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Implementation and expansion of a preoperative COVID-19 testing process for pediatric surgical patients

The coronavirus disease of 2019 (COVID-19) pandemic, caused by the novel coronavirus SARS-CoV-2, presents significant risks to patients, families, and healthcare workers. In the absence of effective treatment and vaccination, the primary mechanism to minimize risk of transmission is to avoid close contact between individuals and detect COVID-19 positive patients through laboratory testing. Social distancing is difficult to achieve in the perioperative period. In addition, many patients may undergo surgeries categorized as high risk for aerosolization of virus-containing particles, or require endotracheal intubation, further increasing risk of exposure, particularly to healthcare workers. Mortality may also be higher for surgical patients who are COVID-19 positive.¹ Institutions are grappling with how to make the perioperative period as safe as possible for patients, families, and healthcare workers in the midst of this pandemic.

To limit unnecessary exposures, our institution has limited booking of surgical cases to those which are emergent, urgent, and semi-urgent (must be done within four weeks). Additional guidelines have been put in place to ensure frequent, thorough environmental cleaning, appropriate use and availability of personal protective equipment (PPE), allowing only one family member at patient's bedside, and symptom-based screenings prior to surgery. We screened patients and their families for cough, fever, shortness of breath, runny nose, or sore throat and often rescheduled symptomatic patients. However, symptom screening may not be sufficient, because patients may be infected but asymptomatic or may be in the incubation period and presymptomatic and able to infect others.¹ Therefore, we implemented a preoperative testing process of surgical patients. Laboratory testing for the SARS-CoV-2 virus was carried out using one of four molecular diagnostic assays that were approved under the Emergency Use Authorization by the FDA and validated in our laboratory. The four tests were used interchangeably as supplies are available (ePlex[®] SARS-CoV-2 Test [GenMark Diagnostics, Inc.]; Simplexa[™] COVID-19 assay [DiaSorin Molecular LLC]; Xpert[®] Xpress SARS-CoV-2 [Cepheid]; Allplex[™] 2019-nCoV Assay, [Seegene]). Laboratory testing for a respiratory virus during a pandemic faces challenges of having unknown disease prevalence and the difficulty of sampling the upper respiratory track. However, because the Washington DC region had a high burden of community spread of disease in children, we were concerned that there would be unrecognized infection in the community.⁶

The testing algorithm guides decision-making with regard to further surgical management:

- Asymptomatic patients with negative test results proceed.
- Patients with positive test results are rescheduled after a minimum of 2 weeks, and a negative test result. Any case deemed urgent with a positive COVID-19 test result will proceed.
- Patients presenting for an aerosol-generating surgical procedure without preoperative COVID-19 testing are either tested upon arrival, delaying the case until results become available, or have their surgery rescheduled with preoperative testing.

It does not address the appropriate approach to PPE, for which, our institution opted to follow the Anesthesia Patient Safety Foundation guidelines.⁵

The program was rolled out in two phases. Initially, due to a limited number of tests available and our inability to test all surgical patients, we developed an algorithm (Table 1) to standardize which patients should undergo testing. In this phase, prioritization was based on consensus among our institution's surgeons, proceduralists, and infectious disease specialists in which we risk stratified COVID-19 testing based on patient symptoms and procedure type. Any single SARS-CoV-2 related symptom was considered a high-risk patient. Procedures were categorized as high or low risk depending on the potential viral burden at the surgical site and risk of aerosolization of virus particles, with the highest threat being procedures involving the oral cavity, upper and lower respiratory tracts, gastrointestinal tract, and ophthalmology.²⁻⁴ Need for aerosol-generating procedures by the anesthesiologist (ie, intubation) was not considered in the testing algorithm because airway manipulation is involved in the vast majority of surgeries at our institution. Inpatients awaiting surgery were also tested according to the priority list described in Table 1.

Due to the 3-4 hour processing time of the COVID-19 test, it was logistically challenging to test outpatients on the day of procedure. Therefore, we created an outpatient preoperative "pop-up" testing clinic to test patients prior to their scheduled surgery. The partially outdoor "pop-up" site alleviates the need for families to enter the hospital and decreases risk of exposure among patients, their families, and healthcare staff. Patients are scheduled for outpatient testing usually within 48 hours of procedure date. To minimize risk of infection, patients are directed to avoid social contact and monitor for development of symptoms until their procedure.

Our outpatient testing clinic has been operating for eleven weeks. In the first phase (April 3-April 22, 2020), we tested 140 patients based on priority per Table 1, of which four tested positive (2.9%). In the second phase of implementation (April 23–present), due to increased laboratory capacity and support for testing, we were able to test all outpatients

TABLE 1 Priority groups for testing

Surgery risk ^a	Patient risk ^a	
	Low risk	High risk
Low risk	Testing when possible N=26	Testing prioritized N=1
High risk	Testing prioritized N=13	Testing required N=0

Abbreviation: N, positive test result.

^aHigh-risk surgeries include all aerosol-generating surgical procedures, including the following list. All other procedures are considered low risk. Ear, Nose, Throat: Tracheostomy, tonsillectomy and adenoidectomy, direct laryngoscopy and bronchoscopy, sinus surgery, nasal endoscopy, turbinate reduction, retropharyngeal or peritonsillar abscess (if intra-oral approach), all oral procedures (frenulectomy, ranula excision, biopsies), cochlear implant, tympanomastoidectomy. General and Thoracic surgery: As above, esophagoscopy or bronchoscopy, upper aerodigestive foreign body removal, thoracotomy or thoracoscopy, laparotomy or laparoscopy. Upper Gastrointestinal Procedures. Urology: Hypospadias with buccal graft; Ophthalmology: Dacryocystorhinostomy, repair of damaged nasolacrimal duct, orbital surgery. Dental/Oral-Maxillofacial: Dental rehabilitation, oral trauma, infection, cancer. Plastics: Mandibular osteotomy for Robin sequence, palatal devices for cleft lip/palate, trauma. Neurosurgery: Skull base surgery with intranasal approach.

^bHigh-risk patient defined as a patient endorsing any COVID-19 related symptoms including cough, fever, shortness of breath, runny nose, or sore throat over the last 2 weeks. All other patients defined as low risk.

scheduled to undergo surgery. In this phase, we tested 1215 patients of which 36 tested positive (3%). In total, we tested 1355 outpatients of which 40 were positive (3%), since we initiated outpatient preoperative testing on April 3. While our testing abilities have increased over time, our initial experience has shown that most asymptomatic pediatric patients in our community are not COVID-19 carriers, but a small percentage have tested positive and will require additional management.


We believe a standardized approach to preoperative COVID-19 testing based on patient symptoms, and risk of the procedure is crucial to ensure maximal safety of patients, their families, and hospital staff. This approach must not only be standardized but also adaptable in a changing environment taking into account the access to collection supplies, testing reagents, and changing surgical population.

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CONFLICTS OF INTEREST

None.

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