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Best Practice

Developing an Outpatient Pediatric Pre-Procedure COVID-19 Testing Model



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A B S T R A C T

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Purpose: The purpose of this project was to design, develop, implement, and manage a sustainable process for pediatric preoperative COVID-19 testing and use the test results to determine the level of personal protective equipment and infection control required for each patient for optimal surgical scheduling and preservation of resources.

Design: This quality improvement project used the Plan-Do-Study-Act methodology. Multiple cycles of re-evaluation refined this process which was standardized across the enterprise.

Methods: A process for preoperative testing for all patients undergoing procedures requiring anesthesia was developed and implemented.

Findings: A safe, feasible, timely process was developed and piloted to obtain COVID-19 test results to guide individualized interventions. During the pilot, 1,707 patients were screened, and five tested positive for COVID-19, eliminating the need to manage 1702 patients as COVID-19 positive.

Conclusion: To continue to safely re-open, knowledge of the patient's COVID-19 status is imperative to ensure a safe journey through the perioperative area.

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With the declaration of the novel coronavirus SARS-CoV2 (COVID-19) as a “public health emergency of international concern” by the World Health Organization on January 30, 2020, the care provided to patients in the United States changed dramatically.^{1,2,3} To contain the global pandemic, guidance was issued leading to a temporary suspension of most face-to-face care including elective and non-emergent surgeries, procedures and routine clinical care, limiting exposure to COVID-19 while expanding surge capacity and preserving PPE.^{1,3} Measures were incorporated to “flatten the curve,” designed to reduce the peak incidence of active COVID-19 infections and reduce potentially overburdening already stressed healthcare systems, especially the availability of critical care beds.²⁻⁴

COVID-19 has forced healthcare providers and institutions to make complex decisions regarding the provision of surgical care during the pandemic, including weighing the risks and benefits of

proceeding versus postponing essential surgeries.⁵ Research to date has demonstrated that delayed care during the pandemic has had detrimental effects on the health of children.⁶⁻¹² More children are presenting to the emergency room with acute illness as a result of delayed care due to fear of exposure to COVID-19 in the healthcare setting. Emergency room providers have been reporting an increased incidence of diabetic ketoacidosis, sepsis, complicated appendicitis, and advanced stage malignancy.⁶⁻¹² Developing a process to provide safe, timely surgical care to pediatric patients is integral to ensuring their ongoing health and development.¹³

In the initial phases of the pandemic, reliable serologic testing was lacking to identify COVID-19 positive patients. Healthcare providers, uncertain whether antibodies offered protection to the virus, relied on clinical and epidemiological factors to assess the likelihood of infection.^{2,4} As reliable testing began to emerge in limited quantities, only symptomatic patients were tested.² Faced with these challenges, early COVID-19 testing processes and workflows needed to be developed, piloted and rapidly implemented to address this urgent need.^{2,4}

However, as reliable tests became more available, including real-time reverse transcription polymerase chain reaction (RT-PCR), it became essential to redefine care processes and develop a sustainable

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This project was QI exempt from IRB approval.

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workflow for preoperative/preprocedural testing before and during the reentry process.^{2,3,14} In this setting, preoperative testing was deemed to be of the utmost importance, given the highly contagious nature of COVID-19 and the aerosols that anesthesiologists, surgeons, and perioperative, procedural and intensive care unit staff are exposed to during airway manipulation and intubation.^{4,15}

When we began this process, no evidence could be found describing processes to obtain COVID-19 samples from children scheduled for procedures requiring the administration of anesthesia. During implementation, only one published paper emerged describing the development of a preoperative process for COVID-19 specimen collection for aerosol generating procedures (AGPs) requiring anesthesia.³

As most of these procedures are AGPs, knowing the patient's COVID-19 status is critical to planning the appropriate level of PPE, procedure time and level of precautions necessary as the patient moves through the perioperative continuum, including the perioperative clinic, preoperative holding unit, the operating room (OR), the post anesthesia recovery unit and procedural areas.^{2,3} Additionally, the patient's COVID-19 status is critical in determining the room disinfection time between procedures.³ Gupta et al. described best practices and developed care algorithms for return to routine endoscopic procedures, indicating that by incorporating point of care testing and accurate clinical assessments, return to elective endoscopy was feasible.⁴ A similar literature review provided guidelines for the return of elective, nonurgent procedures and aesthetic surgery that included six specific guideline subsets and algorithms for: surgical risk management and risk stratification; perioperative and anesthesia management; preoperative testing and screening; perioperative pharmacologic prophylaxis; clinical management and contamination control; and patient information and patient consent.² Guidance was also developed for orthopedic procedures and otolaryngology.^{2,14,16,17}

Notably, a joint statement for resuming elective surgery was issued by the American College of Surgeons in collaboration with the American Society of Anesthesiologists, the Association of Perioperative Registered Nurses and the American Hospital Association, which described the timing for re-opening aligning with state and national recommendations.¹⁸ This included recommendations for COVID-19 testing, PPE, case prioritization and scheduling, as well as post-COVID-19 processes for the five phases of surgical care, data collection and management.¹⁸ These guidelines recognized that requirements will vary by geographic location and were intended to provide broad guidance to address these regional differences.¹⁸

Purpose

The purpose of this quality improvement project was to design, develop, implement, and manage a preoperative/preprocedure COVID-19 testing model for outpatients to support surgical expansion during the re-entry phase after significant care disruption, and to provide necessary surgery and procedures to pediatric patients. Specifically, the project aimed to:

1. Develop a sustainable process and workflow to conduct preoperative COVID-19 testing on all patients scheduled for surgery within 24 to 48 hours of the scheduled surgery.
2. Use the test results to determine the appropriate level of personal protective equipment (PPE) and infection control for each surgical patient to allow for optimal surgical scheduling; and
3. Preserve PPE and mitigate risk of exposure for staff, patients and families.

Methods

This QI project used Plan-Do-Study-Act methodology to design, develop and implement a process for preoperative testing for all patients undergoing surgical procedures requiring anesthesia. Given the dynamic and fast-paced nature of the evolution of the pandemic, the process was re-evaluated frequently as needs changed and research/guidelines evolved. This QI project took place in the Perioperative Care Coordination Clinic (PCCC) at a tertiary pediatric academic institution. The PCCC is a multi-disciplinary clinic that provides preoperative care coordination, clinical evaluation, and education to optimize pediatric patients undergoing general anesthesia for surgical procedures on the hospital's main campus. The PCCC staff consists of patient experience representatives, clinical assistants, nurses, nurse practitioners, and anesthesiologists. At our institution, QI projects are exempt from Institutional Review Board review.

Plan

A project management team was developed consisting of the PCCC nurse manager, two nurses, and three nurse practitioners. The team quickly expanded to include all PCCC nursing and nurse practitioner staff in varying capacities as needs arose. The PCCC team considered the following priorities when developing this process including: utilization of the appropriate levels of PPE to ensure the protection and retention of perioperative/procedural teams; maximizing operational efficiency and mitigation of revenue loss through the effective utilization of limited OR use secondary to COVID-19 state and federal guidelines; reduction of COVID-19 exposure risk to staff, patients and their families; and the reduction of fear and anxiety associated with hospital care. The creation of a process for preoperative COVID-19 testing allowed for an individualized risk-benefit assessment and the development of a plan of care for each patient related to AGPs.

Given the urgent need for patients to proceed to the OR safely during the pandemic for essential care, the team rapidly designed and developed an initial framework. The PCCC team frequently adapted the model between April and May 2020 to adhere to the quickly evolving enterprise-wide infection prevention and control guidelines, as well as state and federal guidance in response to rapidly evolving knowledge, and its impact on our operations. The model was updated based on the available support staff, space, and infrastructure.

Do

The PCCC team coordinated preoperative and preprocedure COVID-19 testing for extended-stay and day surgery patients within 24 to 48 hours of their scheduled procedure, beginning on April 8th, 2020. Patient information was obtained from the OR schedule in advance. The PCCC team then scheduled the pre-operative COVID-19 testing appointment and called the patient/family to provide education and appointment details.

Preoperative/preprocedure COVID-19 testing was initially coordinated at the entrance to our emergency department (ED) with ED nurses obtaining the COVID-19 specimens. Nucleic acid amplification testing (NAAT) was recommended by the Infectious Disease Society of America as the standard for COVID-19 testing.¹⁹⁻²⁰ RT-PCR was the form of NAAT used at our institution to process all preoperative COVID-19 test samples. RT-PCR was considered the gold standard for COVID-19 testing as it is characterized by rapid detection and both high sensitivity and specificity.^{21,22} Oropharyngeal (OP) swabs were collected on patients who were asymptomatic for COVID-19

infection. Per the Infectious Disease Society of America guidelines, all patients with one or more symptom of COVID-19 were tested by nasopharyngeal (NP) swab.¹⁹ This workflow allowed for one patient to be tested every 15 minutes between 8:30 and 12 PM. Patients and their guardians stayed in their cars while a nurse donned PPE and met the patient and family at their car to obtain an OP sample from an asymptomatic patient or a NP sample from a symptomatic patient. The duration from the time of collection to the result was approximately three and a half to four hours.

In order to accommodate patients and families unable to come to the hospital 24 to 48 hours in advance of their surgery, we provided testing either in the PCCC at the time of the preoperative clinic appointment or in the preoperative holding area on the day of surgery. The patient/family remained in isolation in a private room with COVID-19 precautions for several hours until the test was resulted, at which point the need for isolation was re-assessed. At the time of the initial implementation of the project, availability of local COVID-19 testing via primary care offices was inconsistent and unreliable as results were often delayed.

To facilitate ED test coordination, the PCCC team developed a Microsoft Excel database. The test results were reviewed by the PCCC team who communicated negative results to the perioperative team utilizing the preanesthetic evaluation form in the patient's electronic health record. In the event of a positive result, the surgeon and anesthesiologist were notified in order to facilitate a discussion regarding the risk/benefit of proceeding. In instances when the benefit of treating a COVID-19 positive patient outweighed the risk of delaying a procedure, the proper personnel, PPE, and OR arrangements were made. In addition to notifying the surgical teams and documenting positive results, the PCCC team provided education to families via telephone communication regarding their need to self-isolate and other measures for home contagion containment. The team also informed the primary care provider of the positive COVID-19 status in the event that the patient became symptomatic and needed further medical assessment/intervention.

Study

During April, only urgent, emergent, or time-sensitive procedures were moving forward, consistent with enterprise, state and federal

guidelines to decrease risk and reduce exposures at the peak of the COVID-19 pandemic. Thus, the volume of patients who required preprocedure/preoperative COVID-19 testing was low (Figure 1). The reopening of multiple hospital departments, planned for May 18, 2020, required changes to meet the increased demand. The preprocedure COVID-19 testing model grew quickly to accommodate preprocedure/preoperative patients from additional hospital departments, identified as the "affiliates" (eg, patients undergoing diagnostic imaging, interventional radiology procedures, gastrointestinal procedures, satellite surgeries, and cardiac procedures). As the volume of OR cases expanded, the model was adapted to meet the institutional needs. We realized we needed to quickly increase our capacity to schedule and complete COVID-19 tests. We also needed to address the growing number of patients and families facing hardship coming to the hospital 24 to 48 hours in advance to obtain preoperative COVID-19 testing.

Act

To address the need for expanded test scheduling capability, we created a centralized scheduling system and developed a novel role, the COVID-19 test scheduler, to facilitate testing and communication with multiple clinical teams. Initially, the COVID-19 test scheduler was a nurse or nurse practitioner on the PCCC team. As volume grew, this role was transitioned to a patient experience representative.

On May 4, 2020, the preprocedure COVID-19 testing site was relocated to the Patient Family Garage, which could support additional COVID-19 specimen collection. The site was staffed by public relations staff and a pool of nurses to support five COVID-19 tests to be taken simultaneously. The child life services department developed education to improve the patient/family experience and minimize patient stress and anxiety. Our behavioral response team nurses also became engaged to develop individualized behavioral plans to facilitate a safe plan for testing for patients with behavioral health needs.

In addition to our standardized process, some patients required individualized plans of care to ensure the preprocedure/preoperative COVID-19 testing was obtained. This need became particularly pronounced as volume increased. In some instances, preprocedure testing was facilitated at other clinics using a personalized plan of care to best meet the needs of each patient (eg in the infusion, dialysis, or

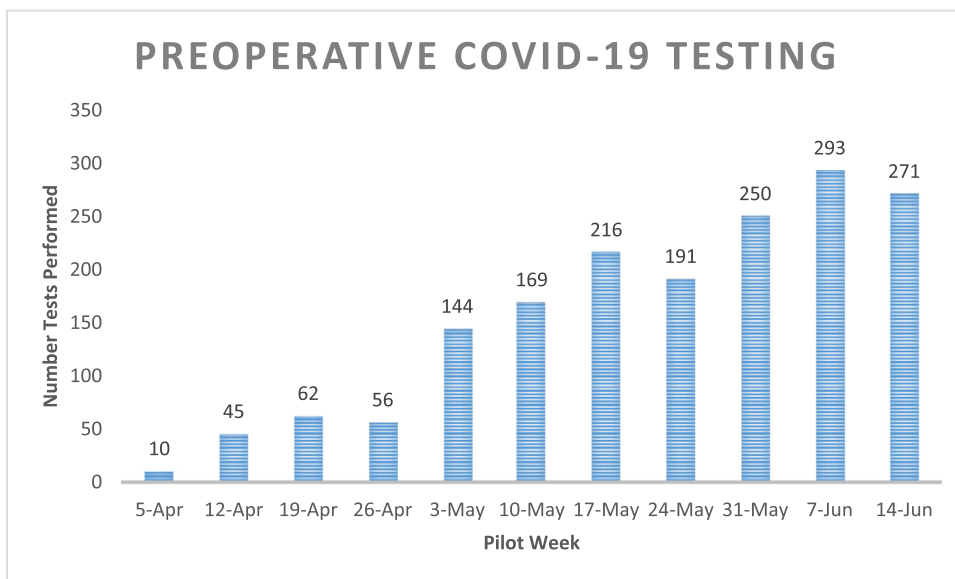


Figure 1. Perioperative COVID-19 testing during pilot period. This figure is available in color online at www.jopan.org.

cancer center). To ensure equitable access to care, as some families did not have access to a car, we partnered with our social work team, family relations team, taxi and public transportation companies to secure a vehicle in which the COVID-19 preprocedure/preoperative testing could be completed. The team also facilitated walk-up testing and arranged local accommodations for families when needed. As the widespread availability of local COVID-19 testing grew, our program accepted local test results as long as it was processed by NAAT (RT-PCR or transcription-mediated amplification) within 48 hours of the surgical start time. Antigen and antibody forms of testing had not been proven to be as reliable as standard RT-PCR in detecting the presence of active COVID-19 infection and thus were not accepted.^{23,24}

With the expansion of surgical services in May 2020, the increased volume of patients requiring preprocedure/preoperative testing triggered additional requests for COVID-19 testing to be completed in the clinic. Our team quickly realized that the clinic lacked adequate physical space to safely support preprocedure COVID-19 testing, and maintain the necessary isolation precautions and social distancing in the setting of complex pre-operative visits. Thus, we adapted the model for patients who required a preoperative visit, scheduling their visit either before the 24-hour window or collecting the COVID-19 testing the morning of the appointment in the Patient Family Garage. The availability of local, reliable COVID-19 testing at primary care offices also alleviated the need for day of surgery testing.

Findings

As of June 17, 2020, we had screened 1,707 patients. Only five COVID-19 tests were positive during this time. In the first week of the screening process, we tested 10 patients. However, by our second week, we saw the demand for testing begin to escalate, screening 45 patients. This escalation continued weekly as local, state and federal guidance evolved. By week 7, we screened 216 patients, or between 40 to 45 patients per day. With this escalation that continued from week 7 on, work was on-going to ensure this process would be transferrable to individual clinics and procedural areas, as well as perioperative services as the re-entry process continued. By week 10, we screened over 250 patients (Figure 1).

Discussion

A safe, feasible, timely process was developed and piloted to obtain COVID-19 test results and communicate them to our anesthesia and surgical teams to plan individualized interventions based on test results. Obtaining the COVID-19 test within 24–48 hours of a planned procedure requiring anesthesia continues to have significant implications for patient safety and perioperative workflow across the enterprise in the setting of the COVID-19 pandemic. The patient's COVID-19 status was imperative to safely re-open hospital departments to provide healthcare access to our pediatric population at a level equal or superior to the time before the COVID-19 pandemic. Only five patients of the 1707 were identified as COVID-19 positive, allowing 1,702 patients to no longer require being managed as COVID positive. This reduced the need for PPE, improved operating and procedural room efficiency, timely throughput and reduced environmental decontamination time throughout these areas. There were no instances of surgical cancellation due to lack of COVID-19 testing availability at our institution. All cases with negative COVID-19 precautions proceeded to the operating room per routine infection control policy, preserving valuable PPE. In the instance of a COVID-19 positive case, the surgical and anesthesia service collaborated to determine the risk versus benefit of proceeding with surgery. When the benefit of proceeding with surgery outweighed the risk of postponing, COVID-19 precautions were utilized perioperatively. With

this process in place, COVID-19 positive patients were identified and proper precautions implemented, thereby minimizing risk of exposure to staff, patients, and families.

Historically, nurses have been pivotal to the healthcare response to pandemics, and this has remained true during the COVID-19 pandemic.^{25,26} Nurses have been providing frontline patient care, advocating for policy changes, and developing innovative processes to sustain access to healthcare.^{27–31} As a result of the pandemic, the PCCC team has expanded to include additional pre-operative nurse practitioners, and one member of our team is designated daily as the Pre-op COVID manager. The Pre-op COVID manager serves as a resource for preoperative COVID-19 testing. In this role, we work closely with our institution's Infection Prevention and Control (IPC) colleagues as new COVID-19 research becomes available. We follow guidance from our Emergency Management team, related to ever-changing policies, procedures, and process changes related to COVID-19. Additionally, we provide guidance and recommendations regarding questions related to pre-operative COVID-19 testing and precautions for out-patients scheduled for surgery at our main campus. We collaborate with surgical and anesthesia colleagues regarding safe management options for COVID-19 positive patients. We guide nurses, schedulers, and various other providers regarding safe practices when potential COVID-19 exposures are identified. We also partner to determine the need for re-testing following a previously positive COVID-19 result when procedures are rescheduled. This role has changed as the pandemic has evolved and as pre-operative COVID-19 testing at our institution has continued.

Conclusion

To continue to safely re-open hospital departments and provide healthcare to our pediatric population, knowing the patient's COVID-19 status is imperative to ensure a safe journey through the perioperative continuum. The PCCC team will continue to facilitate and guide pre-procedure COVID-19 testing until COVID-19 is no longer a significant health risk to patients, families, and staff. Innovative methods that we have developed to coordinate preprocedure COVID-19 testing have been shared with additional enterprise-wide departments as operations slowly and safely return to a baseline volume of patients. The PCCC team will continue to refine the process and increase efficiency as more expedient, reliable testing becomes widely available. Data collection will be ongoing. This data may also have implications for predicted anesthesia and surgical outcomes in pediatric patients who test positive for COVID-19 and undergo a procedure requiring anesthesia. Implementing and streamlining a standardized process for COVID-19 preoperative and preprocedural testing has not only allowed the perioperative teams to reduce the need for additional time and resources, but mitigate risk and increase access to care as vaccines and new treatments are developed.

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