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ACUTE ABDOMINAL PAIN

Developed by Dr. Stephanie de Waal and Dr. Mel Lewis for PedsCases.com.
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Introduction:

Hello everyone, welcome to Peds Cases! My name is Stephanie de Waal. I am a first year Emergency Medicine Resident at McMaster University with an interest in pediatrics. This podcast was developed in collaboration with Dr. Mel Lewis, a Pediatrician at the Stollery Children's Hospital in Edmonton. In this podcast, we will discuss acute abdominal pain in pediatrics. This is a very broad topic so we will focus on an approach to this presentation and important diagnoses to consider.

Learning objectives:
After listening to this podcast, the learner will be able to:

- Define acute abdominal pain in pediatric patients
- Develop a differential diagnosis based on age and symptoms
- Identify red flags associated with acute abdominal pain
- Describe the initial investigations for acute abdominal pain based on history

Case presentation:

Now, let's begin with a case.

You are a clinical clerk on your paediatric emergency medicine rotation. You are asked to assess a patient in the emergency department. The patient's name is Tiara, a 4-year-old, previously healthy female who presented to the ED with generalized abdominal pain for the past two days. Her father mentions that her older sibling had a similar presentation 3 years ago and required emergent surgery to remove their appendix. He is worried that Tiara has also developed appendicitis.

How do you approach this situation? Take a moment to think about it. We will revisit this case later in the episode. For now, let's dive a bit deeper into the topic of this podcast.

Introduction:

Acute abdominal pain is a common presentation in pediatrics. Approximately 10% of ED visits are related to abdominal pain (Hijaz & Friesen, 2017). It is often benign and self-limiting; however, the challenge is to identify uncommon and potentially life-threatening conditions. Data

suggests that only 5-10% of children with abdominal pain have underlying organic disease (Smith & Fox, 2016). Acute abdominal pain is usually defined as new onset pain that has been present for less than 3 days, some academic sources will include up to 7 days. While it can be tempting to jump right into your history and physical, it is important to think through the differential diagnosis list for abdominal pain as this will guide your questions and exam.

Differential Diagnoses:

In pediatrics there is a very wide differential for acute abdominal pain. A logical and structured approach to this presentation in pediatrics is to divide the differential diagnoses by age group. Age groups can be divided into young children (0-4), school aged children (5 -11), and adolescents (12-18). There is also a list of diagnoses that should be considered across all age groups. I have built a table that you can look through after listening to this podcast for a more extensive differential in each age group. I will now discuss the common and emergent diagnoses in each age group that need to be considered.

All Ages	Infants and toddlers	School Age	Adolescents
Appendicitis	Midgut Volvulus	Ovarian/Testicular Torsion	Ectopic Pregnancy
Trauma	Necrotizing Enterocolitis (NEC)	Peptic Ulcer Disease	Ovarian/Testicular Torsion
Bowel Obstruction	Intussusception	Diabetic Ketoacidosis (DKA)	Pelvic Inflammatory Disease
Pyelonephritis	Hirschsprung Disease	Henoch-Schonlein Purpura (HSP)	Diabetic Ketoacidosis
Constipation	Incarcerated Inguinal Hernia	IBD	IBD
Urinary Tract Infection (UTI)	Infantile Colic	Pancreatitis	Pregnancy or Early Pregnancy Loss
Gastroenteritis	Cow's Milk Protein Allergy	Functional Abdominal Pain	Functional Abdominal Pain
Sickle Cell Crisis	Gastroesophageal Reflux Disease (GERD)	Irritable Bowel Syndrome	Irritable Bowel Syndrome
		GAS Pharyngitis	Henoch-Schonlein Purpura (HSP)
		Lower Lobe Pneumonia	Dysmenorrhea
		Lactose Intolerance	Sexually Transmitted Infection
			Mononucleosis
			Lower Lobe Pneumonia
			GAS Pharyngitis

For patients between the ages of 0 and 4, your "can't miss" diagnoses include appendicitis, midgut volvulus, trauma, incarcerated inguinal hernia, intussusception, and necrotizing enterocolitis (Hijaz & Friesen, 2017; Smith & Fox, 2016). Intestinal malrotation is congenital condition that occurs due to a disruption in the formation of fetal intestines, and this increases the chance that the bowel will twist on itself (Ross & LeLeiko, 2010). The twisting of the intestine is called volvulus (Ross & LeLeiko, 2010). This can cause obstruction of the intestines and cut off the blood supply to parts of the organ, leading to bowel ischemia which is

a surgical emergency (Ross & LeLeiko, 2010). Intussusception is the most common cause of bowel obstruction in children, typically occurring in children under the age of two (Reust & Williams, 2016). A proximal section of the bowel telescopes and is caught inside a more distal segment, leading to bowel obstruction (Ross & LeLeiko, 2010). This can present with crampy abdominal pain, vomiting, and bloody bowel movements commonly described as "red currant jelly" like in appearance (Ross & LeLeiko, 2010). Necrotizing enterocolitis is mentioned in this differential as it is an important diagnosis to consider in neonates specifically (Smith & Fox, 2016). The clinical presentation is unlikely to be abdominal pain but rather feeding intolerance, bloody stool, and abdominal distension (Smith & Fox, 2016). Historically this was considered to only be a condition that impacted premature neonates, but you should also consider this in full-term neonates (Smith & Fox, 2016).

Once you've considered the "can't miss" diagnoses, you should also consider the more common etiologies of acute abdominal pain such as infantile colic, cow's milk protein allergy, constipation, viral gastroenteritis, GERD, UTI, or lactose intolerance (typically in children > 4 years) (Hijaz & Friesen, 2017; Smith & Fox, 2016; Reust & Williams, 2016). In this age group it is also important to consider Hirschsprung disease which can present as Hirschsprung Associated Enterocolitis – HAEC or toxic megacolon (Hijaz & Friesen, 2017). Hirschsprung disease is a congenital condition in which patients are missing ganglion cells in the distal rectum and colon (Puri & Montedonico, 2008). This causes narrowing of the distal colon and distension of the unaffected proximal colon (Puri & Montedonico, 2008). This often presents in newborns who exhibit abdominal distension, delayed passage of meconium, severe constipation and frequent pencil-thin stools (Puri & Montedonico, 2008).

In 5-11 year olds, your "can't miss" diagnoses include appendicitis, bowel obstruction, perforated ulcer, ovarian or testicular torsion, trauma, inflammatory bowel disease, and diabetic ketoacidosis (DKA) (Hijaz & Friesen, 2017; Smith & Fox, 2016). Acute appendicitis is the most common pediatric surgical emergency (Smith & Fox, 2016). It can be difficult to differentiate in pediatrics, and you can consider using clinical tools like the Alvarado score or Pediatric appendicitis score to adjunct your clinical decision making (Smith & Fox, 2016). Ovarian or testicular torsion typically presents with severe, sudden onset lower abdominal pain and vomiting (Ross & LeLeiko, 2010). Testicular torsion may present with pain in the scrotum as well (Ross & LeLeiko, 2010). Both ovarian and testicular torsion are surgical emergencies (Ross & LeLeiko, 2010). Inflammatory bowel disease is an autoimmune condition that causes chronic inflammation of the GI tract (Oliveria & Monteiro, 2017). Occasionally this can present as acute abdominal pain, but more commonly is a grumbling, chronic pain with other symptoms like bloody diarrhea, tenesmus, weight loss, and skin changes (Oliveria & Monteiro, 2017). Acute abdominal pain is a symptom of DKA which is often the initial presentation of diabetes mellitus (Ross & LeLeiko, 2010). They may also have symptoms of weight loss, polydipsia, polyuria, nausea and vomiting (Ross & LeLeiko, 2010). The abdominal pain should resolve with improvement of the ketoacidosis, so if it does not improve you should consider other conditions that could be causing the abdominal pain (Ross & LeLeiko, 2010). For example, often DKA can be triggered by UTIs which could also be causing abdominal discomfort (Ross & LeLeiko, 2010).

Once you've considered these conditions, you should consider these more common differentials like viral gastroenteritis, lower lobe pneumonia, UTI, pancreatitis, lactose intolerance, functional abdominal pain, constipation, GAS pharyngitis, UTI, pyelonephritis, and Henoch-Schonlein Purpura (HSP) (Hijaz & Friesen, 2017; Reust & Williams, 2016). Constipation

is very common and often follows changes in a patient's life like toilet training, starting school or change in diet (Ross & LeLeiko, 2010). Patients will usually examine with mild tenderness on palpation and palpable fecal mass (Ross & LeLeiko, 2010). Stools may be described as small, pebbled rabbit stools (Ross & LeLeiko, 2010). Children with lower lobe pneumonia or pharyngitis can present with referred abdominal pain (Ross & LeLeiko, 2010). The diaphragm and abdomen share the T9 dermatome, so diaphragmatic irritation from a pneumonia can irritate the T9 dermatome which may become referred pain in the upper abdomen (Ross & LeLeiko, 2010). We don't have a clear understanding of why there is referred abdominal pain in GAS pharyngitis (Ross & LeLeiko, 2010). HSP is a type of vasculitis that presents with purpuric lesions, abdominal pain, and arthralgias (Ross & LeLeiko, 2010). HSP can also cause glomerulonephritis so it is important to identify and monitor these patients as some can develop chronic kidney disease or other renal complications in the future (Ross & LeLeiko, 2010).

In adolescents, ages 12-18, the differential diagnosis broadens. The very important "can't miss" diagnoses include similar conditions as discussed before like appendicitis, bowel obstruction, ovarian and testicular torsion, DKA and IBD (Hijaz & Friesen, 2017). In post-menarche adolescents, it is important to consider ectopic pregnancy (Hijaz & Friesen, 2017). This occurs when an embryo implants outside of the uterine cavity (Vadakekut & Gnugnoli, 2025). If not detected early and managed appropriately, the ectopic pregnancy can rupture causing patients to become hemodynamically unstable and requiring emergent surgical intervention (Vadakekut & Gnugnoli, 2025).

Other important differential diagnoses to consider include sexually transmitted infections, pelvic inflammatory disease, early pregnancy loss, abdominal migraines, irritable bowel syndrome, pneumonia, UTI, dysmenorrhea, constipation, and gastroenteritis (Hijaz & Friesen, 2017; Reust & Williams, 2016).

Wow, that was a lot of information to cover. We'll move on to the history and physical components next, then we'll put all this information back towards our case.

History:

Taking a complete history for every patient is important, however here are some specific topics and questions to consider when the patient presents with acute abdominal pain. Start with a thorough pain history. OPQRST can be a useful tool to characterize the pain – if you've never heard of this before, it is a pneumonic that can be helpful to remember all aspects of a strong pain history. It stands for onset, pain and palliation, quality, region and radiation, severity and time. Identifying the region of the pain is important to narrow down the differential diagnosis. Ask about associated symptoms like fever, vomiting, bowel movements, loss of appetite, fluid intake, cough, SOB, urinary symptoms, vaginal discharge, and weight loss. If they are vomiting, it is important to characterize this in depth. Is it projectile, shooting across the room? Is it bilious or bloody? It's also important to understand past medical and surgical history because it could eliminate some diagnoses and increase the risk of others, for example obstructions secondary to adhesions in patients with a history of abdominal surgery. In patients with uteruses, don't forget a menstrual history! Teenagers are still pediatric patients. Ask about menarche and if they are having regular periods, clarify the date of their last menstrual period. It is critical to inquire about bowel habits as constipation is a very frequent presentation for both acute and chronic abdominal pain in children.

Important red flags to consider on history include bilious vomiting, projectile vomiting, hematemesis, and hematochezia (Hijaz & Friesen, 2017).

When asking about family history, ask about some specific conditions that can cause acute abdominal pain. This includes sickle cell anemia, cystic fibrosis, Crohn's disease and Ulcerative colitis.

Be sure to ask about travel history and any recent sick contacts in home, school or daycare settings.

Asking questions around sexual history, past STIs, and contraception can be a sensitive topic and difficult to approach in pediatrics. Usually this is something to consider more strongly in adolescents. To create a more comfortable environment for the patient to share this information, it might be necessary to ask the parent or guardian to leave the room before broaching sensitive topics. This creates a safe space for the patient to share information that they may not feel comfortable conveying with their parent/guardian present. Confidentiality is critical in providing care to adolescent patients as well as being transparent around the limits to confidentiality – See the Pedscase: Approach to Adolescent History Taking Parts 1 & 2 for more on this topic.

Physical Exam:

The physical examination should start by taking vital signs to ensure the stability of your patient. Then, observe for general appearance and identify if your patient is "sick vs not sick". You can quickly assess fluid status by looking at mucous membranes, capillary refill, and skin turgor. For young children who may be crying, observing the presence of tears is a reassuring sign of their fluid status.

During inspection examine the integument looking for rashes associated with viral illnesses, HSP (palpable purpura), GAS (scarlatinaform) and IBD (erythema nodosum)

Your abdominal exam should include listening for bowel sounds, superficial and deep palpation, percussion and assessment for tenderness over the costophrenic angle. When palpating, assess for tenderness, presence of masses, or any hepatosplenomegaly. Red flags to look for include peritonitis, voluntary guarding, absent bowel sounds, and rebound tenderness (Hijaz & Friesen, 2017). Sometimes children are hyperresponsive to palpation and it is difficult to differentiate some tenderness from peritonitis. A useful tool can be to ask the child to do jumping jacks or some big jumps for you. If they can do this, they are NOT peritonitic.

Pulmonary auscultation is important for respiratory infections, with pneumonia sometimes giving referred upper abdominal pain due to diaphragmatic irritation. If you notice deep, laboured breathing or tachypnea this may indicate diabetic ketoacidosis.

Consider a digital rectal exam, testicular exam and pelvic exam if there is an indication.

Back to the Case:

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In the past two days, Tiara has been complaining of worsening abdominal pain when voiding and had two episodes of daytime incontinence related to urgency. She tells you that her urine smells funny. Tiara does not have any significant contributing medical, developmental, or family history. She is currently in pre-school. As you review her symptoms, you note that she has not had a fever, night sweats, or any bowel changes. She has not recently traveled or been exposed to sick people. She has a decreased appetite but is still drinking fluids.

On physical exam, Tiara appears well nourished, alert, and interactive. Her vitals are stable. When you examine her abdomen, it is soft with no masses present. There is no hepatosplenomegaly. She is very tender in the right and left lower quadrants but has no rebound tenderness. She has no CVA tenderness.

What do you think is causing her abdominal pain? Reflect on the differential diagnoses we discussed above and try to come up with 3 possible etiologies.

Investigations:

Investigations for acute abdominal pain should be guided based on history and physical exam. If a patient is stable and presenting with a clear-cut history of gastroenteritis, it may not be necessary to order blood work or imaging. Use your clinical judgement when deciding which investigations to use. For cases that are not as differentiated, initial investigations should include a CBC and differential, urinalysis, CRP, and B-HCG (in post-pubertal patients). Imaging options include abdominal Xray, ultrasound, CT and MRI. Abdominal x-ray has low sensitivity and specificity (Hijaz & Friesen, 2017). Only consider using if suspicion of bowel obstruction or perforation (Hijaz & Friesen, 2017). Do not order it if you suspect constipation – this is a clinical diagnosis. Ultrasound is commonly the initial imaging modality used in pediatrics. This is appropriate to order if you suspect nephrolithiasis, ovarian or testicular torsion, appendicitis, pyloric stenosis, and intussusception.

CT has high specificity and sensitivity for abdominal diseases; however, it exposes children to a more significant amount of radiation (Hijaz & Friesen, 2017). This is important to consider because children have a longer expected lifetime to manifest latent complications from radiation (Hijaz & Friesen, 2017). For this reason, MRI would be an ideal imaging modality in pediatrics however it is time intensive, expensive, and not readily available in more Emergency Departments (Hijaz & Friesen, 2017).

Back to the case:

Based on Tiara's history and physical exam, you suspect the most likely diagnosis is a lower urinary tract infection – an infection of the bladder and urethra. Common symptoms in pediatrics include fever, dysuria, increased urinary frequency, lower abdominal pain, and new incontinence (Robinson et al., 2014). You decide to order a urinalysis and urine culture. The presence of nitrites or leukocytes make a UTI very likely (Robinson et al., 2014). UTIs are usually caused by the KEEPS bacteria – Klebsiella, E. Coli, Enterococcus, Proteus mirabilis, and in postmenarchal females, staphylococcus saprophyticus (Robinson et al., 2014). Often practitioners will empirically prescribe antibiotics as it can take days before the urine culture is reported with susceptibilities. Cefixime is typically an appropriate choice but check your local antibiotic guidelines (Robinson et al., 2014)! If the bacteria is not susceptible to cefixime when

culture results are available, make sure to switch the patient to an appropriate antibiotic. In pediatrics, most medications are weight-based dosing and that includes antibiotics. Ensure you have a current weight on the patient when calculating antibiotic dosing.

Conclusion:

In conclusion, in this episode, we have developed an approach to acute abdominal pain in pediatrics. We've discussed that abdominal pain is a general presenting symptom that covers a wide range of pathophysiologic causes, including from extra-abdominal organs. From Tiara's case, we've learned that taking a good history can quickly narrow down the overwhelming initial differential diagnosis list for acute abdominal pain. A key takeaway is an age-related approach to acute abdominal pain that can help guide your history taking and physical exams. We discussed important red flags to identify in acute abdominal pain to ensure no dangerous diagnoses are missed.

Thank you for tuning into Peds Cases. I hope you enjoyed this episode on approach to acute abdominal pain.

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