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APPROACH TO PEDIATRIC ABDOMINAL PAIN

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General Presentation

BACKGROUND

Abdominal pain in a child is one of the most common presentations with both trivial and life-threatening etiologies, ranging from functional pain to acute appendicitis. The majority of pediatric abdominal complaints are relatively benign (e.g. constipation), but it is important to pick up on the cardinal signs that might suggest a more serious underlying disease.

Diagnosing abdominal pain in children is also a challenging task. Conditions vary amongst age groups (ie. volvulus in neonates, intussusception in toddlers) and trying to thoroughly evaluate a child in pain can make the process all the more challenging.

BASIC ANATOMY AND PHYSIOLOGY

When taking a history and examining a child with abdominal pain, consider all the organs in the abdominal area. Pathologies of the lower lung (i.e. pneumonia) can often be interpreted as abdominal pain; similarly, genitourinary pathology (i.e. testicular torsion) can be as well. A sharp stabbing pain may suggest somatic involvement – this type of sensation is usually well localized; while dull, non-specific, throbbing pain suggests visceral involvement that is difficult to localize. Remember, the differential diagnosis of a child varies depending on their age group. (Table 1)

Table 1 Common Causes of Abdominal Pain

Newborn	
Intestinal obstruction (ie. volvulus, Hirshsprung, pyloric stenosis)	Peritonitis (i.e. necrotizing enterocolitis, GI perforation)
Hernia	Gastroesophageal Reflux
Trauma (i.e. during birth)	
Infant (<2 years)	
Constipation	Toxin ingestion
Acute gastroenteritis	Trauma
Hernia, volvulus, intussusception	Infantile dyschezia
Colic	Respiratory illness
Children (2 – 18 years)	
Acute gastroenteritis	Urinary tract infection/ Pyelonephritis
Constipation	Toxin ingestion, food poisoning
Intestinal obstruction	Trauma
Testicular torsion	Henoch-Schnolein Purpura
Respiratory illness, pneumonia,	Appendicitis, pancreatitis, cholecystitis
Mesenteric adenitis	
Adolescents (12 – 18 years)	
Trauma	Toxin ingestion, food poisoning
Dysmenorrhea	Pregnancy (i.e. ectopic)
Pelvic inflammatory disease	Testicular torsion
Ovarian torsion/cysts	Gastroenteritis
Constipation	

PRESENTATION AND EMERGENT CONSIDERATIONS

Acute pain lasts several hours to days while chronic pain can last from days to weeks to months. In a child presenting with abdominal pain, it is important to identify any emergent concerns and reach a timely diagnosis.

Red flag signs include:

- Bilious vomiting
- Bloody stool or emesis
- Night time waking with abdominal pain
- Hemodynamic instability
- Weight loss

Questions to Ask

HISTORY

- **PQRSTAAA**:
  - **Place/Location:** identify the specific location of the pain, have child use one finger to locate her pain.
  - **Quality:** pain can be a sharp stabbing pain (i.e. trauma) or diffuse, poorly, localized pain (i.e. chronic or visceral pain)
  - **Radiation:** pain can radiate from its point of origin in any direction
  - **Severity:** degree of pain on a scale of 10

    - **Timing/Onset:** onset of the pain, duration of pain, course during the day, does it wake them at night, and the frequency of episodes
    - **Alleviating Factors:** anything that reduces the pain – body position, movements (or lack thereof), medications.
    - **Aggravating Factors:** anything that increases the pain – body position, movements, relation to food intake.
    - **Associated Symptoms:** can include hematemesis, vomiting, nausea, hematochezia, melena, diarrhea, fever, and weight loss. (Relevant findings: See Table 2)
- Ask about bowel movement patterns and stool quality (size, hard/soft, odour).
- Ask about ingestion of toxin or foreign object; accidental or non-accidental trauma
- Ask about dietary history: in young children, too much milk can lead to constipation.
- Ask about past medical history and medical comorbidities.
    - Cystic fibrosis predisposes to gallstones.
    - Spina bifida/cerebral palsy/developmental delay predisposes to constipation.
    - Sickle cell disease predisposes to splenic auto-infarction.
    - Recurrent respiratory tract infections suggest mesenteric adenitis.
- Ask about sexual history – screen for STI
    - Females: don't forget about menstrual cycles (regularity, amount of bleeding, relation to abdominal pain)
- Ask about family medical history, especially inflammatory bowel diseas.
- Ask about travel history, social and psychiatric (potential stressors) history.

Table 2 Associated Symptoms for Abdominal Pain

Associated Symptom	Relevance
Diarrhea	Gastroenteritis, Protein losing enteropathy
Bloody stool	UGIB/LGIB, Ulcerative colitis, necrotizing enterocolitis, dysentery, constipation
Hematemesis	UGID, Peptic Ulcer Disease, Gastritis
Bilious emesis	Small bowel obstruction
Jaundice	Hepatitis or Biliary Tree obstruction
Joint pain/swelling	IBD, HSP
Skin Lesions	IBD, HSP, Liver disease
Testicular pain	Testicular torsion
Dysuria/polyuria/hematuria	Urinary tract infection/Pyelonephritis
Vaginal/Penile discharge	STI
Dysmenorrhea	Endometriosis
Shortness of breath	Pneumonia or empyema

Common Differential Diagnoses and Potential Complications

Table 3 Common Differential Diagnosis for Abdominal Pain

Medical Condition	Relevant Findings and Potential Complications
Gastrointestinal	
Constipation	Infrequent bowel evacuations, difficult or painful defecation, can see blood in stool from anal fissures, low fibre diet, high milk consumption (>2-3 cups per day)
Acute appendicitis	Right lower quadrant pain with fever, anorexia, nausea, vomiting, can **rupture and lead to sepsis**
Gastroenteritis	Vomiting and diarrhea with or without fever and nausea, can have **bacterial or viral etiologies**
Irritable bowel syndrome	Change in stool frequency, bloating, abdominal distension, may be associated with **certain foods**
Trauma	History and signs of bruising
Ulcerative colitis	Bloody and/or chronic diarrhea, crampy lower abdominal pain, anorexia, weight loss, fever, fecal urgency, can develop to **toxic megacolon**
Crohn's disease	Intermittent diarrhea, weight loss, crampy right lower quadrant pain, anorexia, weight loss, fatigue
Celiac Disease	Abdominal pain, bloating, growth failure, gluten insensitivity
Inflammatory Bowel Disease	Associated with diarrhea, bloody stools, weight loss, can lead to significant **growth failure** if missed.
Genitourinary	
Urinary tract infection	Dysuria, polyuria, hematuria, can progress to **pyelonephritis**
Primary dysmenorrhea	History of menstrual periods and regularity, consider sexual history
Pulmonary	
Pneumonia and Empyema	Consider respiratory history, past medical history and recurrent respiratory tract infections

Physical Exam and Investigations

PHYSICAL EXAM

ABCs; vitals; and growth parameters (is there evidence of failure to thrive).

- Inspection: look for contour, symmetry, pulsations, peristalsis, vascular irregularities, skin markings, wall protrusions (hernias), any signs of trauma (ie. bruising, swelling), and abdominal distension
- Auscultation: auscultate before palpation in the abdominal exam, listen for bowel sounds, abdominal bruits, pressure of the stethoscope also tests for tenderness
- Percussion: assess general tone (tympanic vs non-tympanic), percuss for liver span and spleen tip, assess for ascites (find edge of percussion tone change).
- Palpation: assess tenderness with light and deep palpation, assess for guarding and rebound tenderness, palpate for liver, spleen, kidney and abdominal masses (including fecal mass).
- Digital rectal exam: first exam the anus for fissures and skin tags, then assess for tone, stool, and blood

- Special Tests: there are a number of special tests for each differential diagnosis

Table 4 Findings on Physical Exam for Common Differential Diagnoses

Medical Condition	Findings on Physical Exam
Gastrointestinal	
Constipation	Abdominal tenderness, palpable fecal mass, look for imperforate anus or stenosis, spina bifida, developmental delay, cerebral palsy
Acute appendicitis	Patient avoids movement, rebound tenderness, McBurney sign (pain at 2/3 between umbilicus and right ASIS), Rovsing sign (pain in right lower quadrant on left-sided palpation), Psoas sign (pain in right lower quadrant when child on left and right hip hyperextended), obturator sign (pain in right lower quadrant on internal rotation of flexed right thigh)
Gastroenteritis	Diffuse pain with no rebound tenderness, abdominal distension, hyperactive bowel sounds
Irritable bowel syndrome	Periumbilical tenderness, no rebound tenderness
Trauma	Signs of bruising and tenderness
Celiac Disease	Growth failure, distended abdomen, diffuse abdominal tenderness.
Inflammatory bowel disease	Appears thin/cachetic, abdominal tenderness, anal skin tags, possible sign of bloody stool on DRE, examine for skin lesions (erythema nodosum, pyoderma gangrenosum), iritis, and joint inflammation
Genitourinary	
Urinary tract infection	Fever, suprapubic and costovertebral angle tenderness, irritability, foul-smeling urine, gross hematuria
Primary dysmenorrhea	Lower abdominal tenderness
Pulmonary	
Pneumonia and Empyema	Tachypnea, cyanosis, decreased breath sounds, crackles and rales, dullness on percussion, febrile

LABORATORY INVESTIGATIONS

Table 5 Laboratory Investigations for Common Differential Diagnoses

Medical Condition	Relevant Diagnostic Tests
Gastrointestinal	
Constipation	None if history does not suggest an alternative diagnosis.
Acute appendicitis	CBC (WBC normal or elevated), urinalysis, urine pregnancy
Gastroenteritis	Serum electrolytes, stool culture, stool for virology
Irritable bowel syndrome	None, based on history and clinical findings
Trauma	CBC for blood loss, abdominal CT with contrast
Celiac Disease	Anti-TTG, IgA
Inflammatory Bowel Disease	CBC, ESR/CRP, electrolytes, albumin, LFTs, Bilirubin, Stool culture, AXR
Genitourinary	

Urinary tract infection	Urine dipstick (for leukocyte esterase and nitrite), urine microscopy, urine culture (best if suprapubic aspirate)
Primary dysmenorrhea	None, based on history and clinical findings
Pulmonary	
Pneumonia and Empyema	CBC, Chest x-ray, sputum culture

Supplementary Information

Uncommon Differential Diagnoses and Potential Complications

Table 6 Uncommon Differential Diagnosis for Abdominal Pain

Medical Condition	**Relevant Findings and Potential Complications**
Gastrointestinal	
Intussusception	Colicky pain, flexing of legs, fever, lethargy, vomiting, peak incidence in children at **6 months of age**
Mekel's diverticulum	Similar presentation to appendicitis, profuse GI bleeding, can develop to **diverticulitis**
Mesenteric adenitis	Can present like acute appendicitis, recurrent respiratory tract infections
Hirschsprung disease	Vomiting, abdominal distension, enterocolitis, primarily in **first year of life**
Small bowel obstruction	Bloating, vomiting, failure to pass flatus or stool, **bilious emesis**
Volvulus	Can present like small bowel obstruction, due to **intestinal twisting**
Large bowel obstruction	Abdominal distension, hard feces and rectal bleeding, can lead to **bowel perforation**
Necrotizing enterocolitis	Feeding intolerance, apnea, lethargy, bloody stools, abdominal distension and tenderness, abdominal erythema, hematochezia, bradycardiac, primarily in **premature infants**
Peptic ulcer disease	Epigastric tenderness, pain related to eating a meal, ulcer can **perforate**
Viral hepatitis	Fever, malaise and jaundice, consider **fecal-oral or vertical transmission**
Acute pancreatitis	Steady and sudden-onset pain radiating to the back, nausea, vomiting, history of cholelithiasis
Splenic infarction	Personal or family history of sickle cell disease
Genitourinary	
Nephrolithiasis	Acute renal colic, flank pain radiating to groin
Testicular torsion	Testicular pain with acute onset, nausea, vomiting
Ovarian torsion	Pain with nausea, vomiting, diarrhea
Ruptured ovarian cyst	Bloating, early satiety
Pelvic inflammatory disease	Consider sexual history
Pregnancy and related complications	Nausea and vomiting, review sexual history and consider **ectopic pregnancy and associated ruptures**

Table 7 Findings on Physical Exam for Uncommon Differential Diagnoses

Medical Condition	Findings on Physical Exam
Gastrointestinal	
Intussusception	Gross or occult blood, abdominal tenderness and palpable abdominal mass
Merkel diverticulum	Bloody stools, abdominal tenderness with guarding, rebound tenderness
Mesenteric adenitis	Diffuse abdominal tenderness, rhinorrhea and pharyngitis, extramesenteric lymphadenopathy
Hirschsprung disease	Abdominal distension, palpable fecal mass, small rectum
Small bowel obstruction	Hyperactive or hypoactive bowel sounds
Volvulus	Diffuse abdominal distension, no bowel sounds, guarding, rebound tenderness, rigid abdomen, fever, hematochezia
Large bowel obstruction	distended abdomen, hyperactive bowel sounds
Necrotizing enterocolitis	Abdominal distension, tenderness, abdominal wall erythema, hematochezia, bradycardia
Peptic ulcer disease	Epigastric tenderness, melena or occult blood
Viral hepatitis	Jaundice, hepatosplenomegaly, lymphadenopathy, wasting, cachexia, ascites, asterixis, caput medusa
Acute pancreatitis	Epigastric tenderness, tachycardia, irritability, abdominal distension, Cullen sign (discoloration around umbilicus), Grey-Turner sign (discoloration around flanks)
Splenic infarction	Left upper quadrant tenderness
Genitourinary	
Nephrolithiasis	Costovertebral angle and flank tenderness, tachycardia
Testicular torsion	Tender, edematous testicle, affected testicle higher than unaffected, absent cremasteric reflex
Ovarian torsion	Tender pelvic mass, cervical motion tenderness
Ruptured ovarian cyst	Adnexal tenderness
Pelvic inflammatory disease	Slight fever, cervical motion tenderness, adnexal tenderness, vaginal or cervical mucopurulent discharge
Pregnancy and related complications	Abdominal tenderness, vaginal bleeding

The differential diagnosis of abdominal pain is extensive making a concise approach sometimes difficult.

Key points:

1. Determine if abdominal pain is acute or chronic
2. Is the abdomen acute/surgical or benign
3. Are red flags present.

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