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## Diagnostic approach to constipation impacts pediatric emergency department disposition☆☆☆

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## ABSTRACT

**Objectives:** Constipation is a common cause of abdominal pain in children presenting to the emergency department (ED). The objectives of this study were to determine the diagnostic evaluation undertaken for constipation and to assess the association of the evaluation with final ED disposition.

**Methods:** A retrospective chart review of children presenting to the pediatric ED of a quaternary care children's hospital with abdominal pain that received a soap suds enema therapy.

**Results:** A total of 512 children were included, 270 (52.7%) were female, and the median age was 8.0 (IQR: 4.0–11.0). One hundred and thirty eight patients (27%) had a digital rectal exam (DRE), 120 (22.8%) had bloodwork performed, 218 (43%) had urinalysis obtained, 397 (77.5%) had abdominal radiographs, 120 (23.4%) had abdominal ultrasounds, and 18 (3.5%) had computed tomography scans. Children who had a DRE had a younger median age (6.0, IQR: 3.0–9.25 vs. 8.0, IQR: 4.0–12.0;  $p < 0.001$ ) and were significantly less likely to have radiologic imaging (OR = 0.50, 95% CI 0.32–0.78;  $p = 0.002$ ), but did not have an increased odds of being discharged home. After adjusting for gender, ethnicity, and significant past medical history those with an abdominal radiograph were less likely to be discharged to home (aOR = 0.56, 95% CI 0.31–1.01;  $p = 0.05$ ).

**Conclusions:** The diagnostic evaluation of children diagnosed with fecal impaction in the ED varied. Abdominal imaging may be avoided if children receive a DRE. When children presenting to the ED with abdominal pain had an abdominal radiograph, they were more likely to be admitted.

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### 1. Introduction

Constipation has a high prevalence in children with estimates as high as 29.6% [1]. Children with constipation seek care in the emergency department (ED) nearly three times more frequently than children who do not have constipation [2,3]. One study showed that constipation was the most common cause of abdominal pain among children presenting to the ED for care [4].

Despite the frequency of pediatric ED visits due to constipation, the diagnosis of constipation poses a challenge to ED healthcare providers,

particularly when constipation is accompanied by abdominal pain. In these cases, the ED provider must address the possibility of emergent etiologies of abdominal pain (e.g. appendicitis) while accounting for the wide variation in constipation symptoms [5]. Common symptoms of constipation in children may include: passing stool less than three times per week, fecal incontinence, hard stools, excessive straining, or feeling of incomplete evacuation of stool [6–8].

Pediatric gastroenterology society guidelines recommend that providers perform a thorough medical, surgical, drug, and dietary history along with a detailed physical exam and often screening laboratory tests as part of the diagnostic evaluation for constipation [9]. Similarly, the Rome IV diagnostic criteria and the Paris Consensus on Childhood Constipation Terminology support a clinical approach to the diagnosis of constipation [10–13]. As the clinical diagnosis of constipation in children may be challenging because of children's difficulty describing and reporting symptoms, digital rectal examination (DRE) can provide useful clinical information such as the presence of fecal impaction [14,15]. The reliability and utility of abdominal radiographs for the diagnosis of constipation has been a point of debate in the past [16,17].

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Few studies describe the diagnostic approach undertaken to identify constipation as a likely contributor in children presenting to the ED with abdominal pain [18]. To our knowledge, none have previously evaluated the potential influence of the diagnostic evaluation on ED disposition. Therefore, the objective of this study in children with abdominal pain who received enema therapy for constipation in the pediatric ED was to 1) determine the diagnostic evaluation undertaken for constipation and 2) to assess the association of this diagnostic evaluation with final ED disposition.

## 2. Material and methods

### 2.1. Study design

This was a secondary analysis of a retrospective database created to assess the efficacy of soap suds enema (SSE) in the treatment of constipation among children in the pediatric ED [19]. SSE is the primary therapy used in our pediatric ED for children with significant constipation. This study was approved by our institutional review board.

### 2.2. Study setting and population

This study evaluated subjects presenting to a quaternary care children's hospital with an average annual volume of approximately 85,000 visits. All children between 8 months and 23 years of age who received a SSE for constipation between June 2011 and June 2012 in the ED were included. Patients were included if they presented with abdominal pain, were diagnosed clinically as having constipation (having fewer than three bowel movements per week, straining, hard stools, abdominal bloating or pain with defecation), and subsequently underwent SSE therapy. Patients were included if they were previously healthy and if they had a significant past medical history to maintain the generalizability of the study.

### 2.3. Study protocol

We used specific key words to search the electronic health record to identify patient charts for those who received SSE for constipation. Unavailable data were coded as missing or not present. The principal investigator trained the data abstractors to minimize potential variation.

### 2.4. Measurements

The diagnostic evaluation captured included: patient demographics, medical history (symptoms and significant past medical history), physical examination (DRE), laboratory testing, and radiographic imaging. Final disposition outcome was also captured. A significant medical history was defined as the presence of a prominent comorbid conditions including: cystic fibrosis, cerebral palsy or muscle disorders, hypothyroidism, spina bifida or other spine anomalies, gastric anomalies, anorectal malformations, Hirschsprung's disease, cardiac anomalies, previous abdominal surgery, or previous diagnosis of constipation. For radiologic imaging results, serious results were defined as "multiple air/fluid levels and distended small-bowel loops compatible with small-bowel obstruction or free air under the diaphragm suggestive of a perforated viscus" as defined by Kellow et al. [20].

### 2.5. Data analysis

Descriptive analyses were provided to identify potential confounders for discharge status. Continuous variables were graphed to assess their distribution. All variables were skewed right (positive direction) and all Shapiro-Wilk tests for normality were significant ( $p < 0.001$ ), therefore non-parametric testing (Mann-Whitney) was utilized to determine significance. Median and interquartile ranges (IQR) were calculated. For comparisons among categorical variables, Pearson

chi-square testing was utilized with percentages provided. For the descriptive analysis, a potential confounder was defined as  $p$ -value  $< 0.20$  and included in subsequent models for further adjustment. Binary logistic regression was utilized to adjust the association analysis between discharge outcome and diagnostic evaluations. All analyses were conducted using the Statistical Package for the Social Sciences, version 24 (IBM Corp., Armonk, NY).

## 3. Results

There were 512 children included in this study, all of whom met the study's inclusion criteria. There were 270 (52.7%) female patients and the median patient age was 8.0 (IQR: 4.0–11.0). Four patients had repeat visits that were not within 72 h and thus were included in the analysis. Less than a third of patients ( $n = 138$ , 26.9%) had a DRE performed as part of their physical exam and 397 (77.5%) had abdominal X-ray.

Sixty one percent ( $n = 313$ ) of patients had significant past medical histories with 37.6% ( $n = 193$ ) having a previous history of constipation. Children with a significant past medical history for both constipation (OR = 2.40, 95% CI 1.40–4.13;  $p = 0.001$ ) and for all other conditions (OR = 1.58, 95% CI 1.04–2.39;  $p = 0.03$ ) were more likely to have a DRE performed than patients without previous medical histories. Children who had DREs had a younger median age (6.0, IQR: 3.0–9.25 vs. 8.0, IQR: 4.0–12.0;  $p < 0.001$ ) and were significantly less likely to have radiologic imaging (OR = 0.50, 95% CI 0.32–0.78;  $p = 0.002$ ), but did not have an increased odds of being discharged home (aOR = 1.29, 95% CI 0.78–2.13;  $p = 0.32$ ). There were no other significant demographic or other characteristics associated with completion of a digital rectal exam (data not shown).

Bloodwork was completed in 22.8% ( $n = 120$ ) patients. Urinalysis was obtained in 43% ( $n = 218$ ) and a urinary tract infection was diagnosed in 5.8% ( $n = 30$ ) patients. The majority of patients had some form of abdominal imaging performed with the most common modality being an abdominal radiograph ( $n = 398$ , 77.7%). Children who received abdominal imaging did not differ from those who did not in terms of their gender, age, ethnicity, past medical history, and history of constipation (data not shown). Minor abdominal findings on abdominal plain film such as ileus or dilated colon were found in 7.4% ( $n = 30$ ), with none having serious findings. Twenty three percent ( $n = 120$ ) of patients had abdominal ultrasounds performed and 3.5% ( $n = 18$ ) had abdominal computed tomography performed. Nearly one fifth of patients ( $n = 95$ , 18.5%) had more than one type of abdominal imaging performed.

Independent demographic and clinical history factors associated with being discharged from the ED included female gender and Hispanic ethnicity, while a significant past medical history was associated with subsequent hospital admission (Table 1). Patients with a significant past medical history were twice as likely to have a positive X-ray finding as patients without a significant past history (OR = 2.00, 95% CI 1.12–3.57,  $p$ -value = 0.02) (results not shown).

Having an abdominal X-ray performed significantly reduced the odds by approximately half of being discharged home but was no longer significant at the 0.05 level when adjusted for gender, ethnicity, and significant past medical history (aOR = 0.56 (95% CI 0.31–1.01);  $p$ -value = 0.05) (Table 2). Conversely, patients with a DRE performed had an increased the odds of being discharged home (aOR = 1.29 (95% CI 0.78–2.13);  $p$ -value = 0.32) but was this was not statistically significant in unadjusted or adjusted models.

## 4. Discussion

Identifying effective diagnostic modalities for children presenting to the pediatric ED with abdominal pain and constipation is important. Previous studies have found a lack of uniformity in the diagnosis of constipation in the outpatient setting [21]. Our study adds to this understanding by showing variation in the diagnostic workup of children

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