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A Conceptual Framework for Rescheduling Elective Pediatric Gastroenterology Procedures Following COVID-19 Pandemic Lockdown

ABSTRACT

Elective surgical and endoscopic procedures were suspended nationwide during the March 2020 COVID-19 pandemic to minimize exposure and healthcare resource utilization. This resulted in an unprecedented backlog of procedures in most clinical practices including pediatrics. Our group developed an internal process toward the rational development of an algorithm prioritizing elective procedures. This was based on patient disease severity defined by the presence of alert symptoms, symptom severity for dysphagia and abdominal pain, and diagnostic investigation findings. The underlying rationale is to prioritize patients in whom suspected disease course would be greatest impacted by endoscopy. We developed a nurse phone call-based process utilizing REDCap®, identifying relevant symptoms categorized by severity, and a validated functional impairment questionnaire for abdominal pain. We abstracted key laboratory and radiological findings also categorized by severity. The order of priority of procedures was established on the basis of a 4-tiered system factoring both presence and severity of symptoms or prior diagnostic testing results. We present the framework that we have adopted toward prioritizing procedures with the assumption that it offers an objective methodology and that can be efficiently and more broadly applied to other similar practice scenarios. Our tool may have wide-ranging implications both in the current COVID-19 pandemic and in other scenarios of limited resource allocation and deserves further investigation.

In March 2020, in response to Surgeon General and Centers for Disease Control and Prevention (CDC) direction, elective ambulatory procedures including pediatric endoscopic procedures were suspended nationwide (“Surgeon General Advises Hospitals,” n.d.; CDC, n.d.) due to severe acute respiratory syndrome coronavirus-2 (SARS-CoV2). The rationale was to mitigate COVID-19 transmission, reducing related morbidity and mortality, protecting healthcare workers,

and preserving healthcare system functioning. This was followed by related guidelines from adult gastroenterology societies (American College of Gastroenterology, n.d.) and recommendations by pediatric gastroenterology societal leadership (Murray, 2020; Walsh, Fishman, Lerner, & NASPGHAN Endoscopy and Procedures Committee, 2020).

With an unprecedented amount of cancellations or postponements, a significant gap would be realized

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when “stay-at-home orders” and related restrictions are relaxed. Specifically, our center recognized that there would be an approximate threefold increase in procedures to be scheduled. This challenge was shared by similar clinical services in the United States (U.S.) and abroad. A three-tiered classification system that differentiates “emergent,” “urgent,” and “elective” pediatric endoscopic procedures has been proposed (Walsh et al., 2020) to help prioritize performance of endoscopic procedures during the pandemic. However, there is, to date, no evidence base or published literature to help guide rebooking of elective procedures once the restrictions begin to ease.

Background

Our backlog of cases triggered an internal effort by a multidisciplinary team of pediatric gastroenterology providers, including physicians and psychologists, toward developing an internal process to triage our elective cases for rescheduling once clinical operations resume. The underlying rationale was to reschedule, prioritizing patients with the greatest likelihood of impact on management and greatest evidence of ongoing distress, functional impairment, and/or disease severity first.

Our focus included defining laboratory and radiological findings related to a more severe inflammatory bowel disease (IBD) phenotype (Arai et al., 2017; Hyams et al., 1991; Imbrizi et al., 2019; Khan, Patel, Shah, Trivedi, & Yang, 2017; Rieder et al., 2014; Tibble, Sigthorsson, Foster, Forgacs, & Bjarnason, 2002; Walker et al., 2007), the highest likelihood of celiac disease

(assuming the institution has not adopted ESPGHAN criteria, by which the diagnosis of celiac disease may in specific clinical scenarios be established without duodenal biopsies) (Husby et al., 2012), or intestinal mass lesions, given the management implications. Beyond that, we focused on developing an algorithm for prioritizing patients requiring elective endoscopy based on severity of other factors that would, collectively, indicate greater impairment in daily life and argue for earlier procedural scheduling to guide treatment. Herein, we describe the conceptual framework we developed and are adopting toward rescheduling elective pediatric gastroenterology procedures at our center.

Framework Development Process

Our center had already determined that, in line with the recommendations by the American College of Gastroenterology, clinic nursing would reach out to families awaiting outpatient endoscopy to monitor symptoms that may justify escalating rescheduling and offer support or interim management options as determined by the referring physicians. This phone call was determined to be an ideal opportunity to abstract clinical information (Figure 1) that could be helpful in prioritizing the rescheduling of the “elective” diagnostic endoscopy group.

We developed a template that would identify relevant symptoms (Table 1) and key laboratory and radiological findings categorized by severity (Table 2). Symptoms other than dysphagia or abdominal pain were outright defined as severe or nonsevere, whereas

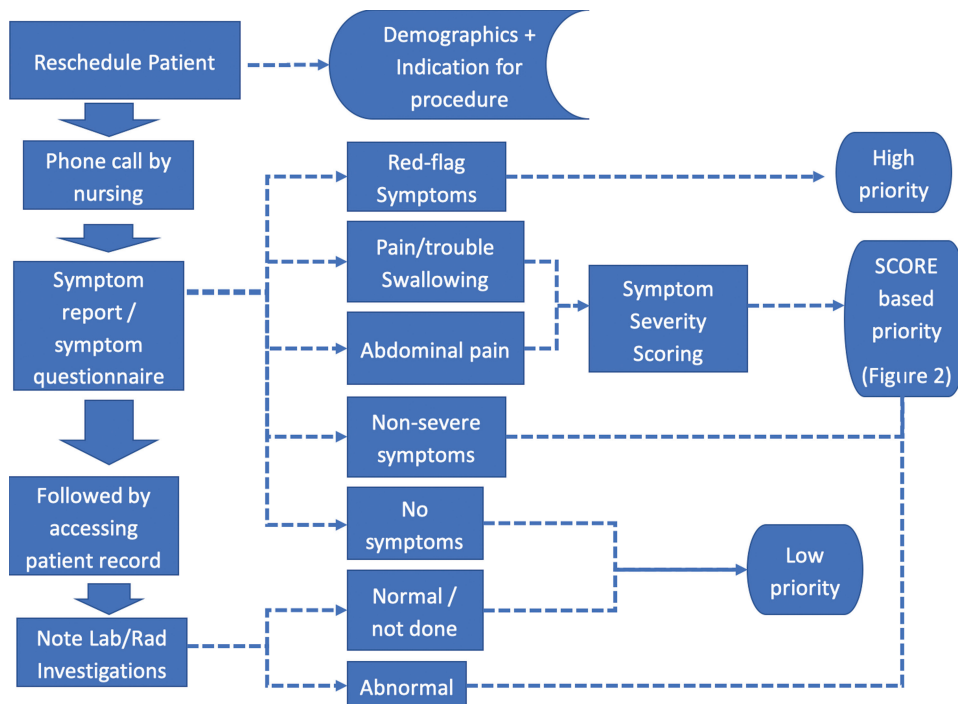


FIGURE 1. Process algorithm—Case abstraction.

TABLE 1. Symptom Classification

Severe symptoms
• Vomiting blood (hematemesis)
• Rectal bleeding (hematochezia) ± diarrhea
• Black tarry stool (melena)
Symptom severity based on scoring
• Difficulty swallowing (dysphagia)
• Pain on swallowing (odynophagia)
• Abdominal pain
Nonsevere symptoms
• Reflux/heartburn
• Bloating
• Diarrhea
• Nausea
• Vomiting
• Weight loss/poor weight gain
• Food refusal

binary severity scoring was predefined for dysphagia and abdominal pain based on the frequency of symptoms and quality-of-life impact, respectively, as described later. Laboratory indices were limited to inflammatory indices; both stool markers for inflammation and hematological/liver and celiac serology were categorized as mildly abnormal or markedly abnormal based on published parameters relating to IBD extent and severity and the likelihood of celiac disease (Husby et al., 2012).

Dysphagia was categorized as absent, mild/moderate, or severe by the frequency of pain or trouble upon swallowing (Table 3). We included a validated questionnaire Child Activity Limitations Interview-9 (CALI-9; Table 4) to be administered to a parent/

TABLE 2. Laboratory and Radiology Abnormality Scoring

	Abnormal	Markedly Abnormal	
Laboratory findings			
Calprotectin	Outside reference range	≥250 µg/g	
Lactoferrin		≥500 µg/ml	
Albumin		≤3 g/dl	
ESR		≥35 mm/hr	
CRP		≥2 mg/dl	
Hemoglobin		≤10 g/dl	
Hct		≤30%	
tTG IgA		≥10× ULN	
Radiological findings			
CT abdominal		Isolated inflammatory changes	Stricture/dilation/fistula/perineal abscess
MRE/MRI abdominal			
<p><i>Note.</i> CRP = C-reactive protein; CT = computed tomography; ESR = erythrocyte sedimentation rate; Hct = hematocrit; tTG IgA = tissue transglutaminase immunoglobulin A; MRE = magnetic resonance enterography; MRI = magnetic resonance imaging; ULN = upper limit of normal.</p>			

TABLE 3. Dysphagia Scoring

	Mild/Moderate	Severe
Pain or trouble swallowing	Present anytime	Daily/every other day

caregiver that could assess the patient's functional impairment due to chronic pain in school-aged children (Holley, Zhou, Wilson, Hainsworth, & Palermo, 2018; Palermo, Lewandowski, Long, & Burant, 2008). This was deemed important to assess in lieu of pain severity, as we needed an observable measure of pain, and pain impact, that parents could provide via phone, which would allow us to assign urgency. Furthermore, physical functioning is recognized as a core outcome/assessment point in pediatric chronic pain. The CALI-9, once completed for all patients, would allow classification of functional impairment as a measure of abdominal pain.

The CALI-9 was anticipated to be used in two ways. First, the CALI-9 functioned as an additional marker of symptom severity, given that scores on the CALI-9 have been associated with pain intensity in validation studies. Those patients obtaining a *T* score of 66 or greater would be considered to have severe abdominal pain, whereas those with a *T* score of 33–66 were considered to have mild/moderate symptom severity (i.e., nonsevere symptoms) based on this measure. Cutoff scores were determined on the basis of both “face” validity (i.e., item response average indicative of greater functional impairment) and validation sample values indicating that these would be reasonable cutoffs for severe versus more mild to moderate pain intensity. The CALI-9 total score would then be used in the algorithm to aid in classifying patients on symptom severity.

Second, within each classification group, the CALI-9 total score would be used to order patients within the group by severity of impairment/impact on daily functioning, thus providing schedulers with a single rank-ordered total list to work from. Any markedly abnormal laboratory index or radiological finding (Table 2) will accordingly categorize the patient as higher priority. This approach, which was not contingent upon new data coming in or comparisons between patients, would also support continued classification and ranking of patients newly referred for endoscopic procedures, creating a single “stream” of patients to be scheduled by priority for as long as resources remain limited.

Our suggested template for prioritizing procedures for rescheduling purposes is summarized in Figure 2. Our scripted process for abstracting the relevant information during one phone call is summarized in Figure 1. The order of procedures is established on the basis of the combination of symptoms and investigations: (1) highest priority: severe symptoms AND

TABLE 4. CALI-9: Parent Report

	Not Very Difficult	A Little Difficult	Somewhat Difficult	Very Difficult	Extremely Difficult
Sports	0	1	2	3	4
Doing things with friends	0	1	2	3	4
Sleep	0	1	2	3	4
Eating regular meals	0	1	2	3	4
Schoolwork	0	1	2	3	4
Running	0	1	2	3	4
Riding in the school bus or car	0	1	2	3	4
Walking one to two blocks	0	1	2	3	4
Being up all day (without a nap or rest)	0	1	2	3	4

Note. Think about your child’s activities over the last 4 weeks. Please rate how difficult or bothersome doing these activities was for your child because of pain. CALI-9 = Child Activity Limitations Interview-9.

markedly abnormal investigations, OR severe symptoms AND mildly (nonmarkedly) abnormal investigations, OR nonsevere symptoms AND markedly abnormal investigations; (2) intermediate-high priority: non-severe symptoms AND mildly abnormal investigations, OR severe symptoms alone, OR markedly abnormal

investigations alone; (3) intermediate-low priority: nonsevere symptoms, OR mildly abnormal investigations alone; and (4) low priority: asymptomatic patients (e.g., patients with no symptoms but need for ongoing/intermittent monitoring).

Process Validation

To assess the functionality of the tool, at an early stage of implementation, we randomly selected patients from the rescheduling list and their medical records were accessed. Their clinical charts were abstracted and summarized along with the priority level assigned to them subsequent to the triage tool application. Our observations are summarized in Table 5. Based on implementation of this tool, the proportion of patients classified in priority scoring 1, 2, 3, and 4 was about 10%, 20%, 40%, and 30%, respectively. During its implementation, the nursing staff applying the tool was routinely asked for feedback and qualitative responses were tracked. Process adjustments were directed by feedback that was received.

The nursing staff implementing the tool overall expressed minimal or no concerns with difficulty abstracting the required data or administering the questionnaire. A pervasive issue was reported with phone calls not being picked up, so about 40% of patients were incompletely triaged until repeated phone calls were made. About 10% were nonrespondents, and after two phone attempts these were mailed a failure-to-contact letter with advice to reach back to the clinic to reschedule the procedure. Two providers escalated their concerns on patients being prioritized low through the triage tool—In one patient, there were extraordinary circumstances including significant weight loss that justified increasing priority, and in a second case, the provider agreed with the priority assigned.

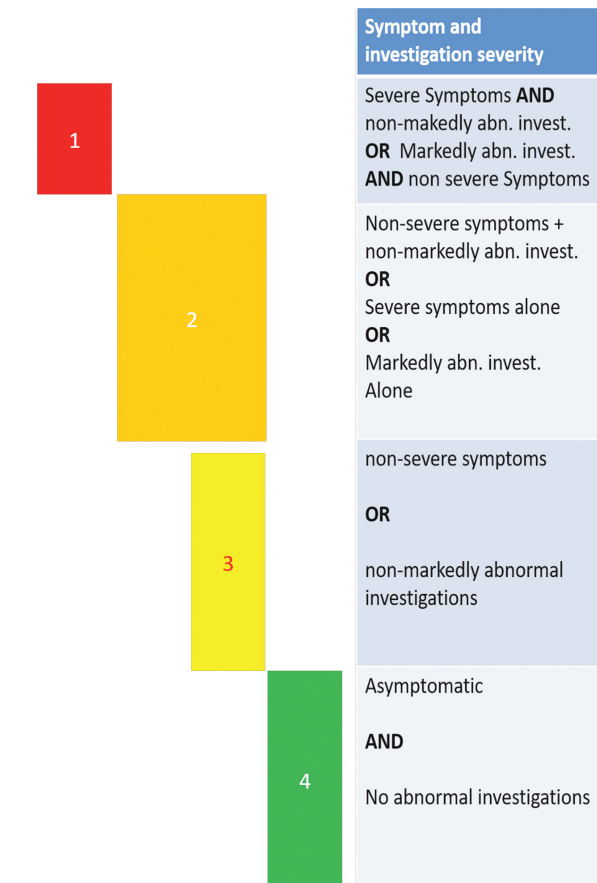


FIGURE 2. Rescheduling template based on symptom/investigation abnormality.

TABLE 5. Application of Algorithm to Randomly Selected Cases

Cases	Clinical Review Abstract	Triage Tool Abstract	Priority Scoring
Case 1	10-year-old M with intermittent abdominal pain, bloody diarrhea three to four daily, ESR 30, CRP 2, hemoglobin 10, calprotectin 600; suspected colitis with PUCAl equivalent 30	Severe symptom: Bloody diarrhea Markedly abnormal CRP Mildly abnormal ESR Markedly abnormal hemoglobin Markedly abnormal calprotectin	1
Case 2	9-year-old F Type 1 diabetic with h/o constipation and reflux-like symptoms, seen in GI clinic for intermittent upper abdominal pain; no diarrhea or growth problems; tTG IgA 150 (>10 ULN), other screening laboratory values normal	Nonsevere symptoms Markedly abnormal tTG IgA	2
Case 3	12-year-old M with seasonal allergies and asthma, presented with 6-month history of dysphagia to solids multiple times a week; two emergency department visits over past month for spontaneously resolved food impactions	Severe symptoms (severe dysphagia) Normal laboratory values	2
Case 4	16-year-old F with 1-year history of intermittent crampy abdominal pain that does not interfere with daily activities, bloating, two to three daily episodes of nonbloody diarrhea, mildly elevated calprotectin 150 µg/g	Nonsevere symptoms Mildly abnormal laboratory values	3
Case 5	8-year-old M with h/o Crohn's disease diagnosed 1 year prior, currently on infliximab every 8 weeks and CDED who is currently doing well; asymptomatic with no laboratory abnormalities scheduled for surveillance endoscopy to assess for mucosal healing	Asymptomatic No (recent) abnormal investigations	4

Note. CDED = Crohn's disease elimination diet; CRP = C-reactive protein; ESR = erythrocyte sedimentation rate; F = female; GI = gastroenterology; h/o = history of; tTG IgA = tissue transglutaminase immunoglobulin A; M = male; ULN = upper limit of normal.

Our institution has implemented this triage algorithm at an early stage. Nursing and REDCap® support resources were needed, but on average, about 10–15 minutes were spent on each patient record. There can be little doubt that the resources used through this process are far less than would be used, in terms of provider time, if a non-protocol-based process was adopted (e.g., case-by-case interprovider discussion).

Discussion

This process is clearly an attempt to address a new challenge brought on by the COVID-19 pandemic, which is currently stressing health delivery systems across the world. This is a starting point, and we propose our framework as a template to be considered as individual institutions or pediatric gastroenterology groups approach an increased backlog of patients and procedures requiring rescheduling. Different groups will likely have different starting points as their threshold for nonelective procedures and PPE availability will vary. Undoubtedly, the process will require ongoing adjustments as it does not account for local spikes in COVID-19. It also avoids the need for lengthy

provider-based assessment and minimizes the use of an arbitrary and/or provider-driven assignment of priority, which could prove contentious. Finally, it offers a rubric moving forward to place newly requested procedures (e.g., driven by telehealth visits) within the waiting list in an appropriate spot until procedural availability is normalized.

Limitations

Conceptually, our approach can be criticized as several limitations are outlined: First, patient acuity is increased by combining measures of functional impairment (as a surrogate for traditional measures of abdominal pain), severity of diarrhea, other symptoms, and laboratory/radiographic findings. However, we have practical constraints on the length of the survey, the individual from whom information can be collected, and the need for comparability among the population to be prioritized. The consensus was that functional impairment, as an observable and measurable core outcome of chronic abdominal pain, would be an appropriate surrogate for disease severity in determining priority.

Although the CALI-9 was validated on school-aged children and adolescents, this served to capture the bulk of our “elective” procedure patients and was able to be completed by parents for any age child based on observation even for our younger patients. In the few situations where an item might be difficult to answer based on COVID-19 restrictions and/or developmental level, the nursing staff was provided with instruction to aid families with rating based on similar items available to the child in quarantine and/or pre-COVID-19 functioning.

The categorization of weight loss as a nonsevere symptom without further qualifiers is also problematic. Weight loss can of course be severe, but this is modulated by age and comorbidities in the context of the anticipated impact of endoscopy, which, in fact, may be limited. We felt that a complex formula defining the severity of poor weight gain and weight loss in the context of several other variables was an unwieldy and likely low-impact item in the triage tool.

The limitations of this approach also include the possibility of patient, family, and provider dissatisfaction, as procedures that had been scheduled for a long time may be prioritized as relatively low, resulting in significant delay from the initial scheduled date. Our algorithm also does not take into account any previous level of prioritization, which includes referring physician-driven assignment of priority. The assessment of disease activity or severity does not consider adherence to previous treatment recommendations, so the impact of the procedure cannot be precisely established.

Finally, we may be overlooking atypical symptoms such as isolated severe extraintestinal manifestations of IBD or gastroesophageal reflux or those that signal severe disease despite being mild such as cramping abdominal pain masking intussusception in patients with Peutz–Jeghers syndrome or celiac disease. Clearly, countermeasures in the process need to include the opportunity for provider feedback if atypical scenarios are encountered but it is our opinion that such scenarios are relatively rare and the overall benefit of the exercise outweighs the likelihood of misclassification. We are also aware that many parts of U.S. are experiencing severe (in some cases total) endoscopy limitations, and they are likely to remain under lockdown for the foreseeable future. Accordingly, therapeutic decisions (e.g., gluten-free diet for presumed celiac disease, IBD step-up/step-down treatment) may now, and for some time in the foreseeable future, be based upon criteria exclusive of endoscopy.

Conclusion

The decision tool has been implemented as a REDCap[®] application that supports multiple users inputting cases at one time, a standardized approach to asking the

interview questions, and the ability to quickly abstract and analyze data once initial interviews are complete, as well as sharing of this template should other institutions find it of value (Harris et al., 2009). The application supporting the triaging algorithm has been successfully implemented at our institution albeit it may be too early to describe all potential shortcomings. Our observations, however, are that it is a useful tool with efficient resource utilization and results in a triaged list of procedures that conforms to our principle of assigning priority to procedures that will have greater impact. The adoption of a system that introduces an objective methodology in outpatient procedure prioritization may have wide-ranging implications both in the current COVID-19 pandemic as well as other scenarios of limited resource allocation and deserves further investigation. ✪

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