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# Acute Appendicitis Clinical Pathway

Johns Hopkins All Children's Hospital

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Updated: October 2024  
Owners: Gonzalez/Willoughby

*This pathway is intended as a guide for physicians, physician assistants, nurse practitioners and other healthcare providers. It should be adapted to the care of specific patient based on the patient's individualized circumstances and the practitioner's professional judgment.*

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# Acute Appendicitis Clinical Pathway

## **Rationale:**

This clinical pathway was developed by a consensus group of JHACH physicians, advanced practice providers, nurses, and pharmacists to standardize the management of children undergoing evaluation for acute appendicitis. The goal of this pathway is to streamline the approach to the evaluation, diagnosis, and treatment of children with suspected appendicitis while minimizing radiation during the diagnostic workup as pediatric patients are known to be more radiosensitive and have an increased risk of developing cancer from radiation (Brenner, Hall, 2007).

## **Background**

Acute appendicitis is one of the most common indications for emergency surgery. It is commonly seen between the ages of 10 – 20 years and has a lifetime risk of approximately 7 – 9% (Kryzazk, 2022). Clinical presentation can include right lower quadrant (RLQ) abdominal pain with coughing, percussion, hopping, vomiting, anorexia, tenderness over the right iliac fossa, and migrating abdominal pain. Timely diagnosis may help decrease the risk of perforation. The Pediatric Appendicitis Score (PAS) is a simple scoring system using history, examination, and select laboratory data, that may help to predict the likelihood of appendicitis in the pediatric patient. PAS uses a 10-point scoring system that allocates points for clinical symptomatology and laboratory results. A score of 3 or less is considered a low-risk probability, 4 – 6 is an equivocal score, and greater than or equal to 7 is a high-risk probability. The positive predictive value of PAS is approximately 98% (Salahuddin, 2022).

## **Diagnosis**

Acute appendicitis is a clinical diagnosis. However, adjuncts can aid clinicians with the diagnosis. Calculating PAS helps with risk stratification and determines the need for imaging.

The [American College of Radiology Appropriateness Criteria](#) and the American College of Emergency Physicians recommend an RLQ ultrasound (US) as the initial choice of imaging in suspected pediatric appendicitis. Sonographic diagnostic findings include a non-compressible, tubular structure measuring  $\geq 6$  mm. Additional supportive findings include surrounding or free fluid in the pelvis, surrounding inflammatory changes, and an appendicolith. The use of US over computed tomography (CT) avoids radiation exposure and can decrease the time of confirming diagnosis while having lower costs (Boyle,2023; Steinl, 2023).

## Lab tests:

Complete blood count (CBC) with differential, basic metabolic panel (BMP) or comprehensive metabolic panel (CMP) as indicated, urinalysis (UA), and urine pregnancy (urine human chorionic gonadotropin (hCG)) for females  $\geq 10$  years of age.

Radiologic studies:

RLQ US and abdominal CT scan, as indicated.

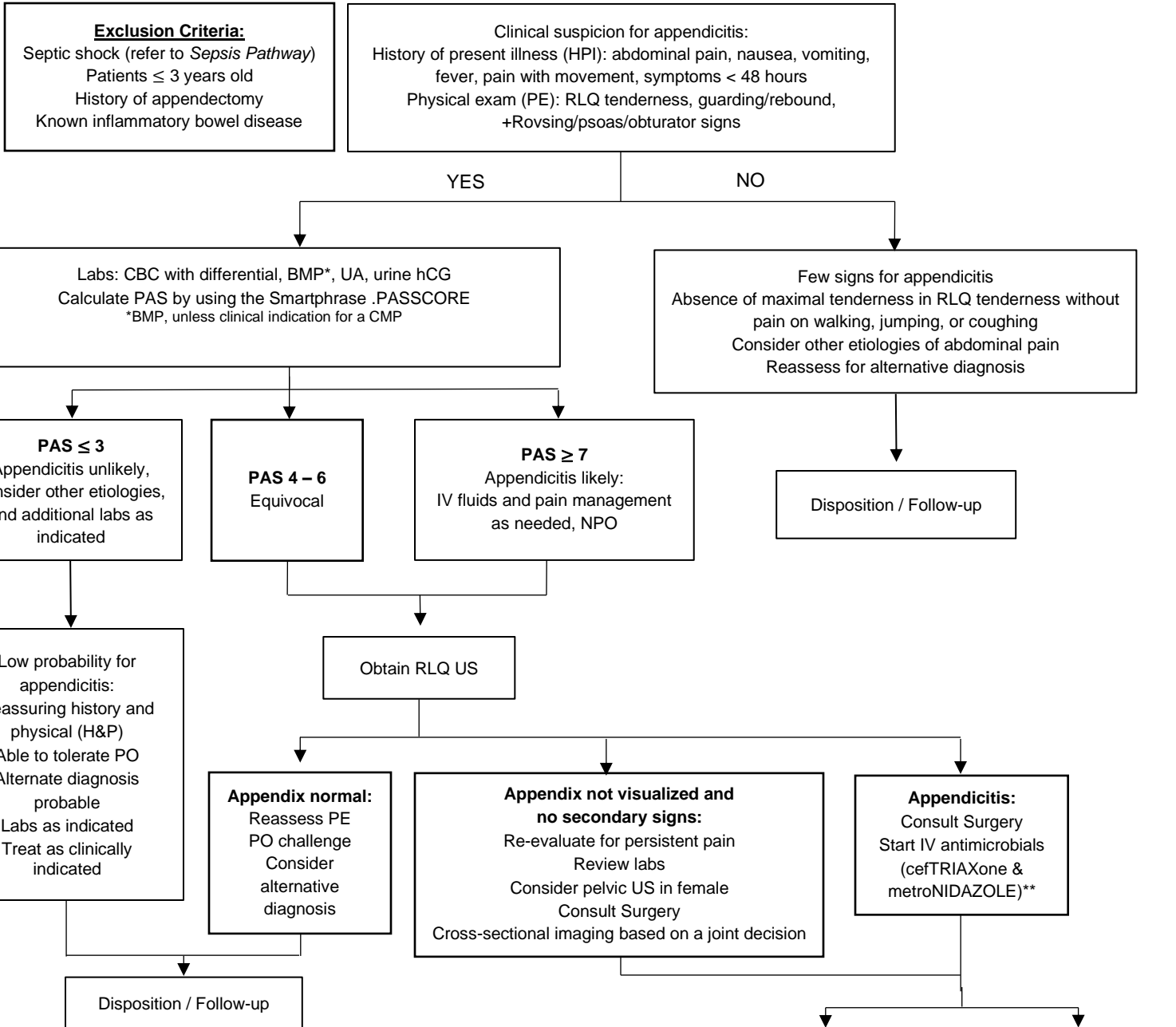
**Clinical Management**

The majority of children with acute appendicitis at our institution are treated with an appendectomy. Concurrent management with the pediatric surgical team enhances preoperative care by identifying patients with complicated appendicitis or those requiring variations in care. Patients with confirmed appendicitis should be given an isotonic intravenous (IV) fluid bolus and promptly started on IV antimicrobials. The antimicrobial regimen of choice is cefTRIAxone and metroNIDAZOLE. If the patient received a dose of metroNIDAZOLE of less than 30 mg/kg at a referring institution, the remainder should be administered upon diagnosis to fulfill the daily dosing. Patients with documented anaphylaxis to cephalosporins or penicillins will receive ciprofloxacin instead of cefTRIAxone. The metroNIDAZOLE daily dosing will remain unchanged. The patient should be kept nothing by mouth (NPO) while awaiting input from the surgical team. Pain should be treated as needed. Avoid the use of ketorolac or other nonsteroidal anti-inflammatory drugs (NSAIDs) secondary to bleeding risk with the procedure.

**Table 1: Antimicrobial Dosing Recommendations**

<b>Medication</b>	<b>Dose</b>	<b>Maximum Daily Dose</b>	<b>Frequency</b>
Preferred therapy:			
cefTRIAxone	50 mg/kg/dose	2000 mg/dose	Q24h
metroNIDAZOLE	30 mg/kg/dose	1500 mg/dose	Q24h
Patients with documented anaphylaxis to cephalosporins or penicillins:			
ciprofloxacin	10 mg/kg/dose	400 mg/dose	Q8h
metroNIDAZOLE	30 mg/kg/dose	1500 mg/dose	Q24h

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**The Pediatric Appendicitis Score (PAS)**  
 (for children ≥ 4 years)

Nausea or vomiting	1
Anorexia	1
Fever (Temp ≥38.0°C/100.4°F)	1
Migration of pain to RLQ	1
RLQ tenderness to cough, percussion, or hopping	2
Tenderness over right iliac fossa	2
Leukocytosis (White Blood Cell (WBC) > 10 K/cc mm)	1
Neutrophilia (Absolute Neutrophil Count (ANC) > 7.5 K/cc mm)	1

Low Risk ≤ 3; Equivocal 4 – 6; High Risk ≥ 7

**\*\*Order Sets:**  
 Ped ED Appendicitis Antimicrobial – ACH  
 JHH-ACH Pediatric General Surgery Appendicitis Complicated Focused

## **Acute Appendicitis Management**

When evaluating patients who are suspected of having appendicitis, providers rely on their clinical suspicion. Patients may exhibit vague symptoms that could indicate other abdominal pathologies. To identify patients with suspected appendicitis, providers need to conduct a detailed HPI and a thorough PE. The most reliable clinical sign of acute appendicitis is localized tenderness with some abdominal wall rigidity at or near McBurney's point (Brandt, 2023). However, the obturator, psoas, and Rovsing signs may or may not be present. Guarding, rebound tenderness, and pain with movement may also be present, increasing the likelihood of appendicitis. It is important to note that children with concern for sepsis, those who are 3 years of age or younger, patients with a prior history of appendectomy, or known inflammatory bowel disease should be excluded from the pathway.

When a patient presents with symptoms of acute appendicitis, obtaining a PAS can help assess the risk and determine the need for imaging. The laboratory evaluation required to calculate the PAS is a CBC with differential examining for elevations in WBC and ANC. However, additional tests may be needed depending on the patient's symptoms and institutional guidelines, such as a basic or comprehensive metabolic panel, and/or a urine pregnancy test.

A PAS score of  $\leq 3$  indicates a low probability of appendicitis, and other potential causes should be considered. A score of 4-6 is equivocal for appendicitis, and these patients should undergo a right lower quadrant ultrasound. A score of  $\geq 7$  is a high probability indicator of appendicitis, and it should be confirmed with a right lower quadrant ultrasound.

Involvement of the pediatric surgery team should occur in patients with a non-diagnostic or diagnostic US. For the former, to assist with assessment and evaluation before cross-sectional imaging. For the latter, to determine disposition (i.e., admission versus operating room).

Starting IV fluids and keeping the patient NPO are recommended for these patients. Pain management should not be delayed, an attending or provider should prescribe medication as needed.

## References

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**Outcome Measures:**

- Time from Emergency Center arrival to completed diagnostic studies
- CT utilization for suspected appendicitis patients

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Acute Appendicitis Clinical Pathway  
Johns Hopkins All Children's Hospital

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**Disclaimer**

*Clinical Pathways are intended to assist physicians, physician assistants, nurse practitioners, and other healthcare providers in clinical decision-making by describing a range of generally acceptable approaches for the diagnosis, management, or prevention of specific diseases or conditions. The ultimate judgment regarding the care of a particular patient must be made by the physician in light of the individual circumstances presented by the patient.*

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## Appendix A: Pediatric Appendicitis Score

### Pediatric Appendicitis Score

Pediatric Appendicitis Score (PAS) Low Risk < 4; High Risk ≥ 7			
Nausea/vomiting	1		
Anorexia	1		
Fever (Temp ≥38.0°C/100.4°F)	1		
Migration of pain to RLQ	1		
RLQ tenderness to cough, percussion, or hopping	2		
Tenderness over right iliac fossa	2		
Leucocytosis (WBC > 10,000)	1		
Neutrophilia (ANC > 7,500)	1		
<b>Low Risk PAS ≤ 3</b>	<b>High Risk PAS ≥ 7</b>	<b>Indeterminate Risk</b>	<b>PAS 4-6</b>

**Appendix B: ACR Appendicitis Document**

<https://acsearch.acr.org/docs/3105874/Narrative/>