

Things We Do for No Reason™: Obtaining an Abdominal X-ray to Assess for Constipation in Children

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Inspired by the ABIM Foundation's Choosing Wisely® campaign, the "Things We Do for No Reason™" (TWDFNR) series reviews practices that have become common parts of hospital care but may provide little value to our patients. Practices reviewed in the TWDFNR series do not represent "black and white" conclusions or clinical practice standards but are meant as a starting place for research and active discussions among hospitalists and patients. We invite you to be part of that discussion.

CLINICAL SCENARIO

A 5-year-old boy is admitted to the hospital for a bowel clean-out after presenting with abdominal pain and having an abdominal x-ray that demonstrated a "moderate stool burden." After ingestion of the bowel prep, he develops worsening abdominal cramping and diarrhea. Upon reviewing the bowel history with his mother afterward, the team learns that he has had a bowel movement every 1-2 days as usual and has been having soft stools without any straining, pain, or blood present.

BACKGROUND

Functional constipation is a common clinical problem in pediatrics and constitutes a large number of admissions into hospitals and visits to clinics and emergency departments. In the United States, up to 36% of children are affected. Associated healthcare costs for children with constipation are estimated at \$5.9 billion per year, which is \$3.9 billion more than the general pediatric population without constipation.¹ In 2011, American children aged 17 years and younger had more than 270,000 visits to the emergency department for constipation.² As many as 70% of children who are given a diagnosis of constipation in the emergency department have an abdominal x-ray completed.³ The carcinogenic effects of radiation from radiography are well known. Unnecessary imaging places the child at risk for these effects while adding to the overall cost of medical care.⁴

WHY AN ABDOMINAL X-RAY MAY SEEM HELPFUL

The overall utilization of diagnostic imaging is increasing in pediatric emergency departments.⁴ When questioning why this is

the case, one should consider the method of problem solving used by most physicians. After formulating initial hypotheses based on available information, prior knowledge, and experience, physicians aim to obtain additional data to confirm or reject each hypothesis.⁵ Despite evidence that abdominal x-ray findings correlate poorly with clinical severity of constipation, radiography is widely available and may be thought of as a cheap and noninvasive means to further investigate. Physicians may believe that an x-ray will allow for quantification of stool in the colon, thereby supporting or refuting one of the hypotheses. In this way, an x-ray can be thought of as a confirmatory test for constipation. In children who have a history of constipation, physicians may seek to obtain an x-ray to assess for the severity of constipation or for improvement from a previous image.

A 2017 study surveyed 24 pediatric gastroenterologists after 72 patient encounters and found that the most common cause for obtaining an abdominal x-ray was for evaluation of stool burden (70%).⁵ Other reasons included assessing the need for a bowel clean-out (35%), diagnosing fecal impaction (27%), finding the cause for abdominal pain (24%), and demonstrating stool burden to a family (14%). This same study found that most of the polled providers used an abdominal x-ray to assess for constipation, and nearly half changed their management based on the findings. The study found that confidence levels were significantly higher after obtaining an x-ray, which likely indicates an internal need to boost the level of confidence in diagnosis and therapy.⁵

WHY ABDOMINAL X-RAYS ARE NOT HELPFUL

Many systematic reviews and retrospective studies have investigated the efficacy of abdominal x-rays for diagnosing constipation. One retrospective review involving 160 children with defecation complaints assessed the accuracy of different radiologic scoring methods in identifying children with constipation.⁶ Three pediatric gastroenterologists and 1 pediatric radiologist blindly applied 4 scoring methods: colonic transit time, Leech score, Barr score, and fecal loading. The results showed that all x-ray scoring methods had low sensitivity for diagnosing constipation, variable specificity, and low interobserver reproducibility of scores.⁶ There was also poor ability to differentiate between patients with constipation and nonretentive fecal incontinence. Fecal loading had the worst performance in differentiating between these two. Greater than 20% of children with clinically diagnosed constipation had normal Barr and Leech scores.⁶ Another systematic review also found no evidence for a diagnostic association between clinical symptoms of constipation and fecal loading on abdominal

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x-rays.⁷ In this study, the sensitivity and specificity of the x-ray were as low as 61% and 55%, respectively, which indicate poor overall diagnostic accuracy. Abdominal x-rays are subjective, not standardized, and represent a single observation in time. The amount of fecal loading seen on imaging is subject to daily variation depending on the timing of last food intake and timing of last defecation. There is a large variance in interpretation of fecal loading, and any stool seen on an x-ray does not rule out another potential diagnosis causing abdominal pain.

In 2014, the North American Society for Pediatric Gastroenterology, Hepatology, & Nutrition (NASPGHAN) and the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) released joint clinical guidelines that the evidence supports not obtaining an abdominal x-ray to diagnose functional constipation.⁸ Similarly, the National Institute for Health and Care Excellence (NICE) stated that abdominal x-rays should not be recommended as an additional test for constipation in children.⁹ These groups advocate for diagnosing functional constipation clinically by using a careful history and physical exam.

WHY ABDOMINAL X-RAYS ARE POTENTIALLY HARMFUL

The primary patient harm associated with abdominal x-rays is radiation exposure. While the amount of radiation in a single x-ray is low, children with constipation tend to have frequent revisits, significantly more than children with other common chronic conditions (eg, asthma and migraine headaches).¹⁰ In accordance with an "As Low As Reasonably Achievable" (ALARA) concept for radiation dose, all imaging should be limited to studies that will contribute to patient care.⁴ The low sensitivity and specificity of abdominal x-rays in identifying constipation challenges whether any new information is being obtained from the imaging. Frequent visits and repeated unnecessary radiographs mean increased exposure to radiation and higher healthcare costs. Moreover, abdominal x-rays in the pediatric emergency room have been associated with missed diagnoses, false reassurance of constipation, more frequent admissions into the hospital, and longer hospital stays.

One multicenter retrospective cohort study that included approximately 282,000 children diagnosed with constipation found that children who received an abdominal x-ray were twice as likely to return to the emergency department with a clinically significant alternate diagnosis (0.33% vs 0.17%). The two most common missed diagnoses were acute appendicitis and intussusception.³ Another retrospective study that included about 3,700 children also found that x-rays were performed more frequently in children who were misdiagnosed than in those who did not have a significant alternate diagnosis (75% vs 46%).¹¹ In this case, both of these groups had a similar amount of stool on the x-rays as determined by the mean Leech scores. While this study identified an association between abdominal x-ray use and misdiagnoses, a causative effect was not necessarily discovered between the two. The authors felt that even relatively large amounts of stool on an x-ray should not discount serious causes of abdominal pain or

tenderness.¹¹ A third retrospective study determined that children who received an abdominal x-ray and were diagnosed with constipation were significantly more likely to be admitted to the hospital, further raising healthcare costs.¹² In this study, having an x-ray reduced the odds of being discharged home by about half. They also found that abdominal x-rays could be avoided if digital rectal exams were performed.¹²

HOW CONSTIPATION SHOULD BE DIAGNOSED

Functional constipation is a clinical diagnosis based on a thorough collection of history and a complete physical exam in children of all ages, including digital examination of the rectum to assess for fecal impaction, if necessary.

The Rome IV criteria for chronic constipation can be helpful and include at least two of the following features for at least 1 month in infants up to 4 years of age: 2 or fewer stools per week, history of excessive stool retention, history of painful or hard bowel movements, history of large-diameter stools, and presence of a large fecal mass in the rectum.¹³ In children who are toilet trained, two additional criteria may be used: at least 1 episode of fecal incontinence per week after being toilet-trained and history of large-diameter stools that may obstruct the toilet.¹³

The NASPGHAN and ESPGHAN joint guidelines from 2014 state that, while constipation is based on history and physical exam, a major role of the history and physical exam is to exclude other disorders that also present with difficulty in defecation.⁸ This can help identify red-flag features or complications and guide further investigation. While evidence did not support routine use of a digital rectal exam in diagnosing constipation, the guidelines stated that a rectal exam (visual and digital) helps to evaluate for anorectal malformations, anal stenosis, rectal tone, distension, erythema, skin tags, anal fissures, or a fecal mass.⁸ Digital rectal exams may be helpful in patients who do not immediately meet at least 2 historical features of the Rome IV criteria.

In regard to history, approximately 0.4%-20% of healthy children without constipation have at least 1 clinical feature listed above. Therefore, the use of a single clinical finding to diagnose constipation, such as decreased bowel frequency, can result in an inappropriate diagnosis. Children experience large variations in stool output depending on diet, genetics, and environmental factors.¹⁰ The usual pattern of bowel habits in humans range from 3 times daily to every 3 days.¹⁴ Importantly, there are times to order an abdominal x-ray for patients with abdominal pain. The NASPGHAN and ESPGHAN joint guidelines recommend obtaining abdominal x-rays to evaluate children who have concerning features, such as previous abdominal surgeries, known genetic conditions or malformations, bilious emesis, or severe abdominal distension.⁸

RECOMMENDATIONS

- Functional constipation should be diagnosed based purely on a thorough history and physical examination, including a rectal exam.

- Abdominal x-rays (ordered for any reason) should not be used to diagnose or assess for functional constipation.

CONCLUSIONS

Performing abdominal x-rays to assess for pediatric functional constipation is not beneficial and potentially harmful to patients. Multiple retrospective studies revealed no diagnostic association between clinical symptoms or severity of constipation and findings on abdominal radiography. X-rays have very low sensitivity and specificity for diagnosing constipation. In the pediatric emergency department, abdominal x-rays completed for patients diagnosed with constipation have been associated with missed diagnoses, false reassurance of constipation, more frequent admissions into the hospital, longer hospital stays, higher healthcare costs, and unnecessary radiation exposure. The NICE as well as 2014 NASPGHAN and ESPGHAN clinical guidelines recommend against obtaining x-rays to diagnose constipation. The most effective way to diagnose

functional constipation in children is with a thorough collection of history and physical exam. In the introductory case, the boy received an osmotic laxative based on abdominal x-ray findings, which resulted in the adverse effect of diarrhea. This case demonstrates how using abdominal x-rays to assess for constipation can be misleading and emphasizes the importance of collecting a thorough history and physical exam.

Do you think this is a low-value practice? Is this truly a "Thing We Do for No Reason™"? Share what you do in your practice and join in the conversation online by retweeting it on Twitter (#TWDFNR) and liking it on Facebook. We invite you to propose ideas for other "Things We Do for No Reason™" topics by emailing TWDFNR@hospitalmedicine.org.

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