Acute Abdominal Pain in Children

*Pediatric Abdominal Emergencies*

**OBJECTIVES**

- Differentiate between low risk and high risk patients
- Describe differences between the adult and the pediatric GI system
- Identify the signs and symptoms of an acute abdomen
- Utilize the diagnostic cues and mnemonics of different pediatric conditions
- Incorporate tips for the abdominal examination of an infant or young child

**GI System Differences Between Children and Adults**

*GASTROINTESTINAL SYSTEM*

- At birth, the resistance of the newborn's intestinal tract is less than that of adults.
- Intestinal tract is incompletely developed.
- Newborns have higher intestinal motility.
- High levels of motility in newborns:
  - Children with nausea and vomiting may experience more discomfort than adults.
  - The infant's stomach is smaller and empties rapidly.
  - Newborns produce nearless until 3 months of age.
  - Swallowing is effective for the first 3 months.
  - Hepatic efficiency in the newborn is immature.
  - The infant's fat absorption is poor because of a decreased pool of bile acids.
ACUTE ABDOMINAL PAIN IN CHILDREN

• Most common Medical cause...Gastroenteritis
• Most common Surgical cause...Appendicitis
• Diagnosis made initially on H & P
• Age is key factor...S/S vary with age,

• Acute Surgical abdomen: pain precedes vomiting
• Acute Medical abdomen: vomiting precedes pain
• Verbal vs. non-verbal.
• Non-verbal usually late ER visits!
• Diarrhea w/ gastroenteritis - think food poisoning
• LRQ pain - think Appie!

HISTORY

• AGE AN IMPORTANT FACTOR
• HISTORY HINTS
  – Gyne – r/o ectopic, mittelschmerz.
  – Surgical -- adhesions.
  – Medical – sickle cell, cystic fibrosis
• Pain
  – first 24 hours, slight nausea, periumbilical pain, include location, onset time, character, severity, duration, radiation.
  – Parietal pain w/movement.
    • If relief after BM, think colon.
    • If relief after vomiting, think proximal bowel.
    • Vomiting, bilious, think bowel obstruction.
    • Diarrhea, think IBS with blood, intussusception with current jelly stools.

• Pain (cont.)
  – Parietal pain w/movement (cont.)
    • No gas, no stool; think intestinal obstruction;
    • Vaginal purulent discharge; think salpingitis.
    • Dysuria, frequency, urgency, think UTI.
    • Cough, SOB, chest pain, think pneumonia, thoracic.
    • 3 Polys; dyspia, dysphasia,uria, think DM.

SURGICAL ABDOMEN
• Involuntary guarding or rigidity
• Marked distention
• Tenderness
• Rebound tenderness
• TESTS:
  – Imaging, Labs, Consults
• PAIN:
  – Visceral...dull, poorly localized, midline, epigastric, periumbilical, lower abdominal.
  – Parietal...sharp, intense, discrete, localized. Coughing, movement increases pain.
  – Referred...remote pain...R/T same dermatome supply, i.e., T-9...think pneumonia w/ abd pain
Symptoms of GI Disorders

- Pain
- Vomiting
- Diarrhea
- Constipation
- Rectal bleeding
- Hematemesis

Appendicitis

- Most common reason for emergency abdominal surgery
- Occurs frequently, 1 in 15 people.
- Obstruction caused by lymphoid tissue or fecaliths.
- Pain is usually visceral, poorly localized, may be periumbilical.
- Within 6 to 48 hours pain may become parietal, well localized, constant, in right iliac fossa.
- LRQ pain...think Appie!

Appendicitis (cont.)

- Abdominal pain usually most intense at McBurney’s point found midway between the umbilicus and the iliac crest
- Presents in side-lying position, with abdominal guarding
- May present with constipation, diarrhea or vomiting
- Peritonitis, leading to ischemia a/o necrosis.
- If they suddenly stop crying, think a BM or a ruptured appie, soon to have s/s of peritonitis
TO BE OR NOT TO BE

- Best not to tell parents child does NOT have appendicitis
- If you miss the diagnosis, you are dead meat!!
- Parental expectations are generally high due to
  - public awareness of appendicitis
  - They are not aware of difficulty in making correct diagnosis

When patients present early in the clinical course, the symptoms are generally mild and less specific. EASILY MISSED!
- Missed diagnosis about 50%; about 50% are atypical presentations; how about the number of cases not reported as missed appendicitis or surgery for mesenteric lymphadinitis!!
- Decision time - what to do? what is next?

SIGNS AND SYMPTOMS
- Increased fever; chills; pallor; progressive abdominal distention; restlessness; right guarding of abdomen; tachycardia; tachypnea

DO’S and DON’T’S
- Avoid heat to abdomen
- Avoid laxatives, enemas
- NPO status
High Probability of Appendicitis

• Obtain a Surgical Consult
• Consider advanced imaging (hope for a good pedie reader)
• Consider hospitalization

Low Risk

• Consider discharge
• Consider distance
• Reliable Family
• Transportation
• Document written instructions to parents
• Plan for follow-up

More Abdomens

• Colic 10 to 20% of infants. Presents within 3-4 weeks. s/s; screaming, legs drawn up to abdomen. Severe pain. Screaming mother. Give her a plan to cope
• Mesenteric Lymphadenitis... Adenovirus. May mimic appendicitis
Gastroenteritis

- Viral; Norwalk, Adeno, Entero.
- Bacterial; E. Coli, Salmonella, Shigella, Campylobacter
- Involves inflammation of the stomach and intestines
- Colitis involves an inflammation of the colon
- Enterocolitis involves an inflammation of the colon and small intestines

Constipation

- Difficult or infrequent defecation with the passage of hard, dry fecal material
- Some infants develop constipation due to high iron content in formula.
- May be secondary to other disorders
  - Acute; organic cause, appendicitis, gastroenteritis.
  - Idiopathic; functional cause, left sided and suprapubic pain.
  - Feel for “stool sausage” over descending colon.

Intestinal Obstruction

- cramping pain,
- volvulus,
- adhesions,
- intussusception,
- incarcerated hernia.
Pelvic Inflammatory Disease

- STI's Chlamydia, Gonorrhea,
- HX of multiple partners,
- IUD,
- Past hx PID

NEPHROBLASTOMA
WILM’S TUMOR

- Most common intra-abdominal & kidney tumor
- Swelling or mass in abdomen; abdominal pain; hematuria; pallor; lethargy; hypertension; fever; dyspnea; SOB; chest pain
- Avoid palpation of the abdomen!

NEUROBLASTOMA

- Tumor of adrenal medulla, sympathetic ganglia, or both
- Signs present when tumor compresses organs, tissues
- Abdomen: firm, non tender, irregular mass felt
- Urinary retention, frequency
- Lymphadenopathy, pallor
- Symptoms specific to region of tumor
Celiac Disease

- Also called gluten-induced enteropathy and celiac sprue
- Four characteristics
  - Steatorrhea
  - General malnutrition
  - Abdominal distention
  - Secondary vitamin deficiencies

Inflammatory Bowel Disease (IBD)

- Includes ulcerative colitis (UC)
- Crohn’s disease (CD) can be located anywhere
Diarrheal Disturbances

- Gastroenteritis
- Enteritis
- Colitis
- Enterocolitis

Etiology of Diarrhea

- Salmonella, Shigella, Campylobacter
- Giardia
- Cryptosporidium
- Clostridium difficile
- Antibiotic therapy
- Rotavirus

Types of Diarrhea

- Acute
- Acute infectious/infectious gastroenteritis
- Chronic
- Intractable diarrhea of infancy
- Chronic nonspecific diarrhea (CNSD)
Diarrhea

- Acute diarrhea is leading cause of illness in children <5 years
- 20% of all deaths in developing countries are related to diarrhea and dehydration
- Acute infectious diarrhea: variety of causative organisms

Intussusception

- Telescoping or invagination of one portion of intestine into another
- Occasionally due to intestinal lesions
- Often cause is unknown

Intussusception (cont.)

- Make diagnosis fast
- May lead to bowel infarction, perforation
- Age is usually less than 2 years, but can be seen in 2 to 7 year olds
- Classic Triad:
  - Vomiting, crampy pain, current jelly stools and add one more symptom, a sausage shaped mass in ascending colon
Intussusception (cont.)

- Look for lethargy in an infant
- In an infant, think sepsis, hypoglycemia
- In an older child, think gastroenteritis
- Enemas hard on a child, but if used, air, barium or water soluble solution
- If has a normal brown formed stool, call the OR and cancel the surgery!!

Intussusception (cont.)

- Occult blood test; other labs not of much value
- Advanced imaging; CT, US
- May have episodes of crying 1-5 minutes
- Followed by 3-30 minutes of quiet with out pain
- Pain episodes related to peristaltic waves

VOLVULUS/ MALROTATION

- Mesentery (broad fan like structure) of the small bowel twists on itself.
- Long w/ multiple loops, often involving the entire bowel
- AKA the Midgut Volvulus
Malrotation and Volvulus

- Malrotation is due to abnormal rotation around the superior mesenteric artery during embryonic development.
- Volvulus occurs when intestine is twisted around itself and compromises blood supply to intestines.
- May cause intestinal perforation, peritonitis, necrosis, and death.

MALROTATION

- Mesentery attachment problem.
- Mesentery is suspended by a stalk rather than the normal broad fan.
- Called “Guts On a Stalk Syndrome” or GOSS.
- Embryonic abnormality.

MECKEL’S DIVERTICULUM

- Tubular pouch found in the jejunum or ilium.
- Meckels Diverticulitis, may become inflamed and appear similar to appendicitis.
- May be seen with ulceration and perforation.
- Pain, but atypical location.
- May have S/S of a bowel obstruction.
- DX is difficult, use CT, US.
MECKEL’S - RULE OF TWO

- 2% of the population are born with Meckel’s
- Only 2% of those with a Meckel’s manifest clinical problems
- Usually located 2 feet proximal to the terminal ileum and the
- Diverticulum is usually 2 inches long
- Symptoms commonly manifest at age 2 years

HERNIAS

- Umbilical/abdominal wall defects
- Hiatal
- Diaphragmatic

HENOCH-SCHONLEIN PURPURA

- Disease of the skin
- Systemic vasculitis
- Involves immune complexes IgA
- May be preceded by infection, i.e., pharyngitis
- Classic triad
  - purpura
  - arthritis
  - abdominal pain
- Resolves w/o treatment, but
- May cause kidney damage
Hyperemesis Gravidarum

• Defined: excessive vomiting accompanied by dehydration, electrolyte imbalance, ketosis, and acetonuria
  – May present with vomiting

Early Pregnancy Bleeding

• Miscarriage (spontaneous abortion)
  – Types
  – Inevitable
  – Incomplete
  – Threatened
  – Complete
  – Abdominal pain, cramping

Late Pregnancy Bleeding

• Placental abruption (premature separation of placenta)
  Sudden acute abdominal pain
  Dark red bleeding
Ectopic Pregnancy

- Clinical manifestations
  - Missed period
  - Cramping
  - Adnexal fullness
  - Dark red or brown vaginal bleeding
  - Abdominal pain

Menstrual Disorders

- Endometriosis
  - Presence and growth of endometrial tissue outside of uterus
  - Major symptoms
    - Dysmenorrhea
    - Deep pelvic dyspareunia (painful intercourse)
  - Treatment
    - Drug therapy
    - Surgical intervention

STI’s

- Sexually transmitted bacterial infections
  - Pelvic inflammatory disease (PID)
  - At increased risk for:
    - Ectopic pregnancy
    - Infertility
    - Chronic pelvic pain
  - Symptoms depend on type of infections:
    - Acute
    - Subacute
    - Chronic
PHYSICAL EXAMINATION

• General appearance - visceral pain, child is writhing. With peritonitis, child is still.
• Vital signs - high fever, think pyelonephritis or pneumonia.
  – Tachycardia and hypotension, think hypovolemia.
  – Respirations...Observe their breathing, Kussmauls, DKA.

PHYSICAL EXAMINATION (cont.)

• Abdominal ; have them point with one finger to the pain.
  – Ascultate. Begin away from the area of indicated pain.

PHYSICAL EXAMINATION (cont.)

• Rectal
  – Rectals are debatable
  – Retrocecal appendix elicit pain with rectal
• Pelvic
  – Vaginals if suspect PID, pregnancy.
PE PEARLS OF WISDOM

• Have parent hold child facing upright w/ the head on the parents’ shoulder.
• Stand in back of the child and use fingers to press on the abdomen
• Remember Stranger Anxiety
  – Teach the parent to use their fingers to press on the abdomen while you step out of the room

PE PEARLS OF WISDOM (cont.)

• For the older child, have them jump up and down
• Guarding? Older child.
  – Have the child put their hands over yours while you lightly palpate. Watch their face as you press for signs of pain such as grimacing, OUCH!!
• For the younger child, have the parent bounce them on their shoulder.
  – Fussiness, crying raises the suspicion of peritonitis and appendicitis

DIAGNOSTIC PROCEDURES

• Upper GI barium swallow
• Lower GI barium enema
• Proctoscopy
• Sigmoidoscopy
• Colonoscopy
• CT
• US
• Flat plate
Management

- Physicals – repeated physical examinations are important
- Analgesics?
- Yes, for a better physical exam
- No, may mask symptoms

References

MNEOMNIC PEARLS

• TAKE A FEW HOME WITH YOU

AIM
AAIIMMM

• Mnemonic double can be used to remember causes of bowel obstruction
• Adhesions,
  Appendicitis,
  Intussusception,
  Incarcerated inguinal hernia,
  Malrotation/volvulus,
  Meckel's diverticulum

ABDOMINAL INSPECTION
5 S’s

• Size
• Shape
• Scars
• Skin lesions
• Stoma
ABDOMINAL ASSESSMENT
DR GERM

• Distention - liver, bowel obstruction
• Rigidity - bleeding
• Guarding - muscle tension when touched
• Evisceration/ Ecchymosis
• Rebound tenderness -infection
• Masses

ABDOMINAL PANE

• Acute - rheumatic fever
• Blood –purpura, hemolytic crisis
• DKA
• Collagen –vascular disease
• Migraine- abdominal
• Epilepsy- abdominal
• Nephron- uremia
• Lead
• Porphyria
• Arsenic

cont

ABDOMINAL PANE
MEDICAL CAUSES

• Arsenic
• NSAIDS
• Enteric fever
ABDOMINAL SWELLINGS

9 P’s
- Fat
- Feces
- Flatus
- Fluid
- Fetus
- Full (tumor)
- Full (bladder)
- Fibroids
- False (pregnancy)

ALVARADO’S MANTREL

- MIGRATORY PAIN (1)
- ANOREXIA (1)
- NAUSEA (1)
- TENDERNESS (2)
- REBOUND (1)
- ELEVATED TEMP (1)
- LEUCOCYTOSIS (2)
- SHIFT TO THE LEFT (1)

ALVARADO’S “MANTREL”

- SCORING SYSTEM FOR APPENDICITIS DIAGNOSIS
- Scores: TOTAL OF 10
  - 3-4 NO
  - 5-6 DOUBTFUL
  - 7 - 10 CONFIRMED
## TABLE 1
Causes of Acute Abdominal Pain in Children

<table>
<thead>
<tr>
<th>Gastrointestinal causes</th>
<th>Genitourinary causes</th>
<th>Drugs and toxins</th>
<th>Pulmonary causes</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroenteritis</td>
<td>Urinary tract infection</td>
<td>Erythromycin</td>
<td>Pneumonia</td>
<td>Infantile colic</td>
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<td>Appendicitis</td>
<td>Urinary calculi</td>
<td>Salicylates</td>
<td>Diaphragmatic pleurisy</td>
<td>Functional pain</td>
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<td>Mesenteric lymphadenitis</td>
<td>Dysmenorrhea</td>
<td>Lead poisoning</td>
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<td>Pharyngitis</td>
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<td>Constipation</td>
<td>Mittelschmerz</td>
<td>Venoms</td>
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<td>Angioneurotic edema</td>
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<td>Abdominal trauma</td>
<td>Pelvic inflammatory disease</td>
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<td>Familial Mediterranean fever</td>
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<td>Intestinal obstruction</td>
<td>Threatened abortion</td>
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<td>Peritonitis</td>
<td>Ectopic pregnancy</td>
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<td>Food poisoning</td>
<td>Ovarian/testicular torsion</td>
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<td>Peptic ulcer</td>
<td>Endometriosis</td>
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<td>Meckel’s diverticulum</td>
<td>Hematocolpos</td>
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<tr>
<td>Inflammatory bowel disease</td>
<td>Metabolic disorders</td>
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<td>Lactose intolerance</td>
<td>Diabetic ketoacidosis</td>
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<tr>
<td>Liver, spleen, and biliary tract disorders</td>
<td>Hypoglycemia</td>
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<td>Hematologic disorders</td>
<td>Porphyria</td>
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<td>Rupture of the spleen</td>
<td>Acute adrenal insufficiency</td>
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<td>Pancreatitis</td>
<td>Sickle cell anemia</td>
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<td>Henoch-Schönlein purpura</td>
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<td>Hemolytic uremic syndrome</td>
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# Differential Diagnosis of Acute Abdominal Pain by Predominant Age

<table>
<thead>
<tr>
<th>Birth to one year</th>
<th>Two to five years</th>
<th>Six to 11 years</th>
<th>12 to 18 years</th>
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<tbody>
<tr>
<td>Infantile colic</td>
<td>Gastroenteritis</td>
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<td>Appendicitis</td>
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<tr>
<td>Urinary tract infection</td>
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<td>Functional pain</td>
<td>Dysmenorrhea</td>
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<td>Intussusception</td>
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<td>Urinary tract infection</td>
<td>Mittelschmerz</td>
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<td>Volvulus</td>
<td>Volvulus</td>
<td>Trauma</td>
<td>Pelvic inflammatory disease</td>
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<td>Incarcerated hernia</td>
<td>Trauma</td>
<td>Pharyngitis</td>
<td>Threatened abortion</td>
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<td>Hirschsprung's disease</td>
<td>Pharyngitis</td>
<td>Pneumonia</td>
<td>Ectopic pregnancy</td>
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<td>Sickle cell crisis</td>
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<td>Ovarian/testicular torsion</td>
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<td>Henoch-Schönlein purpura</td>
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</table>
Evaluation of Acute Abdominal Pain in Children

Evidence of trauma?  
Yes  →  Child abuse  
Accidental injury  
No  
Fever?  
Yes  →  Urinary tract infection  
Pharyngitis  
Gastroenteritis  
Mesenteric lymphadenitis  
Pneumonia  
Appendicitis  
Pelvic inflammatory disease  
No  
Evidence of sickle cell anemia?  
Yes  →  Sickle cell crisis  
No  
Left-sided pain  
Yes  →  Constipation  
Ovarian/testicular torsion  
Mittelschmerz  
No  
Middle to right-sided pain?  
Yes  →  Appendicitis  
Ovarian/testicular torsion  
Mesenteric lymphadenitis  
Mittelschmerz  
No  
Present in other household contacts?  
Yes  →  Food poisoning  
Gastroenteritis  
No  
Sexually active?  
Yes  →  Pelvic inflammatory disease  
Ectopic pregnancy  
No  
Paleness/purpura?  
Yes  →  Hemolytic uremic syndrome  
Henoch-Schönlein purpura  
No  
Blood in stool?  
Yes  →  Inflammatory bowel disease  
Hemolytic uremic syndrome  
Henoch-Schönlein purpura  
Gastroenteritis  
No  
Hematuria?  
Yes  →  Renal calculi  
Renal trauma  
Urinary tract infection  
No  
Evidence of obstruction?  
Yes  →  Malrotation  
Intussusception  
Volvulus  
No  
Refer or observe.