

PEM GUIDE - APPENDICITIS

INTRODUCTION

Appendicitis is the most common acute surgical condition of the abdomen in children. The condition most often occurs in those over 2 years of age, with a peak in teenagers and young adults. The lack of “classical” clinical signs in younger children makes the diagnosis difficult. The delay in diagnosis of appendicitis is the second most common reason for medical malpractice claims against the pediatrician (after missed meningitis). The goal is the rapid identification of appendicitis in order to reduce the morbidity associated with perforation.

COMMON MISDIAGNOSES	
Gastroenteritis (# 1)	
Upper respiratory infection	
Pneumonia	
Urinary tract infection	
Viral syndrome	
Sepsis	
Blunt abdominal trauma	
Febrile seizure	

DIFFERENTIAL DIAGNOSIS	
Constipation	
Testicular torsion	
Ovarian torsion	
Ruptures ovarian cyst	
Ectopic pregnancy,	
Diabetic ketoacidosis	
Pharyngitis (mesenteric adenitis)	
Inflammatory bowel disease	
Pelvic inflammatory disease	

CLINICAL FINDINGS

Classic history, physical examination and laboratory findings in appendicitis are illustrated by a clinical scoring system developed by Alvarado and are identified by the mnemonic MANTRELS. Before the advent of imaging a score of greater than 7 was used as an indication for emergency laparotomy and a score of 5-6 for inpatient observation in adults with suspected appendicitis

MANTRELS SCORE	
M igration of pain	1
A norexia	1
N ausea	1
T enderness in the RLQ	2
R ebound pain	1
E levation of Temp	1
L eukocytosis	2
S hift to the left	1

The younger the patient, the less likely they are to have all of these classic findings. The MANTREL score has no cutoff in children less than 16 years of age with an adequate sensitivity to identify appendicitis and adequate specificity to result in a low false negative laparotomy. Young patients may continue to express hunger (often not able to define abdominal pain as anything but hunger). They also may have diarrhea (30% of children under age 3).

Abdominal pain may resolve for a brief period following perforation and before peritonitis develops. The position of the appendix may vary, and causes a variation in the location of the pain, for example, an appendix lying in the paracolic gutter can produce more flank pain, a pelvic appendix may produce more generalized pelvic pain, and in retrocecal position can produce RUQ pain. Pain with movement has about 80% sensitivity in identifying patients with appendicitis, but is not specific. Do not allow your subjective assessment of the patient's severity of pain to influence your decision-making, as every patient's pain tolerance is different.

PHYSICAL EXAM TRICKS	
Ask the child to point to the pain with one finger	
It sometimes helps to assign a number to the abdominal areas you are palpating – “Does it hurt more at number one or number two?”	
Use distraction while palpating the abdomen – some kids are very “guarded” about having their abdomen touched, but you can usually overcome this with time and patience	
Jiggle the bed or pound on the bottom of their feet to mimic a jump	
Ask the patient to cough or jump	

Be sure to examine the genitalia in boys, and do a pelvic exam in sexually active girls. Rectal exam is often deferred as it doesn't add much to a clear picture, but you can sometimes palpate the adnexal area via the rectum in girls who are not sexually active. Constipation is in the differential for lower abdominal pain, however hard stool in the vault does not rule out appendicitis, and relief of pain with evacuation may simply relieve the pressure on the appendix. Children are often very uncomfortable with a rectal exam making any specific finding of tenderness difficult to ascertain.

LABORATORY EVALUATION	
CBC	Leukocytosis with left shift
ESR, CRP	Elevated values may be indicative of perforation
Electrolytes	Abnormalities associated with vomiting Other diagnosis such as DKA
Urinalysis	Pyuria in cases of UTI or pyelonephritis Specific gravity offers an estimate of dehydration Microscopic hematuria, pyuria sometimes found in appendicitis
Pregnancy Test	In post-pubertal females
Rapid Strep Test	May suggest mesenteric adenitis

RADIOLOGIC EVALUATION

Recently, ultrasound and CT scanning of the abdomen have been used to improve diagnostic accuracy and reduce the negative laparotomy rate. These studies have the added benefit of identifying alternative diagnoses. The impact of imaging on the rate of perforation has not been determined. The choice of imaging study should be guided by the surgical and radiology consultants and is very often institution specific.

Abdominal film may demonstrate a fecalith (calcified fecal matter in the appendix) or signs of obstruction.

Ultrasound may be useful but is very operator dependent. The advantage is no radiation exposure. Sonographic findings include a non-compressible distended appendix, periappendiceal fluid (abscess) or an appendicolith. Some institutions utilize a protocol of initial ultrasound followed by CT if the ultrasound is negative. CT may be requested anyway to identify candidates for interval appendectomy versus immediate surgery.

CT with oral and IV contrast is used by many ED's. Rectal contrast is practiced at some institutions. Positive CT scan findings include: a distended appendix that does not fill with contrast, signs of inflammation in the periappendiceal fat, a periappendiceal fluid collection (abscess) and an appendicolith. Proceed with CT two to three hours after initiating the oral contrast (20 ml gastrograffin in 1 liter of water). Consider a dose of metaclopramide in patients who persistently vomit the oral contrast. Juice may be used to enhance the palatability for children.

MANAGEMENT

Patients with appendicitis may be dehydrated due to: poor oral intake, gastrointestinal losses from vomiting or third spacing of fluids due to bowel edema. Intravenous rehydration with crystalloid should be used in all patients.

In general, a pre-operative dose of antibiotics is recommended. Antibiotics are continued in case of perforation and abscess formation. Broad-spectrum antibiotics effective against gram negative aerobic and anaerobic bacteria are preferred.

RECOMMENDED ANTIBIOTICS
Ertapenem (for perf'd appy's)
Ampicillin Sulbactam
Cefoxitin
Cefotetan
Piperacillin
Tazobactam
Ticarcillin Clavulanate

DISPOSITION	
Home	Appropriate precautions and follow-up
Admission	Observation and serial abdominal exams
	Laparotomy for cases of simple appendicitis
	Intravenous antibiotics with Interval appendectomy*

* A delayed appendectomy is often indicated when the appendix is very inflamed and may have formed a phlegmon – a poorly organized abscess – that is likely to have a problematic intra- and post-operative course. Antibiotics help to reduce the inflammation and the delayed appendectomy has an improved outcome.