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Sharing strategies for safe delivery of surgical care for children in the COVID-19 Era

1. Background

Optimal perioperative practices in the setting of Coronavirus Disease 2019 (COVID-19) remain under evolution [1,2]. We aim to provide an update to our prior publication [3] regarding pediatric surgical practices to help guide safe perioperative decision-making related to COVID-19. Specifically, we provide reports on ongoing controversial topics, including concerns around increased postoperative morbidity and mortality secondary to COVID-19, current perioperative protocols regarding personalized protective equipment (PPE) and patient screening, and variation in current practices around the timing of elective surgical care [1,4].

2. Methods

A 30 question survey regarding COVID-19 related pediatric surgical practices was created and distributed electronically through the American Pediatric Surgical Association (APSA) Library's COVID-19 for Pediatric Surgeons webpage [5]. Design and distribution of similar data-sharing documents have been reported previously [3]. Key stakeholders from APSA were invited to share institutional and operative practices in the era of COVID-19. Responses were retrieved from June 1 to June 30, 2020, and August 15 to October 26, 2020, as free text and coded by the theme of common answers using an inductive coding approach. Descriptive analyses and chi square tests were performed, when appropriate, using SAS 9.4 (Cary, NC).

3. Results

For the June survey, 26 hospitals reported data; this number decreased to 11 hospitals in October. Across all data collection periods, hospitals reported caring, cumulatively, for at least 6355 COVID-19 positive pediatric patients as inpatients since March 2020. Our surveys specifically queried whether adverse respiratory events or additional post-surgical complications that could be attributed to COVID + status occurred following general anesthesia. As of October 26, hospitals reported operating on an aggregate of 284 COVID + pediatric patients (symptomatic and asymptomatic) with a total of 0 COVID-related adverse events reported for patients who were asymptomatic at the time of the operation (Table 1).

At the time of the October survey, 63% (7/11) of institutions were performing elective surgeries without restrictions, with the remaining 36% (4/11) following hospital-based protocols. One of these four hospitals with restrictions reported that they were experiencing a local COVID-19 surge. All institutions were performing outpatient preoperative COVID-19 testing, with a majority (6/11) of screening tests performed within 72 h of the operation, 36% (4/11) within 48 h, and one institution offering up to 5 days preoperatively. Only 9% of hospitals (1/11) also tested patients' parents. Despite the paucity of reported adverse postoperative events for asymptomatic patients, all hospitals (11/11) reported delaying elective procedures for COVID-19 positive patients for variable amounts of time, ranging from 10 days to 4 weeks or more. Further, 82% (9/11) of hospitals reported they would require repeat testing before rescheduling the procedure, with 67% (6/9) of responders reporting they would continue to test until negative (Table 1).

Across both data-sharing timepoints, intraoperative PPE precautions were consistent (Table 2). Eighty-two percent (9/11) of hospitals performed intubation with only anesthesia providers in the operating room, with the remaining 18% permitting the surgical team to be present with appropriate PPE. All hospitals reported that surgical team members were to wear both N95 masks and eye protection during minimally invasive procedures with 27% (3/11) also using smoke evacuators as a precaution. During the initial COVID-19 surge in the spring, 8% of hospitals (5/60) had reported limiting laparoscopy. By September, all hospitals reported they were not limiting laparoscopy. Furthermore, only 9% (1/11) of institutions currently report using non-operative intervention for appendicitis, which was not significantly different from the rate reported in the June survey (19%, $p = 0.42$). Seventy-three percent (8/11) of hospitals report both face mask and eye protection are required for all patient encounters, whereas 27% (3/11) report only universal masking for all patient encounters.

Finally, hospitals are reporting that employee screening and social distancing precautions are still in place but may be difficult to enforce. Almost half (5/11) of institutions in the September survey reported having one or more surgical attending staff contracting COVID-19 since March. Fifty-five percent (6/11) of institutions report their hospitals require pre-shift screening surveys, with the other half (5/11) also reporting use of mandatory temperature to complement screening surveys before work. All hospitals report social distancing guidelines for common areas like lounges and workrooms, but one institution commented on the difficulty of enforcing these guidelines.

4. Discussion

This report provides descriptive data on pediatric surgical practices throughout the United States in the context of the COVID-19 pandemic. Notably, there was a 0% adverse event rate following surgery in asymptomatic COVID-19 positive pediatric patients who received an operation. These data indicate that operative procedures may be safe for asymptomatic COVID-19 positive children. Second, most hospitals report delaying elective cases for patients who test positive for COVID-19 on routine screening. This prac-

Abbreviations: APSA, American Pediatric Surgical Association; COVID-19, Coronavirus Disease 2019; OR, Operating Room; PPE, Personal Protective Equipment.

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Table 1
Reported COVID-19 Burden and Surgical Practices by North American Pediatric Surgical Institutions.

Reported COVID-19 Burden and Practices by Pediatric Surgical Institutions June 2020- October 2020							
	# pediatric patients with COVID-19+ admitted in hospital		# pediatric COVID-19+ with operations since March 2020			# adverse events after operation while asymptomatic and COVID-19+	
Total N (Sum across all institutions)	6355		284			0	
Percent of institutions reporting non-op management for appendicitis (June 2020)	Percent of institutions reporting non-op management for appendicitis (Sept 2020)	Delay elective cases in COVID-19+ children (% yes)	Delay case until:				Retest even if asymptomatic? (% yes)
			> 4 weeks	<= 4 weeks	Up to 2 weeks	Un-determined date	
19%	9%	100%	36%	36%	18%	9%	82%

Abbreviations: COVID-19: Coronavirus Disease 2019; Non-op: non-operative.

Table 2
Reported preventative practices performed by healthcare staff.

	PPE for COVID-19 positive operations (laparoscopic and open)			Employee Screening		
Policy	N95 with eye protection	N95, no eye protection required	Surgical mask with eye protection	Screening Survey only	Screening and Temperature checks	Social Distancing in Common areas
% reporting	90%	0%	10%*	55%	45%	100%

* this institution reported deferring surgical vs. N95 to the surgeon based on preference and corresponding use of a face shield Abbreviations: COVID-19: Coronavirus Disease 2019; PPE: Personal Protective Equipment.

tice is not consistent with recent Centers for Disease Control (CDC) guidelines suggesting that repeat testing is not necessary after a person has had ten days without symptoms [6,7]. We also observed significant variation in time to rescheduling a deferred procedure and variation in the degree of screening and social distancing practices that may be in place for surgical staff and healthcare workers.

We acknowledge the limitations of these data, as they are self-reported and may be subject to recall bias. Nonetheless, the trends observed provide perspective regarding ongoing clinical concerns for pediatric patient care in the ongoing pandemic. First, current evidence available from the adult literature suggests that laparoscopy may still be used safely for cases of COVID-19 and PUIs, and encourage the use of filtration of insufflation gasses and with surgical staff maintaining proper PPE precautions [8]. Second, reports from our data-sharing document suggest that COVID-19 positive (asymptomatic) patients may be at low risk for adverse events following surgery. This is notably in contrast with the literature on perioperative outcomes for adults with COVID-19 positive disease. In this population, multiple studies have shown that rates of 30-day pulmonary complications and mortality are higher among adults who are positive for COVID-19 at the time of surgery [2,9] In a large international case series of perioperative complications after adult surgery, specific risk factors of age greater than 70 years old, being of American Society of Anesthesiologist (ASA) class III or greater, malignancy, or emergent operations were associated with a greater adjusted Odds ratio of 30-day mortality [9]. It is possible that the younger age, overall lower ASA class, and absence of prior symptoms may decrease the risk of adverse outcomes after surgery while COVID-19 positive, though evidence on this topic is lacking. Conversely, pediatric surgeons have reported failure in non-operative management for patients whose surgery, particularly emergent surgery, is deferred owing to COVID-19 status. One report from a busy children's hospital at the beginning of the pandemic reported failure of non-operative management for appendicitis among 55% of a cohort reviewed more than 5 weeks of the pandemic [10]. Further, limited reports demonstrate that opting to defer surgical management for appendicitis and soft tissue infection in patients who were COVID-19 positive have resulted in longer lengths of stay, require prolonged antibiotic therapy, and multiple IR-guided procedures for infectious control management [11]. Formal studies investigating the effect of COVID-19 on surgical outcomes in children are needed to inform safe and best practices in this era fully.

An additional concern that affects decision-making regarding invasive versus non-invasive clinical management for certain diseases is the risk to surgeons and healthcare workers. Our report indicates that more than 70% of institutions require N95s and protective eyewear to protect staff in cases of PUI or COVID-19 positive procedures. In approximately 25% of cases, additional special precautions for intubation and extubation were reported to be applied routinely and used in suspected and confirmed cases. CDC guidelines and additional retrospective studies have suggested that sufficient protection is provided to healthcare workers through the use of these PPE measures. The most significant risk of transmission is through the interrupted practice of proper social distancing and universal masking behaviors [12]. At the time of this research letter, there are no reported cases of COVID-19 transmission from an infected pediatric patient to a healthcare worker. However, our September survey reported that almost half of the respondents had a surgical coworker contract COVID-19. Accordingly, focusing attention on improving enforcement of healthcare worker safety guidelines for social distancing in common spaces (like elevators, lounges, workrooms) and enforcing regular screening and testing may be useful to decrease healthcare worker transmission.

5. Conclusions

Operations for asymptomatic COVID-19 positive children may be safe to perform without increasing the risk of postoperative adverse events. However, a majority of pediatric centers are still deferring elective surgical care for children with COVID-19 infection. Also, there are variations in both provider practices and society guidelines regarding the appropriate interval between positive

COVID test and rescheduling elective surgical intervention. Future studies are required to 1) verify safety of general anesthesia for COVID+ asymptomatic pediatric patients, 2) evaluate the potential negative consequences of delaying surgical care for additional pediatric pathologies and 3) define the appropriate interval between a positive COVID test and elective surgery. Lastly, further efforts targeting healthcare worker transmission prevention may be necessary to reduce rates of COVID-19 positivity among staff.

Level of Evidence

IV.

Declarations of Competing Interest

None.

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