Practical Approach to Pediatric Constipation

Jennifer Webster, DO
Assistant Professor, Department of Pediatrics
Attending Physician, Division of Gastroenterology, Hepatology, and Nutrition
Children’s Hospital of Philadelphia

Disclosure
• I have no relevant financial relationships or conflicts of interest to disclose.

Objectives
• Better understand the epidemiology and pathophysiology of pediatric functional constipation
• Appropriately choose medical work up for pediatric constipation
• Improve treatment of functional constipation in pediatrics
• Understand population required referral to pediatric gastroenterology
National Statistics

- Prevalence around 30%
  - 30-50% of children have symptoms for >5 years

- 5% of visits to the general pediatrician
- 25% of referrals to pediatric GI
- Estimated $3.9 billion of excess spending
  - Outpatient, ED, Inpatient, Pharmacy

Epidemiology

- No difference in prevalence by gender
- Majority of patients are under 4 years of age at diagnosis
- In one major study
  - No differences in:
    - Water intake
    - Feeding pattern in infancy
    - Toilet training age
    - Diet pattern
  - Over 90% of patients have “functional idiopathic constipation”

Healthcare Utilization

Health Utilization and Cost Impact of Childhood Constipation in the United States

- Annual expenditure was significantly higher in children with constipation versus those without ($3430 vs $1099 per year) → cost attributable to constipation relative to the general pediatric population is approximately $3.9 billion

Direct medical costs of constipation in children over 15 years: a population-based birth cohort
- Mean direct medical costs were 4x those of controls ($25,100 vs $5,913)
**Definition of Constipation**

**Rome criteria for child with developmental age <4 years**
- Must have ≥ 2 of the following for ≥ 1 month
  - ≤ 2 defecations per week
  - At least 1 episode of incontinence per week after the acquisition of toilet training skills
  - History of excessive stool retention
  - History of painful or hard bowel movements
  - Presence of a large fecal mass in the rectum
  - History of large-diameter stools that may obstruct the toilet


**Definition of Constipation**

**Rome criteria for child with developmental age ≥ 4 years**
- Must have ≥ 2 of the following for ≥ 2 months with insufficient criteria for irritable bowel syndrome
  - ≤ 2 defecations per week
  - At least 1 episode of incontinence per week
  - History of retentive posturing or excessive volitional stool retention
  - History of painful or hard bowel movements
  - Presence of a large fecal mass in the rectum
  - History of large-diameter stools that may obstruct the toilet

**Formation of Feces**
- Enteric content enters the colon via the ileocecal valve
- Stools are formed by the progressive absorption of water
- Propelled along the colon to the rectum
  - High amplitude propagating contractions
- Rectum stores and eliminates stool
Pathophysiology of Defecation

- Stool in the rectum triggers the autonomic nervous system to relax the internal anal sphincter
- Stool comes in contact with receptors in the anal canal
- Somatic nervous system triggered to control external anal sphincter
- Act of defecating
  - Contract diaphragm, abdomen and rectal muscles
  - Relax external anal sphincter
  - Relax puborectalis muscle

Where is the problem?

- Colon
  - Slow transit
  - Chronic constipation
  - Neurogenic bowel
  - Spinal cord anomalies
  - Sacral teratoma
  - Dysmotility
  - Pseudo-obstruction
  - Colonic inertia

- Rectum and sphincters
  - Internal anal sphincter
    - Hirschsprung disease
    - Anal atresia
  - External anal sphincter (voluntary)
    - Anal stenosis
    - Disordered defecation
    - Voluntary withholding
    - Megarectum
    - Result of abnormal function of external sphincter
### Diagnosis

#### HISTORY AND PHYSICAL

<table>
<thead>
<tr>
<th>Age</th>
<th>History (Frequency and consistency of stool)</th>
<th>Physical</th>
</tr>
</thead>
</table>
| Newborn – 4 months   | • Passage of meconium  
• Change in diet  
• Blood in stool                                                                                                                 | • Abdominal exam (abdominal)  
• Perianal exam (anorectal malformations)  
• Digital rectal exam (passage of stool, tight)  
• Spine and tone (dimple/tuft of hair)  
• Hemoccult                                              |
| 5 months – Toilet training | • Change in diet  
• Passage of hard stool/pain with stools  
• Withholding behavior  
• Success or failure of toilet training                                                                                         | • Abdominal exam (palpable stool)  
• Perianal exam (stool from leakage)  
• Digital rectal exam (stool in rectum)                                               |
| School aged          | • Passage of hard stool/pain with stools  
• Toilet accessibility or phobia  
• Leakage of stool  
• Diet and water intake                                                                                                          | • Abdominal exam (palpable stool)  
• Perianal exam (stool from leakage)  
• Digital rectal exam (stool in rectum)                                               |
| Older children and teens | • Passage of hard stool/pain with stools  
• Recent infection  
• Change in routine or stressors  
• New medications  
• Leakage of stool  
• Diet and water intake                                                                                                           | • Abdominal exam (palpable stool)  
• Perianal exam (stool from leakage)  
• Digital rectal exam (stool in rectum)                                               |
Toilet Training

<table>
<thead>
<tr>
<th>Early (readiness; developmental)</th>
<th>Middle (self-help; teachable)</th>
<th>Late (making progress)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Understands potty words</td>
<td>• Flushes toilet by self</td>
<td>• Uses a regular toilet</td>
</tr>
<tr>
<td>• Shows interest in potty training</td>
<td>• Washes hands</td>
<td>• Stays BM free during the day (no &quot;accidents&quot;)</td>
</tr>
<tr>
<td>• Tells during or after having a BM (and has regular BMs, not overnight*)</td>
<td>• Pulls training pants up/down</td>
<td>• Tells before having to urinate and stays dry during the day</td>
</tr>
<tr>
<td>• Indicates a physical need to &quot;go&quot;</td>
<td></td>
<td>• Enters bathroom to urinate or have a BM</td>
</tr>
<tr>
<td>• Stays dry for 2 hours</td>
<td></td>
<td>• Stays dry overnight</td>
</tr>
</tbody>
</table>

1. Children with constipation and withholding toilet train later
2. Constipation contributes to stool toileting refusal

Differential Diagnosis and Alarm Signs

- Hirschsprung disease
  - No passage of meconium >48 hours of age
  - Onset <1 month of age
  - Abdominal distention
  - Malnutrition
  - DRE: narrow canal, Elimination of stool after DRE

- Anorectal malformations
  - Ribbons stools
  - DRE: tight canal

- Pseudo-obstruction
  - Malnutrition
  - Abdominal distention
  - Urinary involvement

- Spinal cord abnormalities
  - Weakness of legs
  - Urinary involvement
  - Gluteal cleft or tuft of hair
  - DRE: absent anal and cremasteric reflex

- Pseudo-obstruction
  - Malnutrition
  - Abdominal distention
  - Urinary involvement

16

17

18
Less likely etiologies

- Cystic fibrosis
- Celiac disease
- Inflammatory bowel disease
- Sexual abuse
- Anorexia

Work up

Laboratory investigation
- No published data meet standards to validate testing for:
  - Hypothyroidism
  - Celiac disease
  - Hypercalcemia

Abdominal x-ray

Evaluation of a method of assessing fecal loading on plain abdominal radiographs in children: a systematic review and meta-analysis

Are the Using Abdominal Radiographs Appropriate to the Management of Pediatric Constipation? A systematic review and meta-analysis

Work Up – Where is the problem?

Colon
- Slow transit
- Neurogenic bowel
- Dysmotility

1. Transit study
2. Colonic manometry
3. Lumbar spine MRI
**Colonic Manometry**

Fed state – increased activity

After Bisacodyl – HAPCs propagating to the most distal recording port

---

**Work up – Where is the problem?**

**Internal and external anal sphincter**

- Hirschsprung disease
- Anal achalasia
- Disordered defecation

1. Anorectal Manometry
2. Suction Rectal Biopsy

---

**Anorectal Manometry**

Rectoanal inhibitory reflex (RAIR)

Push – Defecation Dynamics
Practical Approach to Pediatric Constipation
Jennifer B. Webster, DO

Ganglion cells not present
- Abnormal acetylcholinesterase staining
- Absence of calretinin staining


Rectal Suction Biopsy

- Dietary
  - Fiber
  - Fluid intake
- Pharmacologic
  - Softeners
  - Osmotic laxatives
  - Stimulant laxatives
  - Rectal therapies
  - Secretagogues

Treatment

- Behavioral Therapy
  - Cognitive behavioral therapy
- Biofeedback
- Surgery
  - Antegrade enemas
  - Ostomy


Dietary Treatment

Fiber
- Limited evidence that additional fiber improves constipation compared to placebo
- NASPGHAN guidelines
  - "Evidence does not support the use of fiber supplements in the treatment of functional constipation"

Fluid Intake
- Increasing fluid alone has not been shown to improve constipation
- Similar stool frequency in patients who increase water intake >50% to those who did not
- NASPGHAN guidelines
  - "Evidence does not support the use of extra fluid intake in the treatment of functional constipation"
Pharmacologic

<table>
<thead>
<tr>
<th>Softeners/Lubricants</th>
<th>Stimulant Laxatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Oil</td>
<td>Bisacodyl</td>
</tr>
<tr>
<td>Docusate</td>
<td>Senna</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Osmotic Laxatives</th>
<th>Rectal Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactulose</td>
<td>Glycerin</td>
</tr>
<tr>
<td>PEG 3350</td>
<td>Mineral oil</td>
</tr>
<tr>
<td>Magnesium products</td>
<td>Sodium phosphate</td>
</tr>
<tr>
<td></td>
<td>NaCl</td>
</tr>
<tr>
<td></td>
<td>Bisacodyl</td>
</tr>
</tbody>
</table>

- Polyethylene glycol as best evidence versus placebo for treatment of constipation
- Lactulose is recommended if polyethylene glycol is not tolerated or <6 months
- Avoid rectal therapies – especially if there is a fear component

The Controversy of PEG 3350

- On February 14, 2017, a Philadelphia news station reported that multiple families approached them claiming that a brand of PEG product caused neuropsychiatric symptoms in their children
- Mass media reporting and patient beliefs about medications have a negative impact on adherence to medication

PEG 3350 Administration Is Not Associated With Sustained Elevation of Glycol Levels

**Objective**

To determine whether those doses of polyethylene glycol (PEG), dextrose/glycol (DGS), or triphosphate (Triphos) (PEG 3350) are associated with increased short levels of SG, DG, or TGA in children receiving PEG 3350. Study design: Blood samples were drawn from 6 children after being treated for constipation with PEG 3350 (20 mL/kg) and after receiving 500 mL of PEG 3350. Blood samples were taken after 1, 2, and 3 hours after receiving the PEG 3350 solution. Results: No significant changes in SG, DG, or TGA levels were observed. Conclusions: Daily PEG 3350 therapy in children was not associated with sustained elevation of SG, DG, or TGA levels.
Secretagogues

<table>
<thead>
<tr>
<th>Lubiprostone</th>
<th>Chloride channel activator ( \rightarrow ) enhances chloride-rich intestinal fluid secretion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Rates of response were higher with lubiprostone vs placebo for improved pain and stool frequency</td>
</tr>
<tr>
<td></td>
<td>• Rates of response were higher with lubiprostone vs placebo for improved bloating and stool frequency</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Linaclotide</th>
<th>Guanylate cyclase-C agonist ( \rightarrow ) increases luminal chloride and fluid secretion through the generation of cyclic guanosine monophosphate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Significantly greater percentage of linaclotide treated patients vs placebo reported a reduction of ( \geq 30% ) in abdominal pain</td>
</tr>
</tbody>
</table>

Behavioral Therapies

- Education
  - “Poo in You”
- Relaxation training
  - Deep exhales, increase belly pressure (pinwheels)
- Address anxiety and toilet phobia
  - Gradual shaping
  - Start with diaper/pull-up on toilet

- Bowel retraining
  - Toilet sitting routine – sit 1 minute for each year up to age 10, after meals
  - Unhurried time
- Reinforcement
  - Simple schedules
  - Immediate, tangible rewards focused to child’s interests

Biofeedback

- Behavioral therapy such as biofeedback is more effective than medication alone
- Most helpful for patients with dyssynergic defecation
- No evidence in children at this time

Electrodes placed on lower abdomen and perianal area

Abnormal if unable to maintain perianal relaxation during increased abdominal pressure
**Surgical Management**

**Anal procedures**
- Sphincter myotomy
- Botox injection

**Antegrade Colonic Enemas**
- Appendicostomy
- Cecostomy

**Colorectal resection**
- Segmental resection
- Subtotal colectomy
- Total colectomy

**Intestinal diversion**
- Ileostomy
- Colostomy

---

**Antegrade Enemas**

Malone Appendicostomy (ACE)

Complications:
- Pain
- Granulation tissue
- Stoma leakage
- Stoma stenosis
- Infection

Surgical Cecostomy

Complications:
- Tube leakage
- Granulation

---

**Cheng, Lily, Goldstein, Allan. Surgical Management of Idiopathic Constipation in Pediatric Patients.** Clin Colon Rectal Surg. 2018;31:89-98

Surgical Management Outcomes

- Maintain continence
- Decrease colonic dilatation
- Return of colonic motility after improved dilatation

Referral to Pediatric Gastroenterology

- Common reasons for referral
  - Parental pressure
  - Concern for missing another diagnosis
  - Failure of initial therapy
- Variability in background knowledge
  - 8% of general pediatrics aware of the NASPGHAN guidelines
  - 60% of general pediatrics aware of the Rome criteria to define functional constipation
- Discomfort with care of these patients
  - 40% of trainees referred because they did not feel comfortable with management of these patients
  - >50% felt there was not enough childhood constipation-related information available

Who should be referred?

- Red flag symptoms
  - Delayed passage of meconium
  - Onset < 1 month of age (without a trigger)
  - Malnutrition
  - Abnormal digital rectal exam
- Lack of response after escalation of therapy
- Need for advanced workup or treatment
  - Evidence of disordered defecation ➔ anorectal manometry
    - Biofeedback
    - Concern for dysmotility ➔ colonic manometry
  - Surgical interventions

Summary

- Pediatric constipation is common and expensive
- The most important part of diagnosis is the history and physical
- Workup can be extensive but often the HPI alone is enough
  - Determine workup based off of primary location of concern
- Treatments include
  - Diet
  - Medication
  - Behavioral Therapy and Biofeedback
  - Surgical
- Referral for patients who have failed typical therapy or may require advanced workup
Patient Resources

- How to Potty Train Your Monster
- I can't! I won't! No way!

Questions?

- Feel free to reach out!
  – websterjb@email.chop.edu