



# EMERGENCY MEDICINE CASES

The CME Audio Program Where the Experts Keep You In the Know  
FREE for students, residents, paramedics and nurses

## Episode 19 – Part 1, Pediatric Abdominal Pain & Appendicitis

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### Most Common Diagnoses for Pediatric Abdominal Pain in the ED

(in order of prevalence) 1. Gastroenteritis 2. Respiratory Tract Infection (including Otitis Media, Pharyngitis and pneumonia) 3. UTI 4. Constipation 5. Appendicitis

Aside from gastroenteritis, upper respiratory tract infection is the most common diagnosis written at the bottom of the emergency chart for missed appendicitis in kids!

### Pediatric Appendicitis Presentation

The majority of cases of appendicitis in children <4y/o are perforated appendicitis, probably due to the atypical presentation and delay in diagnosis in this age group

This delay in diagnosis is due to the **absence** of the classic history of anorexia and vague periumbilical pain followed by migration of pain to the right lower quadrant and onset of fever and vomiting in many children

'Atypical is typical' – diarrhea, constipation and dysuria are not uncommon and may lead the clinician astray; pain may localize to the back or psoas muscle as many children have a retrocecal appendix; vomiting may occur before abdominal pain (in contradistinction to the classic abdominal pain before vomiting in appendicitis) as younger children are unable to communicate their pain

Clues to perforation: Diarrhea is more likely to occur after perforation and temp is often higher; no localization of pain with peritoneal signs; if there is abscess formation you may feel a mass in the RLQ

### Physical Exam of the Abdomen Pearls in Pediatric Patients

Children with appendicitis are usually lying still with the hips flexed as opposed to writhing in pain

Examine the child in their caretaker's lap, or lying on top of their caregiver, or with their legs wrapped around their caregiver's trunk, first with their clothes still on

Roll the patient's hips and look for discomfort/pain with this maneuver

Have the child palpate their own abdomen

Percuss before you palpate!

Ask the child to 'blow out the candles' and look for respiratory splinting as the diaphragm lowers

The equivalent of 'jump tenderness' in infants and toddlers is having the caregiver bounce the child on their knee and observing for irritability

Examine the genitals of all boys with abdo pain to look for testicular torsion!



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## Value of Lab Tests in Pediatric Patients with Abdominal Pain

About 1/4 of children with gastro will have elevated WBC (because dehydration and acidosis elevate the WBC) and many children with appendicitis will have a normal WBC; however, if the appendix is perforated, the vast majority of children will have an elevated WBC count.

CRP may be more sensitive than WBC in identifying a perforated appendix but cannot rule out appendicitis

Urinalysis (clean catch or catheter specimen): useful to rule out DKA, UTI, and pregnancy in teenagers as a cause for abdominal pain; sterile pyuria is consistent with appendicitis and gastro

'Finger-prick' Glucose: hypoglycaemia in severe gastro, hyperglycemia in DKA

## Imaging for Appendicitis in Children

Wide variation of practice when it comes to whether or not, and how to best image children suspected of having appendicitis

First line is ultrasound which has a very high sensitivity and specificity for appendicitis, >95% respectively, but depends on technician skill, radiologist skill, patient co-operation, patient girth (it is more difficult to obtain good images in obese patients), and whether or not the patient is given adequate anxiolysis and analgesic

Ultrasound criteria for appendicitis: tender and non-compressible >6mm appendix, hyperemic appendix, wall thickness >1.7mm, plus secondary signs of thickening of mesenteric fat, free fluid, increased echogenicity, enlarged lymph nodes, abscess

Even if the appendix is not visualized on ultrasound, appendicitis can be excluded more confidently in the patient with low clinical pre-test probability if ultrasonography shows no secondary signs of appendicitis (eg, hyperechoic mesenteric fat, fluid collection, localized dilated small bowel loop)

If ultrasound is equivocal (eg: 'appendix not seen') and you still have clinical suspicion, consider surgical consultation and/or repeat physical exams, repeat blood work and repeat ultrasound

In some centres second line imaging is repeat ultrasound (ie a repeat ultrasound in 12hrs improves accuracy)

In other centres second line imaging is abdominal CT, which carries a life-time cancer risk of about 1 in 1000 in children (the younger the child, the higher the risk)

For children with a very high clinical pre-test probability for appendicitis, consider consulting surgeon for direct appendectomy without imaging

Some centres such as the British Columbia Children's Hospital have a higher negative appendectomy rate for patients who do not get any imaging and go directly to the operating room and a higher perforation rate in patients who get imaging due to the delay in time to surgery

There is likely a happy medium between imaging all patients and taking all patients directly to the operating room



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## Pediatric Pain Control and Anxiolytics

There is good evidence from at least 4 studies that administration of appropriate analgesics does change clinical decision-making for appendicitis and may help the ultrasound technicians obtain a more accurate scan

There is good evidence that children are generally undertreated for pain in the ED

Anxiolytic medication (eg: intranasal midazolam) is helpful prior to imaging in selected patients

Analgesics: Morphine 0.1mg/kg (max 5mg), Fentanyl 1-2micrograms/kg, Ketorolac 0.5-1mg/kg

Codeine: the clinical benefit is unpredictable as there is genetic variation in its metabolism so it has been removed from some pediatric emergency department formularies

## Decision Rules for Pediatric Appendicitis

There is evidence that pediatric appendicitis decision rules decrease the use of CT scans by about 20%

Sensitivities are poor for decision rules when prospectively validated (Ann Emerg Med. 2007;49:778-784) but may be helpful in guiding clinicians who do not see pediatric patients on a regular basis

*Alvarado Score* >6: sensitivity = 72% (1 pt each for - migration of pain to RLQ, anorexia, nausea/vomiting, tenderness in RLQ, rebound pain, fever, leukocytosis, left shift)

*Samuel Score* ('Pediatric Appendicitis Score') >5: sensitivity = 82% (1pt each for - RLQ tenderness elicited by cough, hopping or percussion, anorexia, fever, nausea/vomiting, tenderness over the right iliac fossa, leucocytosis, left shift, migration of pain)

## Treatment of Pediatric Appendicitis

Any child with sepsis, peritonitis, perforated appendix, abscessed appendix requires broad spectrum antibiotics in the emergency department as soon as possible

In pts with non-perforated appendicitis, antibiotics are given pre-operatively on call to the operating room to decrease the incidence of wound infection and abscess formation

Patients with perforated appendicitis are usually managed conservatively with antibiotics, percutaneous drainage and interval surgery (surgery after 8-12wks)