



Educational needs in the diagnosis and management of pediatric functional constipation: a US survey of specialist and primary care clinicians

Justin Barnes, Brandon Coleman, Sharon Hwang, Aleksandra Stolic, Athos Bousvaros, Samuel Nurko & Gregory D. Salinas

To cite this article: Justin Barnes, Brandon Coleman, Sharon Hwang, Aleksandra Stolic, Athos Bousvaros, Samuel Nurko & Gregory D. Salinas (2018): Educational needs in the diagnosis and management of pediatric functional constipation: a US survey of specialist and primary care clinicians, *Postgraduate Medicine*, DOI: [10.1080/00325481.2018.1464364](https://doi.org/10.1080/00325481.2018.1464364)

To link to this article: <https://doi.org/10.1080/00325481.2018.1464364>

 [View supplementary material](#) 

 Accepted author version posted online: 18 Apr 2018.
Published online: 27 Apr 2018.

 [Submit your article to this journal](#) 

 Article views: 5

 [View related articles](#) 

 [View Crossmark data](#) 

Educational needs in the diagnosis and management of pediatric functional constipation: a US survey of specialist and primary care clinicians

Justin Barnes^a, Brandon Coleman^a, Sharon Hwang^a, Aleksandra Stolic^b, Athos Bousvaros^c, Samuel Nurko^c and Gregory D. Salinas^a

^aCE Outcomes, LLC, Birmingham, AL, USA; ^bIndependent Medical Education, Medical External Affairs, Takeda Pharmaceuticals U.S.A., Inc, Deerfield, IL, USA; ^cBoston Children's Hospital, Boston, MA, USA

ABSTRACT

Objectives: The goal of this study was to identify opportunities among gastroenterologists and gastroenterology nurse practitioners (NPs)/physician assistants (PAs) for continuing medical education (CME) related to functional constipation.

Methods: An online, case-vignette survey was designed to identify and quantify practice patterns of pediatric gastroenterology clinicians. Case vignettes are a validated method for assessing clinician practice patterns. The survey consisted of three patient cases: a 3-year-old female with a 6-month history of constipation; a 6-year-old male with a 1-year history of constipation refractory to treatment and a sacral dimple with nearby tuft of hair; and a 16-year-old male with a 10-year history of constipation, and a sullen, depressed mood. Survey responses were compared to NASPGHAN guideline recommendations for diagnosis and management to identify areas where additional education may be beneficial.

Results: Responses were collected from 197 gastroenterologists, 116 gastroenterology NPs/PAs, and 206 pediatrician/primary care clinicians. Several of the practice patterns observed suggest opportunities for future CME: low use of applicable Rome III diagnostic criteria; approximately 85% recommended testing beyond what is recommended for the 3-year-old patient; over 1/3 did not perform several recommended tests for the 6-year-old patient; and over 25% did not refer the 16-year-old patient for psychological evaluation. Further, there was little consensus in treatment approach among the three clinician groups. Primary care familiarity with NASPGHAN guidelines was low.

Conclusions: CME programs focusing on applying diagnostic criteria, matching diagnostic workup to patient presentation, treatment selection, and identifying patients who may benefit from psychological evaluation may fill knowledge and practice gaps of clinicians who manage pediatric patients with functional constipation.

ARTICLE HISTORY

Received 20 December 2017
Accepted 10 April 2018

KEYWORDS

Constipation; gastroenterology; clinical practice patterns; continuing medical education; survey; Rome III

Introduction

Pediatric constipation is a common problem within the United States, responsible for 3% of all pediatric primary care visits and 10–25% of pediatric gastroenterology visits [1,2]. Optimal management of these patients is vital, since the painful bowel movements experienced by these children may result in defecation-avoidant behaviors, which can lead to additional problems including harder, larger, and more painful bowel movements [3]. The vast majority of children presenting with constipation have 'functional constipation,' without any underlying structural or neurologic disease responsible for the symptoms. A thorough evaluation is necessary to distinguish between functional constipation and constipation caused by a medical condition, such as anatomic malformations of the colon and rectum or metabolic conditions.

The European Society of Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) and the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) have jointly developed evidence-based guidelines for the evaluation and management of children intended to

standardize treatment and improve the quality of care in children with functional constipation. These guidelines were initially published in 1999 [4], with updated guidelines in 2006 [5] and 2014 [2]. While one study observed pediatrician adherence to the guidelines published in 2006 [6], little information is available updating these data and comparing current practice to the updated 2014 NASPGHAN guidance, particularly in specialist pediatric gastroenterologists or nurse practitioners (NPs) and physician assistants (PAs).

Continuing medical education (CME) can be a useful tool for improving clinician performance [7–11]. However, CME programs must be targeted to the greatest areas of need to have a robust impact on clinician practice [12]. The development of well-targeted CME programs related to pediatric constipation is hindered by the lack of available data on the use of evidence-based diagnostic and management approaches by clinicians. The purpose of this study was to identify and quantify current trends in evaluation and management of functional constipation in children, compare practice patterns to the latest ESPGHAN/NASPGHAN guidelines [2], and

inform the development of evidence-based CME initiatives to address any common practice gaps.

Methods

Clinical patient case vignettes and associated questions were used to investigate and quantify the practice patterns of gastroenterologists, gastroenterology NPs/PAs, and primary care physicians (PCPs; defined as pediatricians and family physicians) related to the management of pediatric patients with constipation. Research demonstrates that case vignettes (compared to chart review and standardized patients) are a valid and comprehensive method to measure processes of care in actual clinical practice [13–16]. Furthermore, case vignettes are more cost-effective and less invasive than other means of measurement, particularly when assessing care of pediatric patients.

The patient case vignettes were developed through consultation with a clinical expert (AB) and underwent pilot testing among seven health-care providers in the target audiences. This pilot testing utilized cognitive interview techniques to examine whether the instrument assessed the intended concepts, detected key omissions, and identified items that are ambiguous. The final survey instrument was estimated to take the respondent 20–30 min to complete (Supplementary Material). While the survey in general covered diagnosis and treatment, each patient case did not necessarily contain all of these assessment domains. The survey instrument included three patient cases, which are outlined in Figure 1.

The first two patient cases were followed by a series of multiple choice questions used to identify how clinicians assess, diagnose, and manage typical patients within their practice. The third case was included to determine how clinicians initially manage an older pediatric patient and did not include as much detail on diagnosis.

Invitations to take the survey were distributed from September to November 2016 via e-mail and postal mail to a random sample of health-care providers in the target audiences. Clinician contact information was obtained from the AMA Masterfile and purchased from vendors (Integrated Medical Data, West Windsor Township, NJ, USA; IMS Health Incorporated, Danbury, CT, USA). The survey respondents accessed and completed the survey instrument through an online survey platform, Qualtrics. Inclusion criteria for the surveys required the respondents to be gastroenterologists, gastroenterology NPs/PAs, pediatricians, or family physicians currently practicing in the United States, who actively manage the pediatric patients with functional constipation. Respondents meeting the inclusion criteria who completed the survey instrument were provided nominal honoraria for their time and input. Invitations to participate were e-mailed to the acquired contact information of gastroenterology physicians (2936 total e-mail addresses), gastroenterology NP/PAs (2539), pediatricians (1185), and family physicians (1857). Due to our use of a paid honoraria and need to have certain specialties included in our study, a quota system was used to gather the sample. Once estimates for the appropriate power were reached, the online platform closed to the new respondents.

Data were compiled and analyzed with IBM SPSS Statistics 23. The data from the survey instrument were cleaned to ensure duplicate entries, and incomplete participant data were removed from the final sample. Descriptive statistics, such as frequencies and means, were calculated on all items in the surveys to examine overall responses and related trends among the survey items. Differences between the three main groups (gastroenterology physicians, gastroenterology NP/PAs, and PCPs) were conducted via Chi-square analyses and ANOVA. Statistical significance was set at $P < .05$.

CASE 1	CASE 2	CASE 3
<p>A 3-year-old presents to you for evaluation of constipation. The child had no medical difficulties in early life and has had normal growth and development. However, she has had gradual onset of abdominal pain and bloating over the last 6 months.</p> <p>Her mother is concerned that the child is passing large painful bowel movements and is now resistant to toilet training. She prefers to stool in a diaper, though she urinates in the toilet.</p> <p>General physical examination is unremarkable. There is no fecal mass appreciated, there is no sacral dimple, and lower extremity reflexes are normal.</p>	<p>A 6-year-old child presents with a 1-year history of constipation. He has been tried on multiple medications, including PEG and senna. Medications were taken as recommended at appropriate doses, however, he continues to have 2 hard bowel movements a week.</p> <p>There is no family history of constipation and no other comorbidities. He has not had any laboratory work or diagnostic testing performed.</p> <p>General physical examination is normal. There is no fecal mass appreciated on abdominal exam, there is a small sacral dimple with a tuft of hair near the dimple, and lower extremity reflexes are normal.</p>	<p>A 16-year-old male presents with a 10-year history of constipation. His mother states that he has tried multiple medications in the past, and has previously seen two pediatricians.</p> <p>Occasionally, he has fecal accidents at home and at school. He has had an extensive unrevealing evaluation, including celiac studies, thyroid studies, anorectal manometry, spinal MRI, and food allergy testing.</p> <p>In the office, he is withdrawn and reluctant to discuss the issue. He is currently passing one large bowel movement every 2 days. He has been prescribed PEG and senna, but admits to not taking his medication routinely, stating "it does not do any good." Physical examination is unremarkable; the patient declines perianal or rectal examination.</p>

Figure 1. The three cases used in this study to determine clinician practice.

Results

Demographics

A total of 519 responses were gathered from US-practicing gastroenterologists, gastroenterology NPs/PAs, and pediatrician/PCPs. Table 1 shows the demographic information of the respondents included in the analysis. The demographics reveal a representative sample of the United States gastroenterology clinicians: they treat approximately 17 patients per week with functional constipation and the majority work in academic or group private practices. The pediatrician/PCP group sees more patients overall but slightly fewer patients with functional constipation.

Use of Rome III diagnostic criteria

Respondents were asked to select their top five criteria used in making the diagnosis of functional constipation in a child from a list in the survey. The most common selected criteria, stool withholding, large size of bowel movements, frequency of stooling, hard mass on rectal examination, abdominal pain with bowel movements, and fecal incontinence, are the Rome III diagnostic criteria [2] for functional constipation (Table 2). The primary care group selected many of the appropriate responses less than the specialists, but none of these criteria were selected uniformly by all the respondents. Other commonly selected items, including

Table 1. Demographics of respondents.

	Gastroenterologists <i>n</i> = 197	Gastroenterology NPs/PAs <i>n</i> = 116	Pediatrician/PCPs <i>n</i> = 206
Pediatric patients seen per week, mean (SD)	45 (29)	35 (25)	71 (49)
Pediatric patients treated for functional constipation per week, mean (SD)	17 (16)	17 (16)	14 (16)
Years since graduation, mean (SD)	21 (11)	12 (7)	26 (11)
Physician specialty,			
General gastroenterology	22	28	-
Pediatric gastroenterology	78	72	-
Pediatrics	-	-	49
Family medicine	-	-	44
Internal medicine and pediatrics	-	-	7
Major professional activity, %			
Direct patient care	90	96	100
Administration activities	1	0	-
Medical education	5	3	-
Medical research	5	0	-
Other	0	2	-
Practice location, %			
Urban	65	53	31
Suburban	32	40	53
Rural	3	7	16
Present employment, %			
Solo practice	9	3	23
Group single-specialty practice	17	39	42
Group multispecialty practice	13	17	27
Academic/university hospital/medical school	63	43	6
Nongovernment community hospital	2	5	3
Government/military/VA hospital	0	0	0
Other	0	0	3

NPs: nurse practitioners; PAs: physician assistants; PCPs: primary care physicians; VA: Veteran's Affairs.

Table 2. Criteria used in making the diagnosis of functional constipation in a child.

	Gastroenterologists <i>n</i> = 197 (%)	Gastroenterology NPs/PAs <i>n</i> = 116 (%)	Pediatrician/PCPs <i>n</i> = 206 (%)	<i>P</i> -value
Stool withholding ^a	87	86	77	.015
Large size of bowel movements ^a	76	91	78	.003
Frequency of stooling ^a	64	69	51	.003
Hard mass on rectal examination ^a	62	40	41	<.001
Abdominal pain with bowel movements ^a	44	48	48	.714
Fecal incontinence (after toilet trained ^b) ^a	43	43	35	.201
Abdominal mass on abdominal exam	25	16	25	.146
Overflow diarrhea	31	35	34	.731
Abdominal distension	26	30	42	.003
Family history of significant illness	13	12	19	.096
Blood in the stool	8	8	10	.684
Urinary incontinence or recurrent urinary tract infections	7	6	17	.001
Change in appetite	7	10	15	.038
Weight loss	4	3	7	.232
Vomiting	2	1	1	.826

Survey respondents were asked to select the 'top 5' criteria they use to make a diagnosis of functional constipation from this list of possible options.

^aRome III criteria for child less than 4 years old.

^bPatient is not fully toilet trained.

NPs: nurse practitioners; PAs: physician assistants; PCPs: primary care physicians.

overflow diarrhea and abdominal mass, are not in the Rome III criteria.

Initial assessment of functional constipation

Respondents were asked to select how they would conduct an initial assessment on the patients presented in case 1 and case 2. The 3-year-old patient is not exhibiting 'alarm symptoms' and thus, according to NASPGHAN guidelines, no additional testing is needed [2]. However, most clinicians indicated that they would perform some type of assessment, most commonly rectal exam, thyroid testing, and abdominal plain film (Table 3). Overall, 35% of gastroenterologists and 43% of gastroenterology NP/PAs would also conduct celiac screening.

Respondents were also asked to indicate their initial assessment for a 6-year-old patient with a 1-year history of constipation who has had unsuccessful treatment with polyethylene glycol (PEG) and a senna laxative. This patient has constipation refractory to therapy and has clinical signs (dimple, tuft of hair in sacrum) that are concerning for a spinal anomaly. Additional testing is warranted to rule out spinal cord lesions or other potential causes of the constipation. Most clinicians would appropriately conduct a rectal exam for this patient, but fewer are concerned about spinal anomalies (Table 3). Overall, 58% of specialists and 65% of pediatricians/PCPs would conduct an MRI of the spine and less would

recommend anorectal manometry (14% of gastroenterologists, 8% of gastroenterology NP/PAs, and 17% pediatricians/PCPs). Celiac screening and thyroid testing, also appropriate at this point, were selected by a minority of clinicians. Around 30% of pediatricians/PCPs would not attempt to assess this patient, referring them directly to a specialist.

Treatment of functional constipation

For initial management of the 3-year-old patient, 85% of specialists and 63% of pediatricians/PCPs would include PEG in the treatment regimen (Table 4). PEG and lactulose are included in the NASPGHAN guidelines as preferred initial treatment options. Nearly all respondents included lifestyle changes, such as increased hydration and improved diet, into their treatment plan but only three (1%) of specialist clinicians and seven (3%) of pediatrician/PCPs would treat this patient with lifestyle changes only. Many other supplements and recommendations were selected by respondents, most commonly fiber supplements, probiotics, and senna laxatives. Pediatrician/PCPs were significantly less likely to choose PEG and were more in favor of fiber supplementation and mineral oil than the specialists.

For the 6-year-old patient refractory to PEG and senna laxative treatment, the majority of clinicians, but more specialists than pediatricians/PCPs, would recommend 'clean out'

Table 3. Initial assessment of patients with suspected constipation.

Case 1: 3-year-old patient experiencing initial symptoms indicative of functional constipation				
	Gastroenterologists n = 197 (%)	Gastroenterology NPs/PAs n = 116 (%)	Pediatrician/PCPs n = 206 (%)	P-value
Assessment selection (select all that apply)				
No additional evaluation ^a	15	11	20	.087
Rectal examination	75	71	53	<.001
Thyroid testing	37	47	26	.001
Abdominal plain film (KUB)	36	47	50	.013
Celiac screening	35	43	9	<.001
Neurological examination	32	20	26	.062
Metabolic panel/chemistries	29	32	19	.022
Complete blood count	28	34	18	.004
Transit study (Sitzmark study)	8	2	2	.006
Allergy testing	4	8	4	.243
Anorectal manometry	4	3	4	.714
Colonic motility test	3	2	3	.663
Colonoscopy	2	1	1	.874
MRI of the spine	0	1	0	.175
Other	1	2	0	.548
Assessment selection (select all that apply)				
Case 2: 6-year-old with a 1-year history of constipation, unsuccessfully treated with multiple medications				
Assessment selection (select all that apply)				
Rectal examination ^a	86	75	59	<.001
Celiac screening ^a	58	61	17	<.001
MRI of the spine ^a	58	58	45	.015
Thyroid testing ^a	56	63	34	<.001
Anorectal manometry ^a	14	8	12	.281
Abdominal plain film (KUB)	43	56	61	.001
Metabolic panel/chemistries	44	50	32	.002
Complete blood count	41	53	30	<.001
Transit study (Sitzmark study)	15	10	5	.005
Allergy testing	6	11	4	.035
Colonoscopy	5	2	5	.351
Colonic motility test	2	3	6	.087
Refer to specialist	-	-	30	-
Other	3	2	2	.680

^aEvidence-based response.

NPs: nurse practitioners; PAs: physician assistants; PCPs: primary care physicians.

Table 4. Treatment of functional constipation.

	Gastroenterologists <i>n</i> = 197 (%)	Gastroenterology NPs/PAs <i>n</i> = 116 (%)	Pediatrician/PCPs <i>n</i> = 206 (%)	<i>P</i> -value
Case 1: 3-year-old patient experiencing initial symptoms indicative of functional constipation. The child has no fecal mass or impaction, and testing results were normal.				
Treatment choice (select all that apply)				
Polyethylene glycol (PEG) ^a	85	85	63	<.001
Lactulose ^a	8	6	7	.791
Lifestyle change (hydration, diet)	88	93	94	.057
Fiber supplement	44	34	55	.001
Delay toilet training	39	39	27	.015
Probiotic dietary supplement	18	27	24	.129
Senna laxative	16	22	10	.013
Mineral oil	8	9	18	.003
Refer to behavioral psychologist	6	5	3	.551
Bisacodyl	3	2	3	.806
Prucalopride	2	0	0	.276
Erythromycin	1	0	1	.537
Other	2	5	1	.067
Case 2: 6-year-old with a 1-year history of constipation, unsuccessfully treated with multiple medications. All imaging and test findings are found to be normal.				
Would you give this patient a "clean out?"				
Yes, for use at home	71	62	58	.061
Yes, inpatient	3	7	6	
No	26	31	37	
Treatment choice (select all that apply)				
Lifestyle change (hydration, diet)	83	89	80	.135
Optimize current therapy (PEG, senna)	81	91	67	<.001
Toileting regimen	79	81	56	<.001
Fiber supplement	44	38	64	.004
Bisacodyl	17	18	8	.004
Probiotic dietary supplement	14	29	33	<.001
Mineral oil	7	9	18	.022
Lactulose	5	9	12	.140
Prucalopride	2	1	1	.572
Erythromycin	1	1	1	.991
Refer to motility specialist for colonic manometry	13	21	9	.004
Refer for psych evaluation	8	7	2	.024
Refer to a pediatric surgeon for cecostomy or appendicostomy	1	2	1	.809
Refer to specialist	-	-	7	-
Other	3	5	2	.159

^aEvidence-based response.

NPs: nurse practitioners; PAs: physician assistants; PCPs: primary care physicians.

therapy for this patient even though he has no evidence of obstruction (Table 4). A small percentage of clinicians would recommend inpatient 'clean out.' For treatment, most clinicians preferred a conservative approach, using lifestyle changes, optimization of current PEG/senna therapy, and establishing a toilet regimen. Only 7% of pediatricians/PCPs deferred therapy selection to a specialist.

Clinicians were asked to rate their satisfaction with currently available therapies for pediatric constipation (1–10 scale, where 1 = not satisfied and 10 = extremely satisfied). Overall, clinicians are most satisfied with PEG (Table 5). Laxatives, osmotic enemas, and lubricants fall in the middle of the scale, indicating moderate satisfaction. Pediatrician/PCPs were significantly less satisfied with laxatives and PEG than specialists.

Referral for psychological evaluation

The 16-year-old male patient in case 3 self-reported medication noncompliance, had fecal accidents causing psychosocial distress, and appeared withdrawn and depressed during his office visit. As shown in Table 6, 72% of gastroenterologists and NPs/PAs, but only 56% of pediatricians/PCPs, included a referral for psychological evaluation as part of their management recommendation.

Use of NASPGHAN guidelines

when asked how often they used guidelines, roughly two-thirds of gastroenterologists and gastroenterology NP/PAs reported that they use them in all or most of their patients

Table 5. Satisfaction with currently available therapies for pediatric constipation.

	Gastroenterologists <i>n</i> = 197	Gastroenterology NPs/PAs <i>n</i> = 116	Pediatrician/PCPs <i>n</i> = 206	<i>P</i> -value
Laxatives	6.0 (2.0)	6.3 (2.2)	5.0 (2.0)	<.001
PEG	7.7 (1.8)	7.9 (1.8)	7.2 (1.8)	.004
Osmotic enemas	5.6 (2.0)	5.7 (2.0)	5.2 (2.0)	.069
Lubricants	5.3 (2.2)	5.3 (2.4)	5.3 (2.0)	.996

Values represent mean satisfaction scores (standard deviation) on a 10-point scale: 1, not satisfied; 10 extremely satisfied.

NPs: nurse practitioners; PAs: physician assistants; PCPs: primary care physicians; PEG: polyethylene glycol.

Table 6. Management of a 16-year-old patient with constipation history and adherence issues (case 3).

	Gastroenterologists <i>n</i> = 197 (%)	Gastroenterology NPs/PAs <i>n</i> = 116 (%)	Pediatrician/PCPs <i>n</i> = 206 (%)	<i>P</i> -value
Referral for psychological evaluation ^a	72	72	56	.002
Optimize current therapy	62	67	47	<.001
Lifestyle changes	59	62	66	.443
Toileting regimen	50	49	33	.001
Fiber supplement	35	26	41	.021
Referral to a GI motility specialist	28	28	11	<.001
Bisacodyl	15	18	9	.054
Probiotic dietary supplement	14	22	23	.071
Colonoscopy	5	17	6	<.001
Mineral oil	5	3	8	.140
Lactulose	5	3	12	.002
Prucalopride	4	1	2	.174
Erythromycin	2	0	1	.417
Referral to a surgeon	2	3	1	.522
Other	4	8	3	.180

^aEvidence-based response.

NPs: nurse practitioners; PAs: physician assistants; PCPs: primary care physicians; GI: gastrointestinal.

(Table 7). Overall, 76% of pediatricians/PCPs had never heard of these guidelines.

Specialists who indicated that they use the guidelines in all or most of their patients were significantly more likely to follow some guideline recommendations when compared with those clinicians who did not. In recognizing the criteria for functional constipation diagnosis, these clinicians were significantly more likely to include stool withholding (89.8% vs. 82.1%, $P = .049$) and fecal incontinence (48.0% vs. 34.2%, $P = .017$). When assessing the 6-year-old patient refractory to treatment (case 2), clinicians who used the guidelines were significantly more likely to conduct celiac screening (64.3% vs. 51.3%, $P = .023$). All other evidence-based decisions were similar between both groups.

Discussion

Constipation is a common ailment in children, and optimal management is imperative to prevent the development of defecation-avoidant behaviors and subsequent escalation of symptoms [1,3]. A critical early step in the management of pediatric patients with signs and symptoms of constipation is the selection of an appropriate diagnostic strategy. Patients presenting with a straightforward history and no alarm symptoms typically do not warrant extensive testing. In contrast, patients with refractory constipation or patients displaying a presentation suggestive of underlying abnormalities or organic causes that could be responsible for the constipation symptoms should be more thoroughly evaluated. Matching

diagnostic strategy to patient presentation in a manner that avoids either over-testing or under-testing can be challenging.

An important consideration when determining a strategy for evaluating a patient is identification of the criteria that will establish a diagnosis of functional constipation. The joint ESPGHAN/NASPGHAN guidelines recommend the use of the Rome III diagnostic criteria [2]. Survey respondents were asked to indicate the top five signs or symptoms they consider to establish a diagnosis of functional constipation (as the child had not completed toilet training and currently defecates in a diaper, the fecal incontinence criterion was not considered to apply to his patient). As shown in Table 2, stool withholding and large bowel movements were considered indicative of functional constipation by more than three-fourths of the respondents, while frequency of stooling was considered by approximately two-thirds of specialists and half of pediatrician/PCPs, and presence of a hard mass on rectal exam and painful bowel movements were considered by lower percentages still. A frequency of stooling is not provided in patient in case 1; however, a 6-month history of gradually worsening abdominal pain, large and painful bowel movements, absence of hard mass on rectal exam, and resistance to toilet training are described. The fact that the patient displays some signs/symptoms that correspond to criteria that were selected by only a minority of clinicians suggests that some of the Rome III criteria are considered less frequently.

While these criteria are useful for diagnosis of functional constipation, the guidelines may not be easy to apply in practice. A study has shown that parent and child symptom

Table 7. Use of NASPGHAN guidelines.

How often do you use NASPGHAN guidelines when managing pediatric patients with functional constipation?	Gastroenterologists <i>n</i> = 197 (%)	Gastroenterology NPs/ PAs <i>n</i> = 116 (%)	Pediatrician/ PCPs <i>n</i> = 206 (%)
All of my patients	12	9	0
Most of my patients	48	59	8
About half of my patients	18	13	9
Few of my patients	15	10	6
None of my patients	8	9	1
Never heard of these guidelines	-	-	76

NASPGHAN: North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition; NPs: nurse practitioners; PAs: physician assistants; PCPs: primary care physicians.

reporting is not always in congruence and there may be disagreement in pain and stool reporting based on the type of measurement used [17]. Furthermore, some patients that present to the primary care provider may have symptoms compatible with functional constipation, but do not yet fulfill Rome criteria, given the short duration of the symptoms. After this study was conducted, the Rome IV criteria were released [18]. In the Rome IV guidance for pediatric functional constipation, a distinction has been made for patients who are toilet trained and those who are not, but the main criteria are the same.

The pediatric primary care community appears unfamiliar with NASPGHAN guidelines for functional constipation. Overall, 76% of the pediatrician/PCP group report unfamiliarity – similar to the results of a 2013 survey showing that 84% of pediatricians reported unfamiliarity [6]. However, specialist clinicians who claimed to use the NASPGHAN guidelines in a majority of patients were more familiar with or used guideline recommendations in only a few incidences when compared to those specialists who did not. This may indicate that continued education may be needed not only to increase familiarity with these guidelines but to show how and why they should be used in practice. Continued research may be needed to determine whether the specialist lack of adherence to these guideline recommendations is due to a lack of knowledge or other attitudinal issue or barrier to their use.

The patient in case 1 presents with no alarm signs or symptoms [2]; thus, guidelines that suggest no additional evaluation is necessary. However, as shown in Table 3, the large majority of respondents would perform a rectal examination for this patient. The current ESPGHAN/NASPGHAN guidelines suggest that in routine constipation, rectal examination may not be necessary at the initial visit; however, rectal examinations have been a long-standing part of routine clinical practice. Several other diagnostic tests were selected by over one-third of gastroenterologists and nearly half of NPs/PAs. During the physical examination of the patient in case 2, a sacral dimple near a tuft of hair was observed, suggesting a potential spinal anomaly [19]. Despite this concerning exam finding, less than two-thirds of respondents would perform an MRI of the spine. In case the spine is normal, the guidelines recommend celiac screening and thyroid testing for intractable patients, tests that may be indicated for this patient. Taken together, the apparent over-testing in case 1 and under-testing in case 2 suggest that gastroenterology clinicians may lack consensus on how best to match diagnostic approach to patient presentation. Educational programs which explore common diagnostic tests and their evidence-based indications may assist clinicians in selecting diagnostic approaches that are sufficiently informative and not overly burdensome.

Clinicians appear to be taking a very conservative approach to treatment of patients with functional constipation. Even with the refractory patient who has been experiencing symptoms for 1 year, most clinicians will prefer to encourage lifestyle changes or continue PEG and senna therapy rather than stepping up to second-line treatments. This reluctance could stem from their perceptions of current treatments. Overall, clinicians are only somewhat satisfied with currently available

treatments and, while not a top barrier, inadequate effectiveness was rated as a somewhat significant barrier. Continued research may be needed as emerging treatments become available for the pediatric population.

An additional area where educational programming may be beneficial was identified in relation to referring appropriate patients for psychological evaluation. The 16-year-old patient in case 3 presents after having previously been seen by two pediatric gastroenterologists during his 10-year history of constipation. He has not responded well to the therapy but admits noncompliance with this medication regimen. The patient displays a depressed mood and has a history of fecal accidents at home and school. Taken together, this presentation is indicative of a teenager experiencing psychosocial distress related to his functional constipation. While the majority of specialists (72%) would refer this patient for a psychological evaluation (Table 6), over one-quarter of specialists and over half of PCPs/pediatricians did not include this step in their management recommendation. Psychosocial difficulties are common in children and adolescents with constipation and can have a profound impact on quality of life, and it is important to address such issues in addition to treating the constipation itself [20,21]. Future educational programming may assist clinicians in identifying patients who may benefit from a psychologic consultation.

Limitations

This study used a case vignette survey as a surrogate measure of clinicians' practice. While the use of case vignettes has been shown to provide valid and reliable data on clinicians' actual practice patterns [12–15], the scenarios included in this survey are limited and overall trends may not be applicable to all patients with functional constipation. Further, not all physicians in this study may have access to the needed tests, including anorectal manometry or defecography. Responses including specialized tests may be more due to lack of access than knowledge gaps, and further investigation is warranted. Respondents were compensated for their participation, which could influence participation rates and responses. To reduce inappropriate bias, the compensation provided was nominal – sufficient only to encourage, rather than induce participation. Additionally, the use of a quota sample could establish a selection bias as only the clinicians who responded quickly were included in the analysis. However, demographic characteristics of the sample were representative of the general population of gastroenterologists, PCPs, and pediatricians according to the AMA Physician Masterfile.

Conclusion

This study used an online case vignette survey to identify and quantify opportunities for future education among gastroenterologists, gastroenterology NPs/PAs, and PCPs. Specialist physicians and NPs/PAs have similar practice patterns, and both audiences consistently made treatment recommendations for the three patient cases that are well aligned to the latest NASPGHAN guidelines. PCPs are less familiar with these guidelines and may not be always appropriately managing pediatric patients with functional constipation. Nevertheless,

all groups of clinicians may benefit from CME activities focusing on diagnostic criteria, matching diagnostic approach to patient presentation and treatment strategies, and identifying patients who may benefit from psychological evaluation to improve the quality of care provided to the pediatric patients with constipation.

Acknowledgments

None reported.

Funding

This manuscript was funded by Takeda Pharmaceuticals US.

Declaration of interest

AB received an honorarium for his assistance with survey development and data interpretation. AS is an employee of Takeda Pharmaceuticals. All other authors have no conflicts to disclose. This study was financially supported by Takeda Pharmaceuticals USA, Inc. to objectively identify areas of educational need within these communities. Postgraduate Medicine peer reviewers on this manuscript have no relevant financial or other relationships to disclose.

References

1. Van den Berg MM, Benninga MA, Di Lorenzo C. Epidemiology of childhood constipation: a systematic review. *Am J Gastroenterol*. 2006;101(10):2401–2409.
2. Tabbers MM, Dilorenzo C, Berger MY, et al. Evaluation and treatment of functional constipation in infants and children: evidence-based recommendations from ESPGHAN and NASPGHAN. *J Pediatr Gastroenterol Nutr*. 2014;58(2):265–281.
3. Nurko S, Zimmerman LA. Evaluation and treatment of constipation in children and adolescents. *Am Fam Physician*. 2014;90(2):82–90.
4. Baker SS, Liptak GS, Colletti RB, et al. Constipation in infants and children: evaluation and treatment. A medical position statement of the North American Society for Pediatric Gastroenterology and Nutrition. *J Pediatr Gastroenterol Nutr*. 1999;29:612–626.
5. Baker SS, Liptak GS, Colletti RB, et al. Evaluation and treatment of constipation in children: summary of updated recommendations of the North American Society for Pediatric Gastroenterology and Nutrition. *J Pediatr Gastroenterol Nutr*. 2006;43(3):405–407.
6. Yang CH, Punati J. Practice patterns of pediatricians and trainees for the management of functional constipation compared with 2006 NASPGHAN guidelines. *J Pediatr Gastroenterol Nutr*. 2015;60(3):308–311.
7. Laxdal O, Jennett P, Wilson T, et al. Improving physician performance by continuing medical education. *Can Med Assoc J*. 1978;118(9):1051–1058.
8. Stein L. The effectiveness of continuing medical education: eight research reports. *J Med Educ*. 1981;56(2):103–110.
9. Davis D, O'Brien M, Freemantle N, et al. Impact of formal continuing medical education: do conferences, workshops, rounds, and other traditional continuing education activities change physician behavior or health care outcomes? *JAMA*. 1999;282(9):867–874.
10. Mansouri M, Lockyer J. A meta-analysis of continuing medical education effectiveness. *J Contin Educ Health Prof*. 2008;27(1):6–15.
11. Davis D, Galbraith R. Continuing medical education effect on practice performance: effectiveness of continuing medical education: American College of Chest Physicians Evidence-Based Educational Guidelines. *Chest*. 2009;134:425–485.
12. Accreditation Council for Continuing Medical Education. Accreditation criteria [ACCME website]. 2017 [Accessed 2017 Jun 29]. Available from: http://www.accme.org/sites/default/files/626_20170321_Accreditation_Requirements_Document.pdf.
13. Peabody J, Luck J, Glassman P, et al. Comparison of vignettes, standardized patients, and chart abstraction: a prospective validation study of 3 methods for measuring quality. *JAMA*. 2000;283(13):1715–1722.
14. Peabody J, Luck J, Glassman P, et al. Measuring the quality of physician practice by using clinical vignettes: a prospective validation study. *Ann Intern Med*. 2004;141(10):771–780.
15. Luck J, Peabody J, Lewis B. An automatic scoring algorithm for computerized clinical vignettes: evaluating physician performance against explicit quality criteria. *Int J Med Inform*. 2006;75(10–11):710–717.
16. Peabody J, Liu A. A cross-national comparison of the quality of clinical care using vignettes. *Health Policy Plan*. 2007;22(5):294–302.
17. Czyzewski DI, Lane MM, Weilder EM, et al. The interpretation of Rome III criteria and method of assessment affect the irritable bowel syndrome classification of children. *Ailment Pharmacol Ther*. 2011;33(3):403–411.
18. Benninga MA, Faure C, Hyman PE, et al. Childhood functional gastrointestinal disorders: neonate/toddler. *Gastroenterology*. 2016;150:1443–1455.
19. Rosen R, Buonomo C, Andrade R, et al. Incidence of spinal cord lesions in patients with intractable constipation. *J Pediatr*. 2005;145(3):409–411.
20. Philips EM, Peeters B, Teeuw AH, et al. Stressful life events in children with functional defecation disorders. *J Pediatr Gastroenterol Nutr*. 2015;61(4):384–392.
21. Ranasinghe N, Devanarayana NM, Benninga MA, et al. Psychological maladjustment and quality of life in adolescents with constipation. *Arch Dis Child*. 2017;102(3):268–273.