Update on Pediatric Gastroenterology

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## Presenter Disclosures

<table>
<thead>
<tr>
<th>Category</th>
<th>Disclosures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant/Speakers bureaus</td>
<td>No Disclosures</td>
</tr>
<tr>
<td>Research funding</td>
<td>No Disclosures</td>
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<tr>
<td>Stock ownership/Corporate boards-employment</td>
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Objectives

• Review of common pediatric GI issues (Abdominal pain, GERD, EOE, constipation)
• Discuss treatment strategies for common pediatric GI issues
• Review when to refer patients for specialty care for GI issues
Chronic Abdominal Pain
(Functional Abdominal Pain Disorders)

• Prevalence: ~13.5%, female predominance
• Etiology: unknown, multifactorial
• Rome IV criteria:
  • “after appropriate medical evaluation, the symptoms cannot be attributed to another medical condition.”
  • Related conditions: irritable bowel syndrome, functional dyspepsia, abdominal migraine, etc
Rome IV Diagnostic Criteria

TABLE 2. Rome IV diagnostic criteria for functional abdominal pain disorders in the child/adolescent.8,9

Functional abdominal pain - not otherwise specified

- Occurs ≥4 times per month for ≥2 months
- Episodic or continuous abdominal pain that does not occur solely during physiologic events (e.g., eating, menses)
- Insufficient criteria for other functional GI disorders i.e. irritable bowel syndrome, functional dyspepsia, or abdominal migraine
- After appropriate evaluation, abdominal pain cannot be fully explained by another medical condition
Evaluation

- History
- Physical
- ROS

### Table 2. Potential Alarm Features in Children With Chronic Abdominal Pain

<table>
<thead>
<tr>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family history of inflammatory bowel disease, celiac disease, or peptic ulcer disease</td>
</tr>
<tr>
<td>Persistent right upper or right lower quadrant pain</td>
</tr>
<tr>
<td>Dysphagia</td>
</tr>
<tr>
<td>Odynophagia</td>
</tr>
<tr>
<td>Persistent vomiting</td>
</tr>
<tr>
<td>Gastrointestinal blood loss</td>
</tr>
<tr>
<td>Nocturnal diarrhea</td>
</tr>
<tr>
<td>Arthritis</td>
</tr>
<tr>
<td>Perirectal disease</td>
</tr>
<tr>
<td>Involuntary weight loss</td>
</tr>
<tr>
<td>Deceleration of linear growth</td>
</tr>
<tr>
<td>Delayed puberty</td>
</tr>
<tr>
<td>Unexplained fever</td>
</tr>
</tbody>
</table>

_aClinical judgment should be exercised, putting what might be considered an alarm sign into the whole context of the history and physical examination._

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Evaluation

• Labs
  • CBC, Chem 14, ESR, CRP
  • Celiac testing, Thyroid tests, Amylase, Lipase, urinalysis
  • Others based on thorough history, physical, and ROS
Influences that contribute to abdominal pain

The Three Influences on the GI System

- Physical (disease, damage)
- Sensation (nerve endings)
- Nervous System (anxiety, stress, worry, depression)

Functional GI Disorder (FGID)
Management

• Treat underlying disease
• Education and reassurance
  • Emphasize absence of organic disease
• Diet and lifestyle changes
  • Avoid triggers (consider Low FODMAP foods)
  • Probiotics and fiber
  • Yoga, meditation, relaxation
• Symptom relief
  • Peppermint oil
  • Histamine receptor antagonist (cyproheptadine)
  • Anticholinergic agents (dicyclomine or hyoscyamine)
  • Tricyclic antidepressants (amitriptyline)
• Cognitive-Behavioral therapy
When to refer

- Red flags on history and physical
- Abnormal labs (celiac disease, inflammation, etc.)
- Need for upper and/lower endoscopy.
- Unclear diagnosis after thorough evaluation
Gastroesophageal reflux disease

- GER: Passage of gastric contents into the esophagus with or without regurgitation or vomiting.
- GERD pathologic GER
- Prevalence:
  - Infant: 23.1% to 40.0%; decreases as infant age increased
  - Less than 10 years: 3.2%
  - Older than 10 years: 0.2%-18.8%

# GERD Red Flags

<table>
<thead>
<tr>
<th>Infant</th>
<th>Child</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset immediately after birth</td>
<td>Weight loss</td>
</tr>
<tr>
<td>Weight loss</td>
<td>Weight loss</td>
</tr>
<tr>
<td>Fever</td>
<td>Dysphagia or odynophagia</td>
</tr>
<tr>
<td>Dyspnea or cough</td>
<td>Hematemesis</td>
</tr>
<tr>
<td>Projectile vomiting</td>
<td>Hematochezia</td>
</tr>
<tr>
<td>Bilious emesis</td>
<td>Chest pain</td>
</tr>
<tr>
<td>Bulging fontanelle</td>
<td>Cyclical/specific timing</td>
</tr>
<tr>
<td>Seizure</td>
<td>Nocturnal</td>
</tr>
<tr>
<td>Macrocephaly</td>
<td></td>
</tr>
<tr>
<td>Abdominal distention</td>
<td></td>
</tr>
<tr>
<td>Hematemesis</td>
<td></td>
</tr>
<tr>
<td>Hematochezia</td>
<td></td>
</tr>
</tbody>
</table>

Not all-inclusive. Use clinical judgement based on thorough history and physical

Physiologic GER

- “Happy spitter”
- Rare prior to 1 month or after 6 months
- Usually resolves by 12 months
- Consider work if not following this pattern

- Sandifer syndrome: arching of the back with opisthotonic posturing.
  - May resemble seizure – unlike seizures, patient is responsive to stimulus
Physiologic GER

• “Happy spitter”

Prevalence of daily regurgitation during the first year of life.

Physiologic GER

• “Happy spitter”

Prevalence of daily regurgitation during the first year of life.

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deglutition</td>
<td>Oral and pharyngeal phase swallowing</td>
</tr>
<tr>
<td></td>
<td>Laryngeal penetration</td>
</tr>
<tr>
<td></td>
<td>Tracheal aspiration</td>
</tr>
<tr>
<td>Esophagram</td>
<td>Identifies esophageal webs, tracheoesophageal fistula, achalasia, diaphragmatic hernia</td>
</tr>
<tr>
<td>Upper GI series</td>
<td>Assesses through to the ligament of Treitz</td>
</tr>
<tr>
<td></td>
<td>Identifies esophageal pathologies in esophagram and gastric antral webs, microgastria, pyloric obstruction/stenosis, duodenal atresia/stenosis, malrotation</td>
</tr>
<tr>
<td>EGD</td>
<td>Aids in diagnosis of eosinophilic esophagitis, diaphragmatic hernia, gastritis, peptic ulcer disease, Crohn’s disease</td>
</tr>
<tr>
<td>pH and impedance probe</td>
<td>Evaluation of changes in pH and solid, liquid, and gas passage in the esophagus</td>
</tr>
<tr>
<td></td>
<td>Measures reflux events and correlates with symptoms</td>
</tr>
</tbody>
</table>

Management

“In the absence of red flag signs and symptoms, diagnostic testing and/or therapies including acid suppression are not indicated if there is no impact of the symptoms on quality of life such as feeding, growth or acquisition of developmental milestones”

Management

• Diet and lifestyle changes:
  • Infants remain in supine position
  • Thickening milk/formula
  • Trial of dairy and soy elimination (minimum 2 weeks)
  • Avoidance of chocolate, tomato based and acidic foods, caffeine, fatty foods, tobacco, and alcohol

• Acid suppression:
  • Infant: no benefit found
  • Child: 4-8 weeks after diet and lifestyle changes
  • PPI’s are preferred
    • Long term use increased incidence of pulmonary infections, Clostridium difficile, and necrotizing enterocolitis.
    • May impact skeletal and renal health
When to refer

• Red flags suggesting underlying disease, unexplained weight loss, persistent forceful vomiting, dysphagia or odynophagia or hematemesis.

• GERD symptoms in an older child that are refractory to treatment, (8 weeks with little or no response to optimal treatment).

• 3) Endoscopically-confirmed GERD that requires chronic treatment with acid suppressing medications.
Eosinophilic Esophagitis

• First reported in 1990’s
• Prevalence: 5-10 per 100,000 children
• Type 2 T-helper mediated allergy; NOT IgE mediated
• Higher incidence in those with other atopic conditions
Presentation

- Dysphagia or odynophagia
- Food impactions
- Vomiting
- Food refusal
- Chronic reflux
- Poor weight gain/weight loss
Evaluation and Initial Treatment of EoE

Patient presents with symptoms of: chronic gastroesophageal reflux, chest pain, odynophagia, dysphagia, hx of food impaction

Referral to pediatric gastroenterology

Esophagogastroduodenoscopy (EGD) with proximal and distal biopsies

> or = 15 eosinophils per high-power field

Rule out non EOE causes of esophageal eosinophilia

Confirm eosinophilic esophagitis

Fig. 1. Evaluation and treatment algorithm.
Work up

• Requires mucosal biopsies
• PPI trial not required to diagnose EOE
• PPI responsive esophageal eosinophilia
• Food allergy testing does not rule in or rule out EOE
• Normal esophagogram does not rule out EOE
Work up

• Requires mucosal biopsies
• PPI trial not required to diagnose EOE
• PPI responsive esophageal eosinophilia
• Food allergy testing does not rule in or rule out EOE
• Normal esophagram does not rule out EOE
Treatment options

- PPI
- Swallowed steroids: fluticasone or budesonide
- Food elimination
  - Amino acid based diet
  - Allergy testing directed
  - 6-food elimination diet is the most effective dietary treatment for eosinophilic esophagitis
6 Food Elimination Diet

- Dairy
- Soy
- Wheat
- Eggs
- Nuts
- Fish
Management

• Repeat endoscopy required between every treatment change
• 8-12 weeks necessary to allow for histologic improvement
• Uncontrolled inflammation may lead to esophageal stricture
Constipation

• 35% of pediatric office visits
• 10-25% of pediatric gastroenterology referrals
• Functional constipation: 95% of constipation cases
# Functional Constipation

**TABLE 2. Rome IV criteria for functional constipation.**

Must include 2 or more of the following occurring at least once per week for a minimum of 1 month with insufficient criteria for a diagnosis of irritable bowel syndrome:

- 2 or fewer defecations in the toilet per week in a child of a developmental age of at least 4 years
- At least 1 episode of fecal 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 can obstruct the toilet

After appropriate evaluation, the symptoms cannot be fully explained by another medical condition.

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### TABLE 3. Alarm signs (“red flags”) for organic causes of constipation in the history and physical exam of a child being evaluated for constipation.²,⁶

<table>
<thead>
<tr>
<th>History</th>
</tr>
</thead>
</table>
| • Constipation starting extremely early in life (< 1 month of age)  
| • Delayed passage of meconium (> 48 h)  
| • Family history of Hirschsprung disease  
|  
| Stool characteristics |  
| • Visible blood in the stools in the absence of anal fissures  
| • Ribbon stools  
|  
| Systemic symptoms |  
| • Poor growth/failure to thrive  
| • Fever  
| • Bilious vomiting  
|  
| Physical exam |  
| • Severe abdominal distension  
| • Perianal fistula  
| • Abnormal position of anus  
| • Absent anal wink or cremasteric reflex  
| • Decreased lower extremity strength/tone/reflex  
| • Tuft of hair on spine or sacral dimple  
| • Gluteal cleft deviation  
| • Extreme fear during anal inspection  
| • Anal scars  
| • Abnormal thyroid gland  

Work up

• Labs and imaging in the presence of red flags
  • Chem 8, celiac markers, Thyroid function
  • Abdominal XR
    • Radio-opaque markers
  • Contrast enema

• Motility testing
  • Anorectal manometry
  • Colonic manometry
<table>
<thead>
<tr>
<th>Laxative agents</th>
<th>1-2 years</th>
<th>2-4 years</th>
<th>5-10 years</th>
<th>10+ years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stimulant</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Senna</td>
<td>Twice a day</td>
<td>Twice a day</td>
<td>Twice a day</td>
<td>Twice a day</td>
</tr>
<tr>
<td></td>
<td>7.5 mg</td>
<td>15 mg</td>
<td>22.5 mg</td>
<td>30 mg</td>
</tr>
<tr>
<td>- Bisacodyl</td>
<td>None</td>
<td>5 mg</td>
<td>5 mg</td>
<td>10 mg</td>
</tr>
<tr>
<td><strong>Osmotic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- PEG 3350</td>
<td>Take over 4-8 h</td>
<td>Take over 4-8 h</td>
<td>Take over 4-8 h</td>
<td>Take over 4-8 h</td>
</tr>
<tr>
<td></td>
<td>2.5 capfuls in 16 oz of fluid</td>
<td>4 capfuls in 20 oz of fluid</td>
<td>7 capfuls in 32 oz of fluid</td>
<td>14 capfuls in 64 oz of fluid</td>
</tr>
<tr>
<td>- Magnesium citrate</td>
<td>None</td>
<td>2-4 oz (1 oz per age) plus 8-16 oz additional fluids</td>
<td>5-10 oz (1 oz per age); Plus 16-24 additional fluids</td>
<td>10 oz Plus additional 24-32 oz fluids</td>
</tr>
</tbody>
</table>

## Maintenance Regimens

<table>
<thead>
<tr>
<th>Laxative options</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Osmotic agents</strong></td>
<td></td>
</tr>
<tr>
<td>Lactulose</td>
<td>1-2 g/kg/day (1.5-3 ml/kg/day) div 1-2 times a day</td>
</tr>
<tr>
<td>PEG 3350</td>
<td>0.2 to 0.8 g/kg/day (4-8 oz fluid per 17 gm)</td>
</tr>
<tr>
<td>Milk of Magnesia</td>
<td>2-5 yrs: 0.4-1.2 g/day</td>
</tr>
<tr>
<td></td>
<td>6-11 yrs: 1.2-2.4 g/day</td>
</tr>
<tr>
<td></td>
<td>12-18 yrs: 2.4-4.8 g/day</td>
</tr>
<tr>
<td><strong>Stimulant agents</strong></td>
<td></td>
</tr>
<tr>
<td>Senna</td>
<td>2-6 yrs: 2.5-5 mg/day</td>
</tr>
<tr>
<td></td>
<td>6-11 yrs: 7.5-10 mg/day</td>
</tr>
<tr>
<td></td>
<td>&gt;12 yrs: 15-20 mg/day</td>
</tr>
<tr>
<td>Bisacodyl</td>
<td>3-10 yrs: 5 mg/day</td>
</tr>
<tr>
<td></td>
<td>&gt;10 yrs: 5-10 mg/day</td>
</tr>
</tbody>
</table>

Behavioral Changes

- Toilet sitting 2-3 times a day
- Footstool
- Consistency
- Symptom control for 6-9 months before weaning medications
- Evidence does not support extra fiber or fluids

When to refer

- Red flags present
- Poor response to laxatives
- Relapse
- Concern for motility disorder
# Foreign Body Ingestions

## TABLE 1. Timing of endoscopic intervention in pediatric foreign body ingestions

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
<th>Symptoms</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Button battery</td>
<td>Esophagus</td>
<td>Yes or No</td>
<td>Emergent</td>
</tr>
<tr>
<td></td>
<td>Gastric/SB</td>
<td>Yes</td>
<td>Emergent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>Urgent (if age &lt; 5 and BB ≥ 20 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Elective (if not moving on serial x-ray)</td>
</tr>
<tr>
<td>Magnets</td>
<td>Esophagus</td>
<td>Yes</td>
<td>Emergent (if not managing secretions, otherwise urgent)</td>
</tr>
<tr>
<td></td>
<td>Gastric/SB</td>
<td>No</td>
<td>Urgent</td>
</tr>
<tr>
<td>Sharp</td>
<td>Esophagus</td>
<td>Yes</td>
<td>Emergent (if not managing secretions, otherwise urgent)</td>
</tr>
<tr>
<td></td>
<td>Gastric/SB</td>
<td>No</td>
<td>Urgent (if signs of perforation, then with surgery)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Urgent</td>
</tr>
<tr>
<td>Food impaction</td>
<td>Esophagus</td>
<td>Yes</td>
<td>Emergent (if not managing secretions, otherwise urgent)</td>
</tr>
<tr>
<td></td>
<td>Gastric/SB</td>
<td>No</td>
<td>Urgent</td>
</tr>
<tr>
<td>Coin</td>
<td>Esophagus</td>
<td>Yes</td>
<td>Emergent (if not managing secretions, otherwise urgent)</td>
</tr>
<tr>
<td></td>
<td>Gastric/SB</td>
<td>No</td>
<td>Urgent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Elective</td>
</tr>
<tr>
<td>Long object</td>
<td>Esophagus</td>
<td>Yes or no</td>
<td>Urgent</td>
</tr>
<tr>
<td></td>
<td>Gastric/SB</td>
<td>Yes or no</td>
<td>Urgent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Elective</td>
</tr>
<tr>
<td>Absorptive object</td>
<td>Esophagus</td>
<td>Yes</td>
<td>Emergent (if not managing secretions, otherwise urgent)</td>
</tr>
<tr>
<td></td>
<td>Gastric/SB</td>
<td>No</td>
<td>Urgent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes or no</td>
<td>Urgent</td>
</tr>
</tbody>
</table>

BB = button battery; SB = small bowel.

References