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Risk Stratification and Personal Protective Equipment Use in Pediatric Endoscopy During the Coronavirus Disease 2019 Outbreak: A Single-center Protocol

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ABSTRACT

SARS-CoV-2, the novel coronavirus causing coronavirus disease 2019 (COVID-19), is now a global pandemic. Human-to-human transmission has been documented to occur through respiratory secretions, feces, aerosols, and contaminated environmental surfaces. Pediatric patients present a unique challenge as they may have minimal symptoms and yet transmit disease. Endoscopists face risk for infection with viruses like SARS-CoV-2, as the aerosol-generating nature of endoscopy diffuses respiratory disease that can be spread via an airborne and droplet route. We describe our center's methodology for pediatric patient risk stratification to facilitate responsible use of endoscopic resources during this crisis. We also describe our recommendations for use of personal protective equipment by endoscopists, with the goal of ensuring the safety of ourselves, our anesthesiology and endoscopy staff, and our patients.

Key Words: , coronavirus disease 2019, endoscopy, personal protective equipment

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SARS-CoV-2, the novel coronavirus causing coronavirus disease 2019 (COVID-19), is now a global pandemic. Human-to-human transmission has been documented to occur through respiratory secretions, feces, aerosols, and contaminated environmental surfaces (1,2). Transmission can occur from both symptomatic and asymptomatic individuals (3). The risk of infection to healthcare providers (HCP) is substantial: in one of the earliest documentations of infection in Wuhan, China, 29% of patients were healthcare workers (4). It is unclear how much of the risk was related to community transmission or to breaches in use of personal protective equipment (PPE) during the care of patients with COVID-19. It

appears inevitable that, when performing endoscopy, HCP will be exposed to either respiratory or gastrointestinal fluids from patients. Thus, adequate protection of HCP during endoscopic procedures is now critical. An Italian group has provided recommendations regarding the safe performance of endoscopy of adult patients during the COVID-19 outbreak (5).

Pediatric patients requiring endoscopy represent a unique challenge, as they are disproportionately asymptomatic or mildly ill if infected, yet can still transmit disease (6). Despite the need for mobilization of resources to address this pandemic, there remain children who require ongoing care and evaluation from a specialized gastroenterology team, including endoscopy. Delaying such procedures may compromise patient health and strain future resources. The inability to predict when the surge in community infection and demand for hospital resources will occur further complicates care decisions. We here report our methods for pediatric patient risk stratification and associated utilization of PPE to facilitate responsible and safe procedures for patients in this pandemic. It is based on review of the available and relevant literature, primarily from China, and local experience.

RISK STRATIFICATION AND PERSONAL PROTECTIVE EQUIPMENT DURING ENDOSCOPY

There are currently no reports in the literature of SARS-CoV-2 infection directly linked to an endoscopic exposure. As endoscopy is an aerosol-generating procedure (AGP), the risk for infection, however, remains. Coughing and retching during upper endoscopy generates aerosols (7). Patients undergoing colonoscopy may pass flatus or liquid stool, which disseminates organisms to nearby surroundings. Fecal carriage of SARS-CoV-2 has been documented, implying that the virus actively replicates in the gastrointestinal tract even after viral clearance in the respiratory tract (8). Recently, the World Health Organization (WHO) has published guidelines for rational use of PPE for COVID-19, including specific instructions for healthcare workers performing AGP on patients with known/documented COVID-19 (9). These include the use of a respirator (N95 respirator or equivalent), water-resistant gown, gloves, and eye protection for personnel in the endoscopy suite. At the same time, we also recognize the need to conserve PPE and other needed resources in anticipation of the surge of COVID-19 patients that require hospitalization.

This report is designed to ensure the safety of ourselves, our anesthesiology and endoscopy staff, and our patients without overly taxing front-line responders' need for PPE during this crisis. In the absence of routine viral testing, in keeping with guidelines outlined by Repici et al (5), we stratify the patient's COVID-19 risk based on symptoms and sick contacts (Table 1). Decisions regarding

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TABLE 1. SARS-CoV-2 infection risk in pediatric patients requiring endoscopy

Classification of potential COVID-19 infection risk in pediatric patients undergoing endoscopic evaluation

Low risk	No symptoms (eg, cough, fever, shortness of breath) in the past 14 days AND No known contact with confirmed COVID-19 case
High risk	At least 1 symptom (eg, cough, fever, shortness of breath) in the past 14 days, with: Contact with confirmed COVID-19 case OR At least 1 symptom (eg, cough, fever, shortness of breath) in the past 14 days, with: No known contact with confirmed COVID-19 case OR No symptoms (eg, cough, fever, shortness of breath) in the past 14 days, but: Contact with confirmed COVID-19 case
Unknown risk	In an emergency setting, all procedures should be considered high risk if patient history cannot be properly assessed

COVID-19, corona virus disease 2019.

appropriate PPE use are then made based on the patient’s assessed risk (Fig. 1). Our proposed stratification takes into account the higher probability that an asymptomatic or mildly ill child may be infected with SARS-CoV-2 and is infectious. Review of the data from Wuhan, China reveals that nearly 18% of all children with SARS-CoV-2 infection are asymptomatic (3). Given initial limitations in the availability of testing for SARS-CoV-2 infection, however, our institution’s current screening algorithm specifies testing only individuals with influenza-like illness and exposure to a patient with known COVID-19. As our own lab-developed testing capabilities increase, we anticipate future modifications of our pre-procedure screening to incorporate oropharyngeal and nasopharyngeal swabs for SARS-CoV-2 infection. Stool testing, along with anal swab tests, may also present future preprocedure screening possibilities.

We advise placing a surgical mask on the high-risk and unknown risk patient for transport in and out of the procedure room. We limit all nonessential personnel for all procedures, with no more than 5 individuals in the endoscopy suite at a time. We recommend use of a negative pressure room, rather than a positive pressure room, for all endoscopic procedures (Fig. 2). A neutral pressure room with the door closed may be used if all personnel in the room don a powered air-purifying respirator (PAPR) in lieu of hair covering, N95 respirator, and eye protection, as well as using a water-resistant gown and double layer of gloves. This room would need to remain closed for 1 h after the procedure is complete to allow enough air exchange to evacuate suspended infectious particles. Appropriate signage should be placed outside the procedure room, indicating to others that an AGP is occurring (Fig. 3).

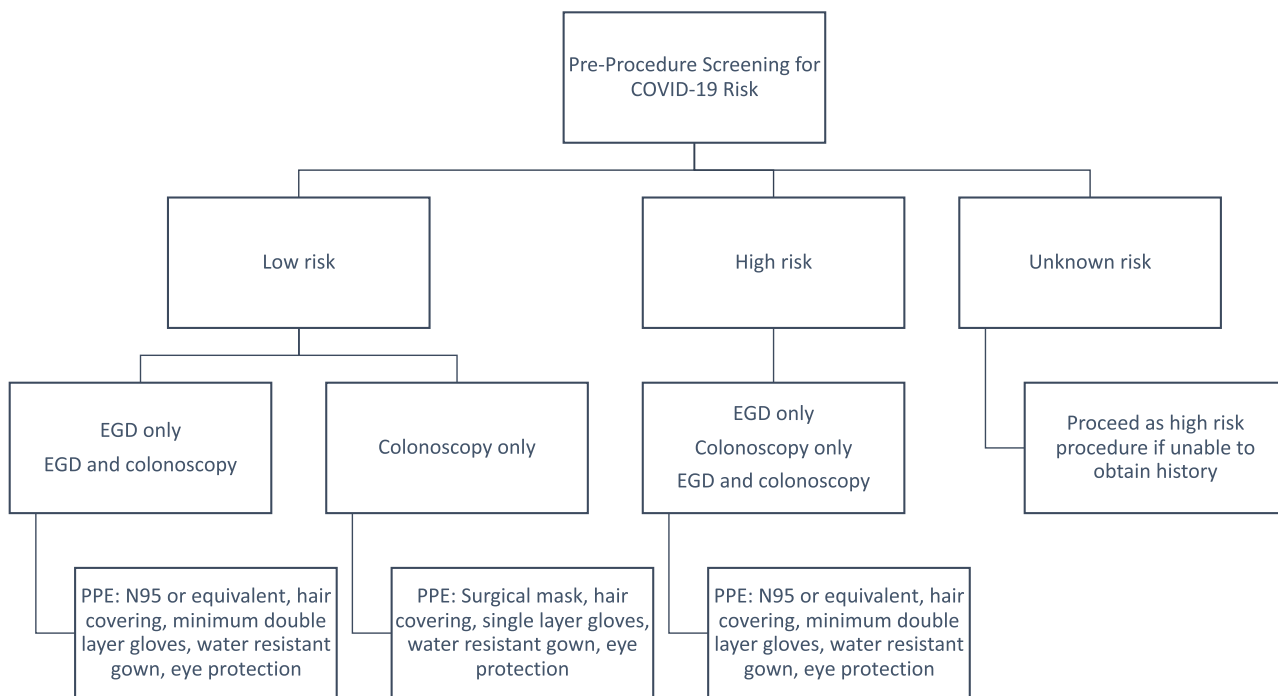


FIGURE 1. Personal protective equipment utilization algorithm for endoscopists.

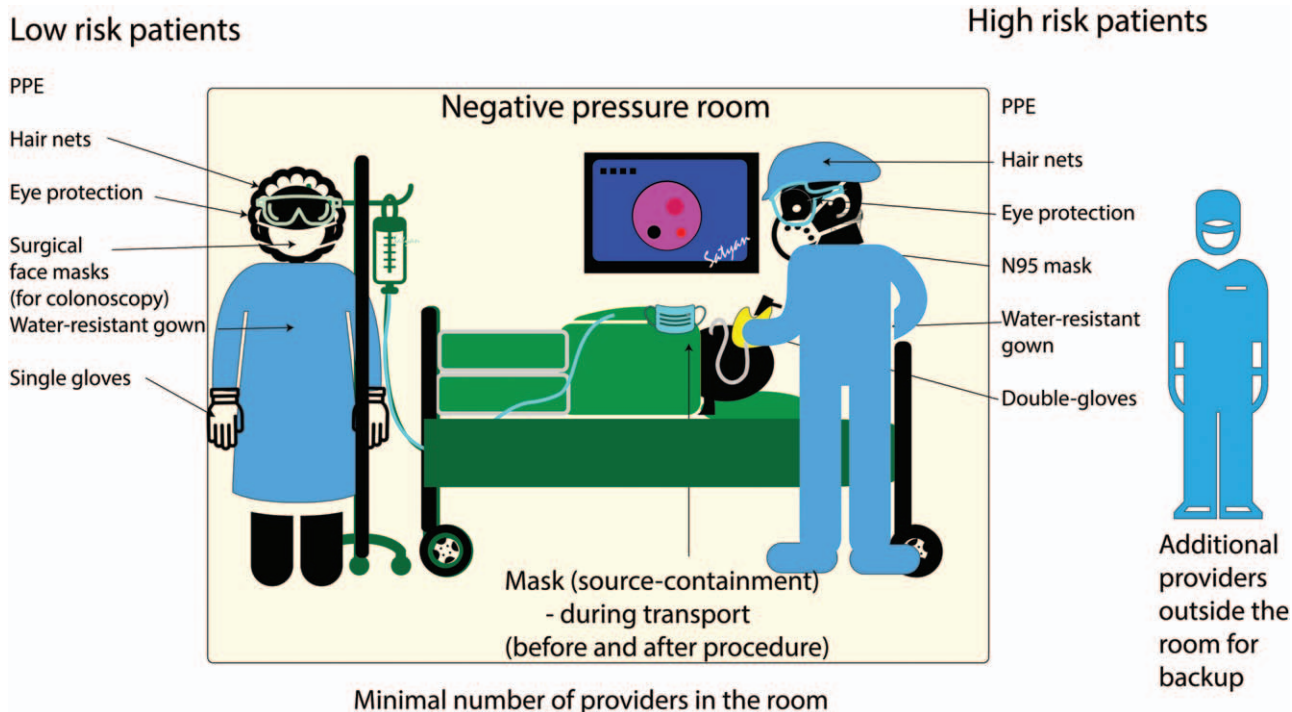


FIGURE 2. Personal protective equipment utilization in the endoscopy suite.

SCHEDULING OF ENDOSCOPIC PROCEDURES

In an effort to support patient-centered care, we plan to perform all previously scheduled and new outpatient endoscopic procedures that are deemed “essential” for as long as adequate

PPE resources described in these recommendations will allow. We define “essential” endoscopic procedures as those that, if delayed more than 8 to 12 weeks, would predispose a child to harm or injury. Should the status of available PPE or provider workforce change, we anticipate limiting our procedures only to “emergent” procedures (eg, foreign body removal, gastrointestinal bleeding, diagnostic procedures in hospitalized patients). We will also review the risks and benefits of endoscopy with our patients’ families in advance of procedure, as well as the potential risks of exposure to SARS-CoV-2 associated with nonadherence to the public health recommendations to “shelter in place.” Many patients’ families may choose to reschedule procedures until after current social distancing restrictions have been lifted. If a patient’s endoscopic procedure is delayed, we will regularly assess the patient’s clinical status to ensure safety and provide necessary supportive measures in the interim. We have created a registry to enable monitoring of affected patients via telemedicine evaluation and to facilitate future procedure rescheduling.

Aerosol-Generating Procedure In Progress

DO NOT ENTER

AUTHORIZED TRAINED PERSONNEL ONLY

- PAPR or N95 + Eye Protection Required During Procedure and 1 Hour Post-Procedure
- Keep Door Closed

OR

TIME PROCEDURE ENDED: TIME ROOM IS AVAILABLE:
(60 Minutes Post-Procedure)

SUMMARY OF RECOMMENDATIONS

If viral testing for SARS-CoV-2 infection is not available, patient risk stratification before endoscopy may be accomplished based on symptoms and sick contacts.

Emergent procedures, including but not limited to foreign body retrieval, diagnostic and therapeutic evaluation of gastrointestinal bleeding, and procedures in hospitalized patients should be prioritized.

We suggest limiting outpatient procedures only to “essential” procedures (defined as procedures that, if delayed more than 8–12 weeks, would lead to harm or injury). Ultimately, final decisions regarding the scheduling and timing of endoscopy will be made through shared decision-making between the individual gastroenterologist, patient, and the patient’s family.

FIGURE 3. Aerosol generating procedure notification.

At minimum, those in the pediatric endoscopy suite will require use of gloves, water-resistant gowns, surgical face masks, eye protection, and hair coverings for all endoscopic procedures.

For low-risk and high-risk patients requiring upper endoscopy and high-risk patients requiring colonoscopy, endoscopists will utilize N95 respirators (in lieu of surgical face masks) or equivalent in addition to the PPE listed above.

PAPR may take the place of surgical face masks/N95 respirators, eye protection, and hair coverings.

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