resource shortages that would catastrophically stress the health care system to its limit, that is, resources such as personal protective equipment, mechanical ventilators, and frontline health care providers. Along with attention to preservation of equipment most hospitals and states declared a pause to “elective” surgeries, although there was latitude allowed for continued performance of “urgent surgeries,” the definition of which was left to hospitals [2]. Hospitals, Departments of Surgery within, and individual doctors were left to decide if certain surgeries, such as esophagectomies, prostatectomies, and pancreatic resections for cancer or organ transplants for heart or kidney failure, were truly “elective”

*Corresponding author. *E-mail address:* Acamero5@jhmi.edu

or were more rightly considered life-saving and thus urgent. In the case of almost all hospitals, surgeries that could be delayed without imminent loss of life or limb were postponed [3]. The cost or risk of a poor outcome for those patients already scheduled for surgery but now postponed was thus made subservient to the concern for incoming patients with COVID-19, their caregivers, and the health care system as a whole that was assumed to be soon reaching a crisis situation [4]. Elective surgeries and care were suspended by the state until further notice. What follows are guidelines that speak to returning to elective care as the threat of the pandemic begins to reside.

AFTER THE SHUTDOWN: GUIDELINES FOR RAMPING BACK UP SAFELY

Overview

In response to governmental relaxation of the moratorium on nonessential surgery and procedures, our center began planning to resume such cases as the COVID-19 pandemic evolved. Patients with COVID-19 placed a high demand on overall capacity within the system, making available surgical acute care and intensive care unit (ICU) beds a scarce resource. As a result, the entire system of surgical/procedural postings and cases required attention to judiciously allocate such scarce resources. The scope of these guidelines includes activities performed in inpatient and outpatient hospital-based settings for cases and procedures classified into 4 tiers: (1) urgent/emergent, (2) semi-urgent, (3) elective requiring inpatient admission (includes same-day admission and extended stay), and (4) elective outpatient (ambulatory). All patients were to be screened for COVID-19 symptoms and it was highly recommended that patients are also tested for the presence of SARS-CoV-2. That screening test is ideally obtained within the 48 hours but not more than 72 hours before surgery and evidenced by laboratory results documented in the medical record. Testing was highly recommended but not mandatory for asymptomatic patients (patients without symptoms of COVID-19). At this time, patients classified in Tiers 2, 3, and 4 must be clinically asymptomatic and COVID-19 negative. Patients in Tier 1, regardless of COVID-19 status, still undergo procedure or surgery as scheduled, with appropriate precautions taken. In addition, hospital employees must be free of COVID-19-related symptoms as determined by daily self-report.

What follows is guidance to prioritize and coordinate the backlogged inpatient and outpatient hospital-based procedures accrued across a hospital system. Such cases are first classified into tiers based on their time sensitivity. Next, cases are prioritized into a queue considering their urgency in the context of local site-specific and overall health system's current capacity. Lastly, a mechanism for oversight and a transparent appeals process is outlined to help operationalize the ramp-up.

Priorities

These guidelines seek to consider and balance the following: (1) monitoring and maintenance of overall hospital capacity and critical supplies (personal protective

equipment [PPE]) to remain prepared to safely respond to surge in patients with COVID-19, (2) desire to resume procedures for patients who have had their medical/surgical care deferred, (3) understanding that health care systems may represent a heterogeneous group of sites that will have differing clinical backlog and differing capacity to ramp back up, (4) a need for transparency and consistency in hospital policy while recognizing urgency and heterogeneity of situations across system sites and even within sites, recognition, and consistency with published position statements from relevant bodies (American College of Surgery/American Heart Association (ACS/AHA) Joint Statement <https://www.facs.org/covid-19/clinical-guidance/roadmap-elective-surgery>), and (5) a desire to optimize the operating room (OR)/procedural schedule with maximal utilization of the OR/procedure blocks while minimizing holds in the ORs/procedure rooms and postanesthesia care units (PACUs), optimally matching surgical demand to non-COVID capacity. Realizing the complexity of the system, modeling tools and simulations should guide decisions, whenever available [5].

The key operational questions to consider when posting a case include the following: (1) how many resources will this case use? (2) can we safely perform this surgery/procedure? (3) is there any specific resource we will not be able to provide that will harm the patient? (4) will doing this case severely reduce our ability to help other patients? (5) are we optimally using our resources available to us so we can help the most people, in the safest way, and in the timeliest fashion? In order to operationalize application of the aforementioned framework the authors developed clear definitions and triage criteria for each case. Triage of each case is based on (1) acuity of the procedure (tier system), (2) availability of supplies (PPE, blood products, medications), and (3) demand on capacity (perioperative and inpatient). These variables are further described in the following section.

Acuity

Suspension of elective procedures and surgery clearly specified that urgent or emergent procedures and surgery should continue during the COVID-19 pandemic—these are the essential services hospitals provide to the community. These cases have continued at our center throughout the pandemic and are considered here as “Tier 1.” To facilitate stratification of cases that have been deferred, we now specify “Tier 2” cases as “semi-urgent” defined as procedures that have a time-sensitive nature and cannot be delayed more than 3 months without adverse effect on patient care. “Tier 3” cases are those that are considered elective and can be delayed 3 months or longer without adverse effect on patient outcomes and require inpatient admission (includes same-day admission and extended stay). Lastly, we have designated elective outpatient procedures as “Tier 4” cases that can occur in parallel to Tier 1 in inpatient settings to fill in OR time when predicted inpatient capacity is exceeded for Tier 2 and 3 cases, as long as they do not consume supplies excessively relative to available stocks (Table 1).

All Tier 2 and 3 cases that have been deferred over the past weeks due to the moratorium during COVID-19 pandemic are to be entered into a queue or

Table 1

The 4-tier system to categorize acuity of surgery cases

Surgical urgency	Tier 1: <i>urgent/emergent</i>	Tier 2: <i>semi-urgent</i>	Tier 3: <i>elective</i>	Tier 4: <i>ambulatory</i>
Note:	Still currently doing in our system	Should not wait >3 mo	Could be delayed >3 mo	N/A

“depot” for stratification to be scheduled and completed, as scenarios allow for resumption of activity. Initially, as elective procedures and surgery resume, capacity will not be at pre-COVID-19 levels. Block time for elective cases is to be granted based on caseload (both number and time required to complete cases) represented in the depot of waiting cases. Decisions regarding ordering of elective cases within assigned block time should be made at the divisional level after evaluation of capacity.

Supplies

Availability of supplies should be assessed on a regular basis at both health system and entity levels. A red-yellow-green light system is used (red = do not proceed; yellow = proceed with caution; green = proceed as usual) based on the following: (1) PPE supply assessment (≥ 3 or more weeks = green, 2–3 weeks = yellow, and ≤ 1 week = red—only Tier 1 cases proceed). (2) Blood product availability is assessed based on institutional supply and case requirements. Use of blood order schedule is encouraged. Communication with blood bank for any case requiring 15+ units of packed red blood cells is required ahead of time. (3) Similar to blood products, medications availability is assessed based on institutional supply and case requirements. Critical shortages are regularly reported.

Capacity

Capacity is defined by the ability to provide services to the patient and consists of perioperative and inpatient capacity. *Perioperative capacity* describes the ability to provide care in preoperative areas, operating rooms/procedural rooms, and PACUs. *Inpatient capacity* describes the ability to provide care to patients requiring admission to acute care units (same-day admissions and extended stay) or ICU.

COVID burden has direct impact on institutional capacity and overall proceeding with cases other than Tier 1. Although all cases in Tiers 2 to 4 are affected, limited numbers of cases in Tier 4 may proceed based on their lack of need in inpatient capacity. Under conditions of high COVID-19 burden, capacity should be considered interchangeable across service lines with notable exceptions (eg, cardiac surgery, craniotomy patients, liver transplant, etc. requiring care in specialized environment). To further optimize utilization, bed capacity should be considered across all health care system locations

whenever possible for surgical patients, similar to what happens currently with patients with COVID-19.

Procedural services (endoscopy, interventional radiology [IR], neuroIR, Cardiovascular Interventional Laboratory (CVIL), etc.) should follow the same algorithms as surgery.

AN UNPREDICTABLE PANDEMIC: GUIDELINES FOR RAMPING BACK DOWN AS NEEDED

Given that the course of the pandemic is unpredictable and heterogeneous across the country, it is assumed that spikes of disease outbreak are inevitable. Hospitals and health care systems need to be prepared to ramp back down in terms of elective activity should local conditions worsen. A plethora of measures are available for monitoring COVID-19 status and impact at global, national, state, county, and organizational levels. Among these data, there are a few key metrics that serve as leading indicators to resurgence and foretell the need to adjust care delivery operations: early indicators (1–2 week lead); external indicators, which include increase in asymptomatic rate (week to week comparison), confirmed doubling (if $<2\%$ —on alert), absolute asymptomatic rate of greater than or equal to 5% (implies sustained community spread), COVID-19 positive rate in state, and statewide hospitalizations and ICU admissions; and internal indicators, which include hospitalizations and ICU admissions by entity, capacity (defined as available space, staffed beds, and staffing), patient populations with COVID-19 positive status (if available, by alpha/beta trauma patients admitted in the emergency department), and admissions with non-COVID-19 reasons but COVID-19 positive test results in course of patient's hospital stay.

The initial response to COVID-19 occurred in a state of crisis. Our center broadly closed operations across clinical sites within 72 hours of the declaration of the state of emergency. Going forward, it is the goal of our system to be able to maintain and build on the operations recovery that has occurred since May 2020. Some differences with a resurgence, in comparison to the initial surge, is that people requiring care for non-COVID-19 medical reasons will not wait at home as happened before, and our non-COVID-19 medical operations will be in full demand. Another difference is that many patients in surgical Tier 1 and 2 waited for their procedures for too long, and further wait will affect their outcomes disproportionately to the initial surge. However, should the resurgence cause an untenable strain on critical resources (ie, staffing, beds, medications/blood supply, PPE), ramp down will occur in a step wise, rather than an all or nothing, manner. Thus, ramp down may be specific to local entities, and the approach is to reduce non-COVID-19 volumes by unit, depending on local constraints, such as PPE, staffing, capacity, etc. For hospital transfers, specific consideration is needed for patients with the most severe cases and require advanced care.

Because the critical resources for caring for patients with COVID-19 (critical care providers and staff, beds, ventilators, high-risk PPE, blood supply) are hospital-centric, the first areas to ramp down non-COVID-19 volumes will

be inpatient and extended stay surgeries/procedures. Should the resurgence continue to escalate, ramp down will next occur for hospital outpatient-based surgeries. Lastly, in the event of dramatic levels of resurgence, our system will ramp down ambulatory surgery centers and ambulatory clinics.

GUIDELINES ON OTHER IMPORTANT CONSIDERATIONS

Patient placement and bed management

Bed placement across system facilities should be managed centrally by the Patient Placement and Transfer Command, which should be housed in some type of Capacity Command Center. Given the continued coexistence of COVID-19 and non-COVID-19 care, the use of space across our system for the care of patients with COVID-19, and the constriction of medical ICU beds in the near future, centralized bed management authority allows for the greatest degrees of freedom and maximum efficiency.

Infection prevention obligations and social distancing

Continue current clinical and nonclinical PPE per system HEIC policy, as described using the link found at https://intranet.insidehopkinsmedicine.org/heic/novel_coronavirus/clinical_resources.html. PPE utilization within the surgical environment is determined by high-risk and low-risk procedures. High-risk procedures are those likely aerosol-generating procedures. A current listing of high-risk procedures can be found at the HEIC link https://intranet.insidehopkinsmedicine.org/heic/_docs/2019-nCoV_agp.pdf.

PPE will be donned and doffed according to HEIC regulations and monitored by the Safety Officers. HEIC link to day of procedure PPE use (scroll to page 2):

https://intranet.insidehopkinsmedicine.org/heic/_docs/2019-nCoV_asymptomatic_testing_patients_needing_surgery_procedure.pdf.

Low-risk procedures require standard PPE and infection control precautions. N95s and modified face shields may be provided for cases requiring the surgeon to wear loupes such as ophthalmology cases. In addition, both phase 1 and phase 2 of patient recovery are considered to be low risk. PPE will be used accordingly. Weekly retrospective and prospective monitoring of PPE consumption will be necessary for safe operations.

All employees must be screened on a daily basis for symptoms related to COVID-19 per protocol. Employees who attest to having any of the aforementioned symptoms must be tested and negative for COVID-19 as well as afebrile for 72 hours to return to work, or, after a positive test, must be cleared for return to duty by occupational health. Attestation occurs via Kronos or on sign-in to a clinical workstation. Employees experiencing any symptoms consistent with COVID-19 should contact the Employee Covid Call Center. Maintain aggressive environment of care procedures adopted for COVID-19 including, but not limited to, the following areas: eliminating patient food areas, frequent cleaning of high touch surfaces in community spaces (eg, waiting rooms, door handles, elevators, etc.), restricting internal waiting rooms, and visitor

restrictions. Continue appropriate infection prevention guidance including universal masking, social distancing of at least 6 feet between people whenever possible, and surgical/procedural masks with eye protection for all health care workers interacting with patients.

Patient and visitor flow

Limit facility entrances with appropriate screening and PPE (universal masking/ COVID-19 questions) at all portals of entry for staff and visitors. Registration desk staff and patients must wear a face mask and maintain a physical distance from other people of 6 feet at all times. Limit one parent/guardian per patient. For same-day surgery patients, one visitor will be permitted and staff will escort them to the family lounge. The visitor will provide their phone number for updates and leave the building once the patient is taken to the prep area. Ensure appropriate terminal cleaning processes in clinical spaces.

Preoperative screening

In an effort to ensure the safety of patients and staff, all preoperative patients will be symptom screened and, ideally, tested for COVID-19 in addition to the standard preoperative assessment. Screening test is ideally obtained within the 48 hours before procedure or surgery but not more than 72 hours before surgery. Testing is highly recommended but not mandatory for asymptomatic patients (patients without symptoms of COVID-19). A surgery or procedure can proceed if the clinical team and patient agree to do so without a test or if the test result occurred more than 72 hours before the surgery or procedure.

For elective procedures, the patient will be symptom screened and, ideally, tested at the designated ambulatory testing station (strongly preferred) or other location. This requires providers to place the order for COVID-19 testing before the surgery/procedure using appropriate epic criteria for tent (routine, future, clinic collect). On resulting, members of CART will call patients to communicate their test results. If a prospective ASC patient has a positive COVID-19 test, providers will contact the patient, discuss the results, and make decisions accordingly. Patients with positive COVID-19 tests will be postponed and/or considered for treatment at a hospital-based outpatient facility. Patients should be referred back to their primary care physician for management of their COVID symptoms.

Staff safety and well-being

Ensuring the safety, health, and well-being of our staff is a priority. Physicians and other frontline health care professionals are particularly vulnerable to negative mental health effects, as they strive to balance the duty of caring for patients with concerns about their own well-being and that of their family and friends. As the hospitals ramps up to normal clinical volumes, the approach taken by the hospitals will be aligned with strategies developed by the hospital Office of Well-being. A support structure that encompasses safety, spiritual support, emotional support, mental health, and physical health ideas is valuable for management to deploy.

SUMMARY ON GUIDELINES FOR SURGERY IN THE TIME OF PANDEMIC

COVID-19 has called on all of us to change our lives in ways both trivial and important. In the case of delaying planned medical care, the decision to delay life-saving surgeries became an ethical quandary that was quickly made irrelevant by mandates from the government. As the pandemic ebbed, at least temporarily, hospitals and health care systems were able to resume elective surgeries and care and required guidelines to help them do so in an orderly and logical manner. Ours are presented here. Likewise, hospitals must retain the ability to toggle back and forth between ramping up and down as local conditions change. Such flexibility may be the “new normal” until there is effective vaccine development and distribution and maybe beyond.

DISCLOSURE

Neither author has any commercial or financial conflicts of interest to disclose. No external funds were used to support this manuscript.

Reference

- [1] Livingston E, Bucher K. Coronavirus disease 2019 (COVID-19) in Italy. *J Am Med Assoc* 2020;323(14):1335.
- [2] Knezevich A. Most Baltimore-area hospitals halt elective surgeries to ease strain on resources amid coronavirus outbreak. *Baltimore Sun*; 2020. Available at: <http://www.baltimoresun.com/coronavirus/bs-md-coronavirus-surgeries-20200315-3ojwc7ylgrczbaqqckh5ag3fastory.html>.
- [3] Evans M, Mathews AW. Hospitals push off surgeries to make room for Coronavirus patients. *Wall Street J* 2020. Available at: <https://www.wsj.com/articles/hospitals-push-off-surgeries-to-make-room-for-coronavirus-patients-11584298575%20>.
- [4] Rosenbaum L. The untold toll-the pandemic's effect on patients without Covid-19. *N Engl J Med* 2020;382(24):2368–71.
- [5] Prachand V, Milner R, Angelos P, et al. Medically-necessary, time-sensitive procedures: a scoring system to ethically and efficiently manage resource scarcity and provider risk during the COVID-19 pandemic. *J Am Coll Surg* 2020;231(2):281–8.