Clinical Pathways

Appendicitis

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What is a Clinical Pathway?

An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective, and consistent patient care.

Objectives of Pathway

- To standardize care of patients with both acute simple (non-perforated) appendicitis, complicated (acute perforated) appendicitis in the pediatric population
- To delineate guidelines on when to consider operative vs non-operative management
- To standardize care of patients with operative and non-operative management
- To provide evidence-based recommendations for key elements of care for appendicitis
- To clearly delineate discharge criteria and instructions

Why is Pathway Necessary?

- Abdominal pain is a common reason for presentation to the Emergency Department, pediatric and surgical offices
- Appendicitis is a common surgical etiology for this type of pain.
- American Pediatric Surgical Association has altered their guidelines to help decrease the following:
  - number of CT scans used for diagnosis
  - inappropriate antibiotic choices and duration
  - need for inpatient management post-operatively
- Pathway was developed to ensure an optimal consistent approach to the surgical management of children who present with appendicitis

Epidemiology of Appendicitis

- Overall lifetime risk is 8.6% in males, 6.7% in females
- Luminal obstruction that subsequently leads to infection
  - Fecaliths are the most common cause; however the cause of the obstruction may not always be clear
  - Hyperplasia of appendiceal lymphoid follicles
  - Associated with :
    - Bacterial Infections: Yersinia, Salmonella, Schistosoma, Enterobius, Ascaris
    - Viral Infections: Measles, Chicken Pox, CMV

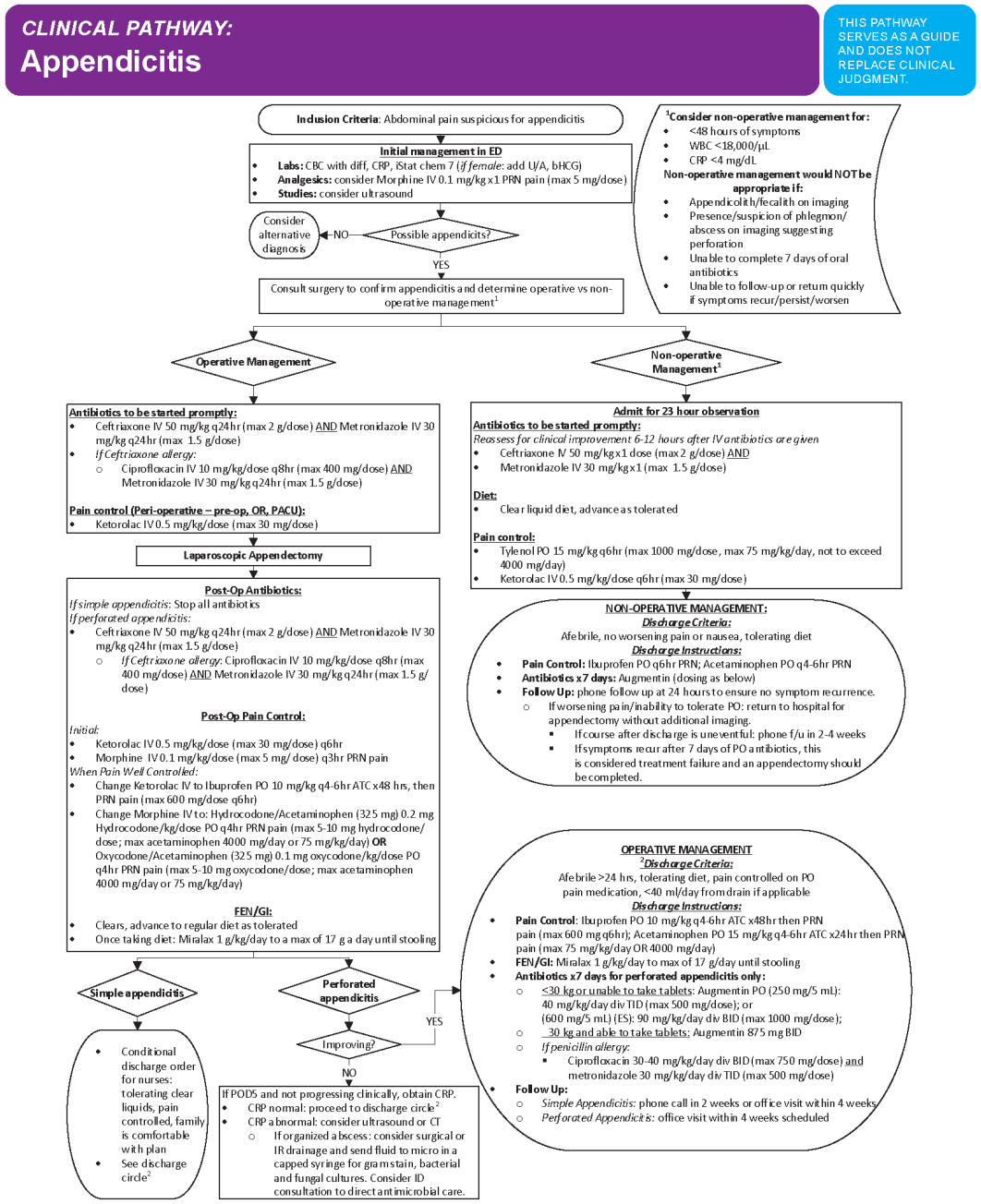
Evidence

- Improved outcomes ≠ Increased resource utilization

- Good evidence-based recommendations to guide care include:
  - Ultrasound as first line imaging approach for diagnosis
  - Once daily dosing for antibiotics (ceftriaxone/metronidazole)
  - Post-op labs/imaging should be minimized
  - TPN is not beneficial in the majority of cases

This is the Appendicitis Clinical Pathway.

We will be reviewing each component in the following slides.

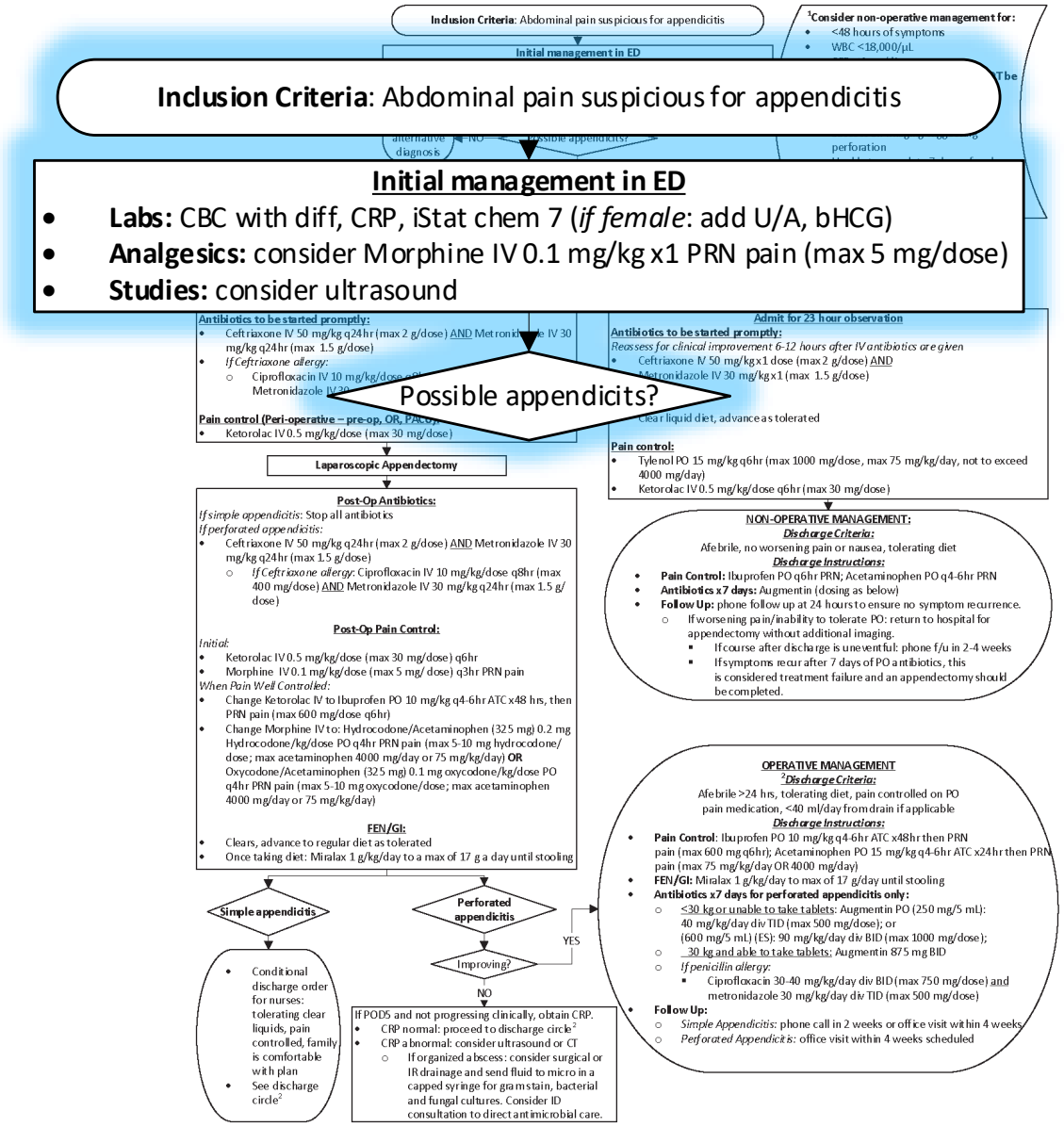


Initial management in the ED includes obtaining screening labs, managing pain, and considering obtaining an ultrasound to help determine potential for appendicitis.

CLINICAL PATHWAY:

Appendicitis

THIS PATHWAY SERVES AS A GUIDE AND DOES NOT REPLACE CLINICAL JUDGMENT.



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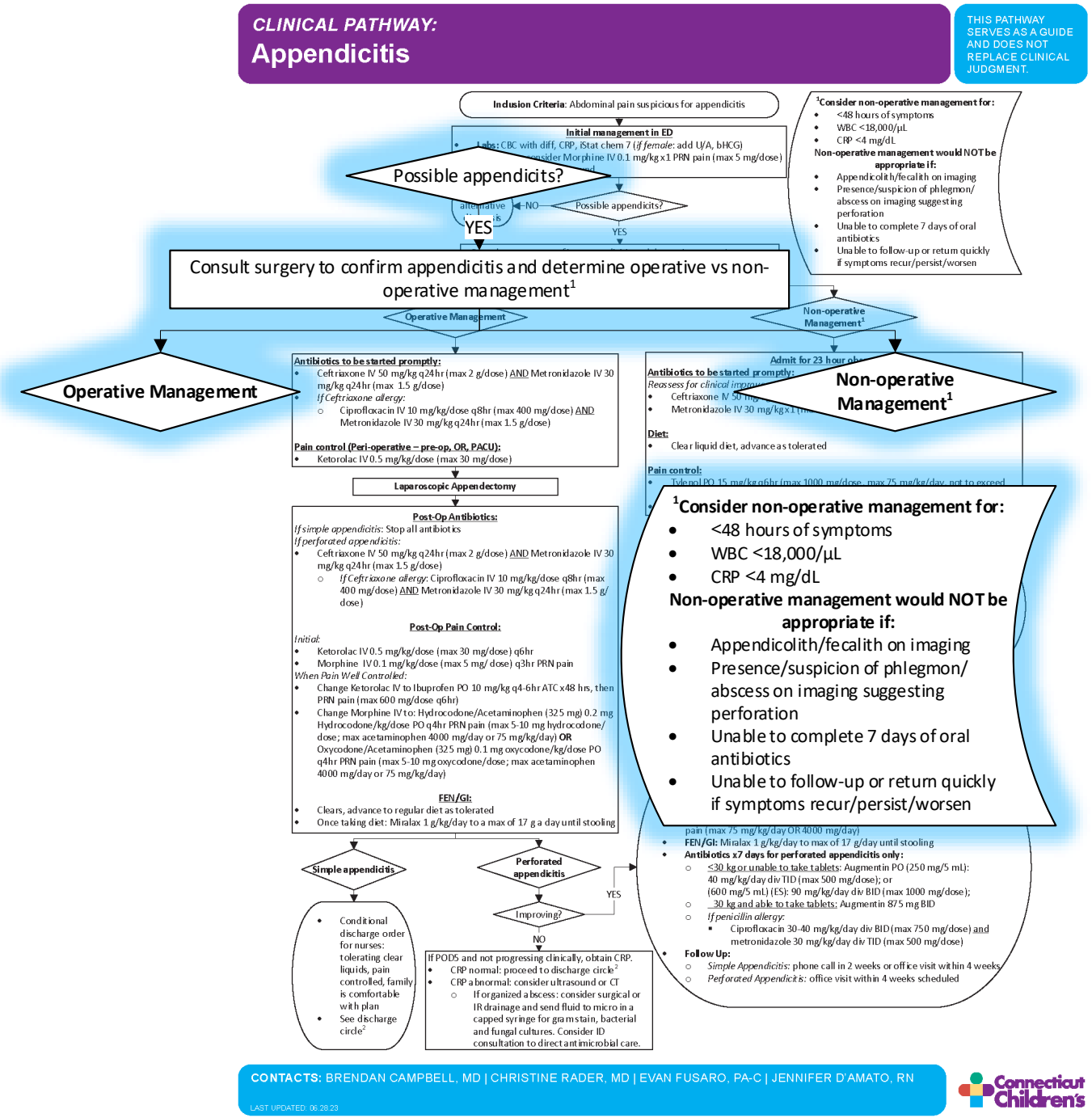
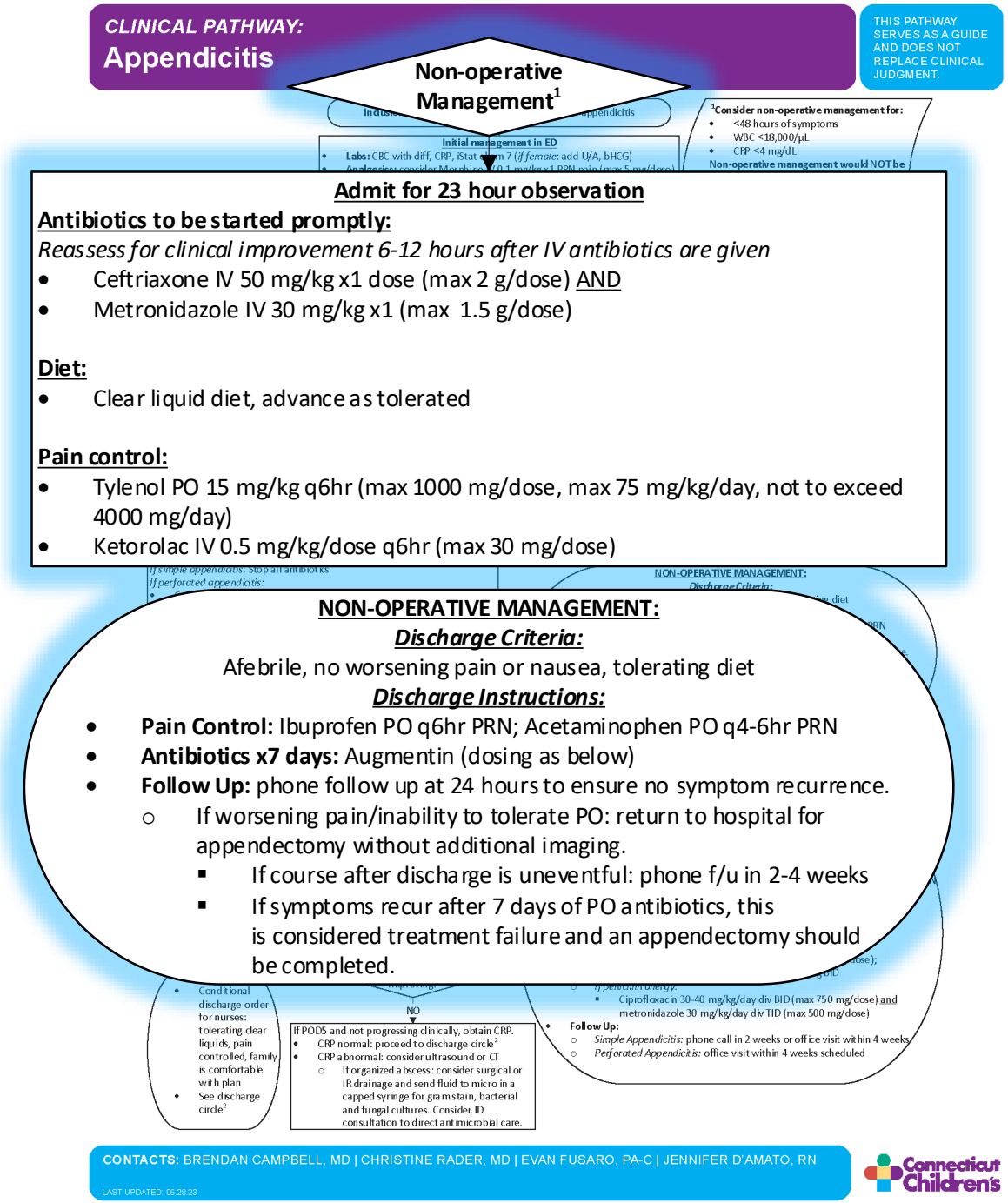
- If appendicitis is suspected, consult surgery to confirm the diagnosis.
- Surgery will decide on operative vs non-operative management based on certain criteria.
- Non-surgical management should be considered based on duration of symptoms and reassuring WBC and CRP.
- Criteria have been outlined for when non-operative management would NOT be appropriate.



Non-Operative Management

If the patient meets criteria for non-operative management, admit for 23 hour observation

- IV Antibiotics should be started promptly
- Reassessment should be done every 6-12 hrs after IV antibiotics given
- Pain should be controlled and diet should be advanced as tolerated
- Upon discharge, antibiotics should continue for 7 days with follow up at 24 hours.
- Guidance is given for further management, including surgical intervention if necessary.



Operative Management

If the patient meets criteria for operative management:

- Surgery to give the "OK" for ED provider to order Ceftriaxone AND Metronidazole prior to incision
  - If Penicillin and/or Ceftriaxone allergy, use Ciprofloxacin AND Metronidazole
- Peri-operative pain control includes Ketorolac

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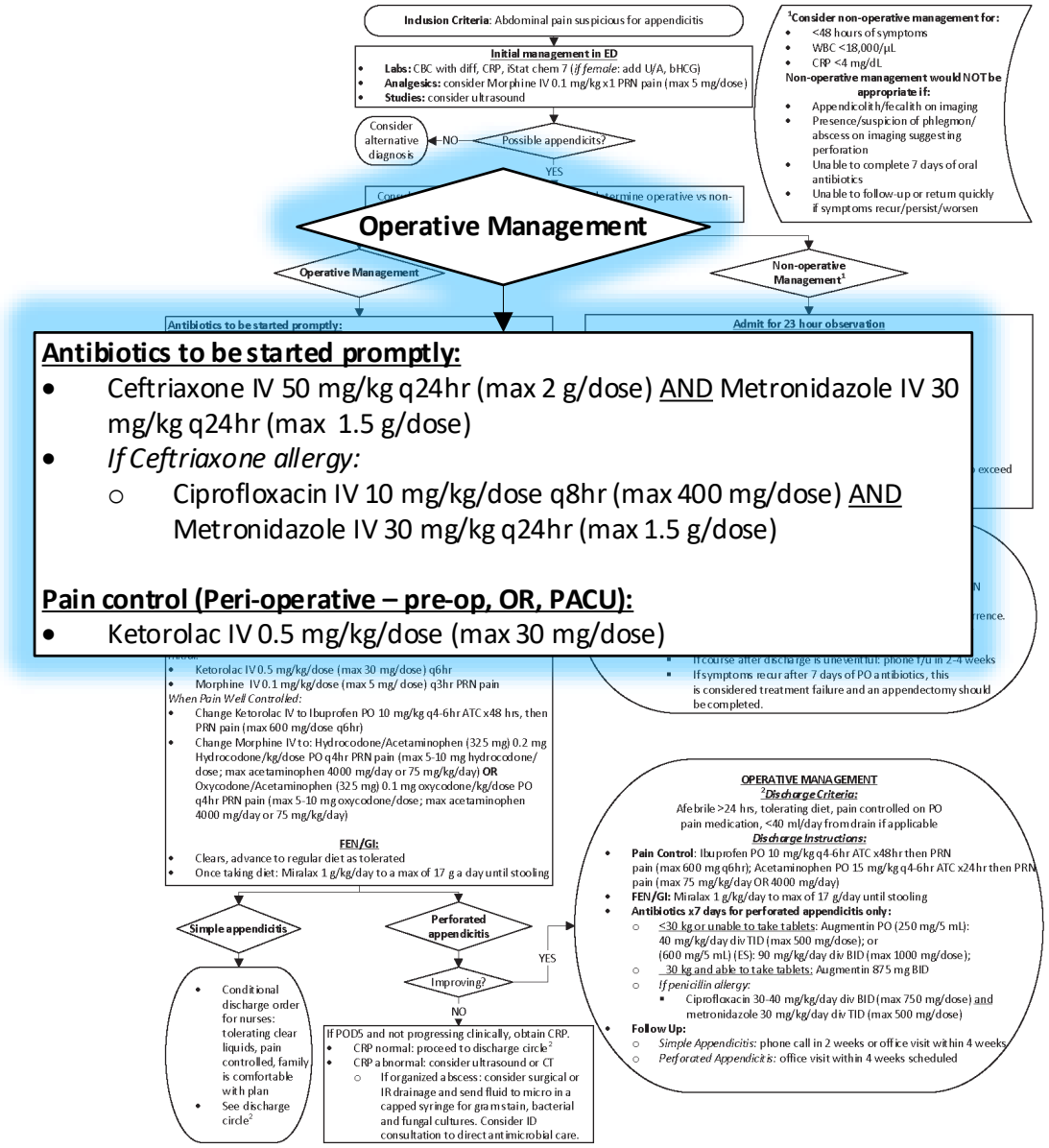

Antibiotics to be started promptly:

- Ceftriaxone IV 50 mg/kg q24hr (max 2 g/dose) AND Metronidazole IV 30 mg/kg q24hr (max 1.5 g/dose)
- *If Ceftriaxone allergy:*
  - Ciprofloxacin IV 10 mg/kg/dose q8hr (max 400 mg/dose) AND Metronidazole IV 30 mg/kg q24hr (max 1.5 g/dose)

Pain control (Peri-operative – pre-op, OR, PACU):

- Ketorolac IV 0.5 mg/kg/dose (max 30 mg/dose)

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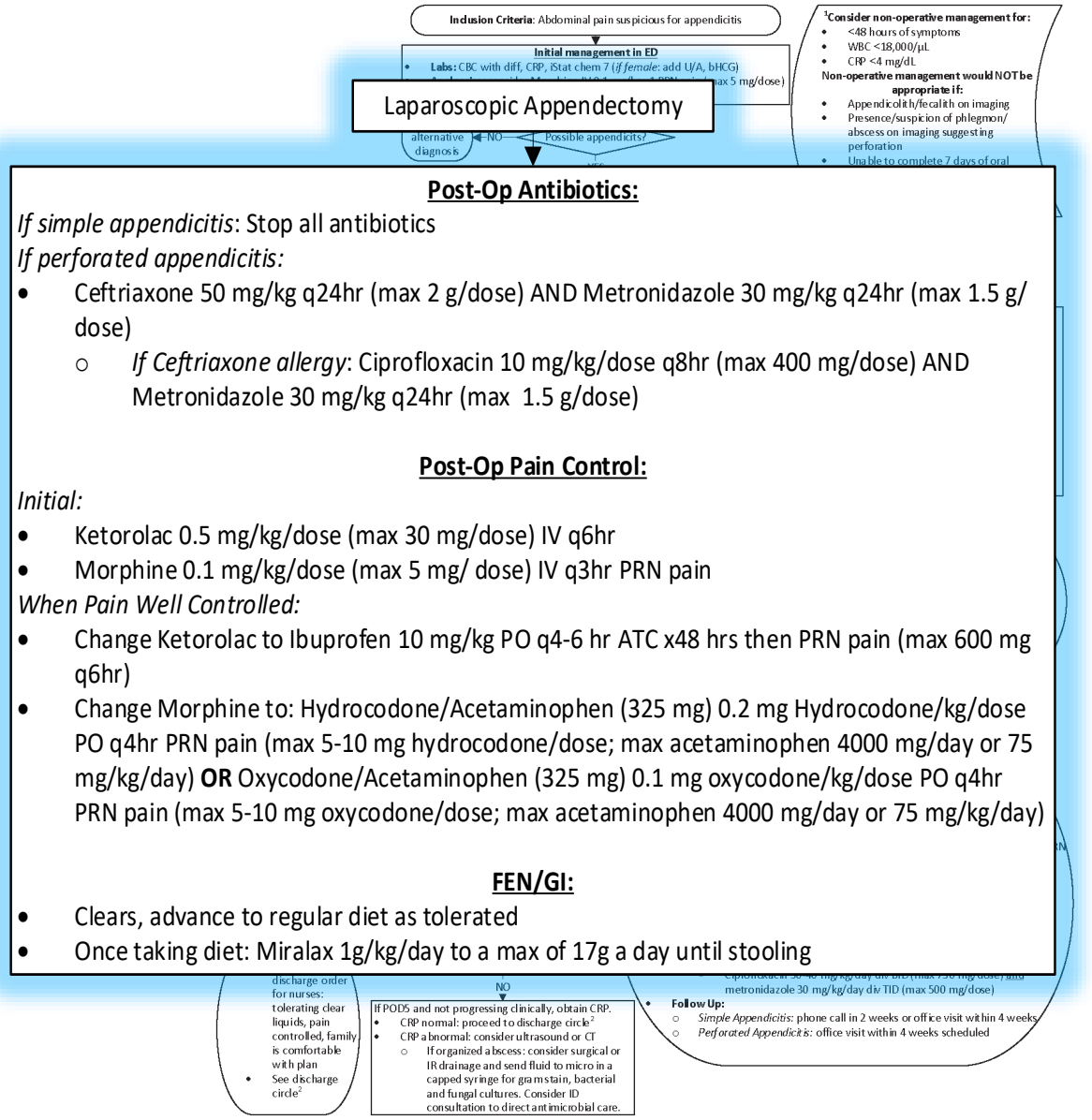
Operative Management

- After laparoscopic appendectomy, post-op antibiotics are only given if there is a perforated appendicitis. Otherwise, antibiotics are not indicated and should be discontinued.
- It is important to continue to assess pain level and adjust medications as needed
- Diet should be advanced as tolerated; miralax should be started and continued until the patient is stooling



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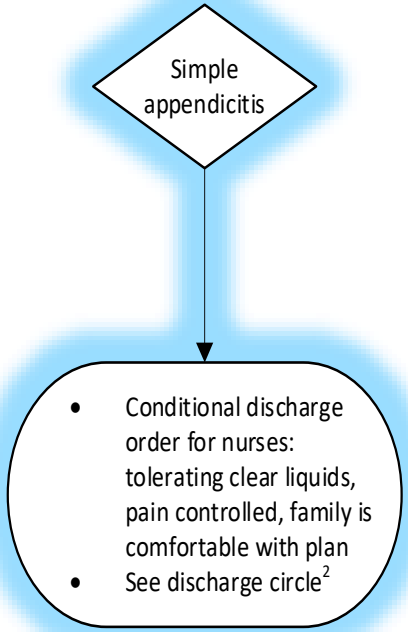
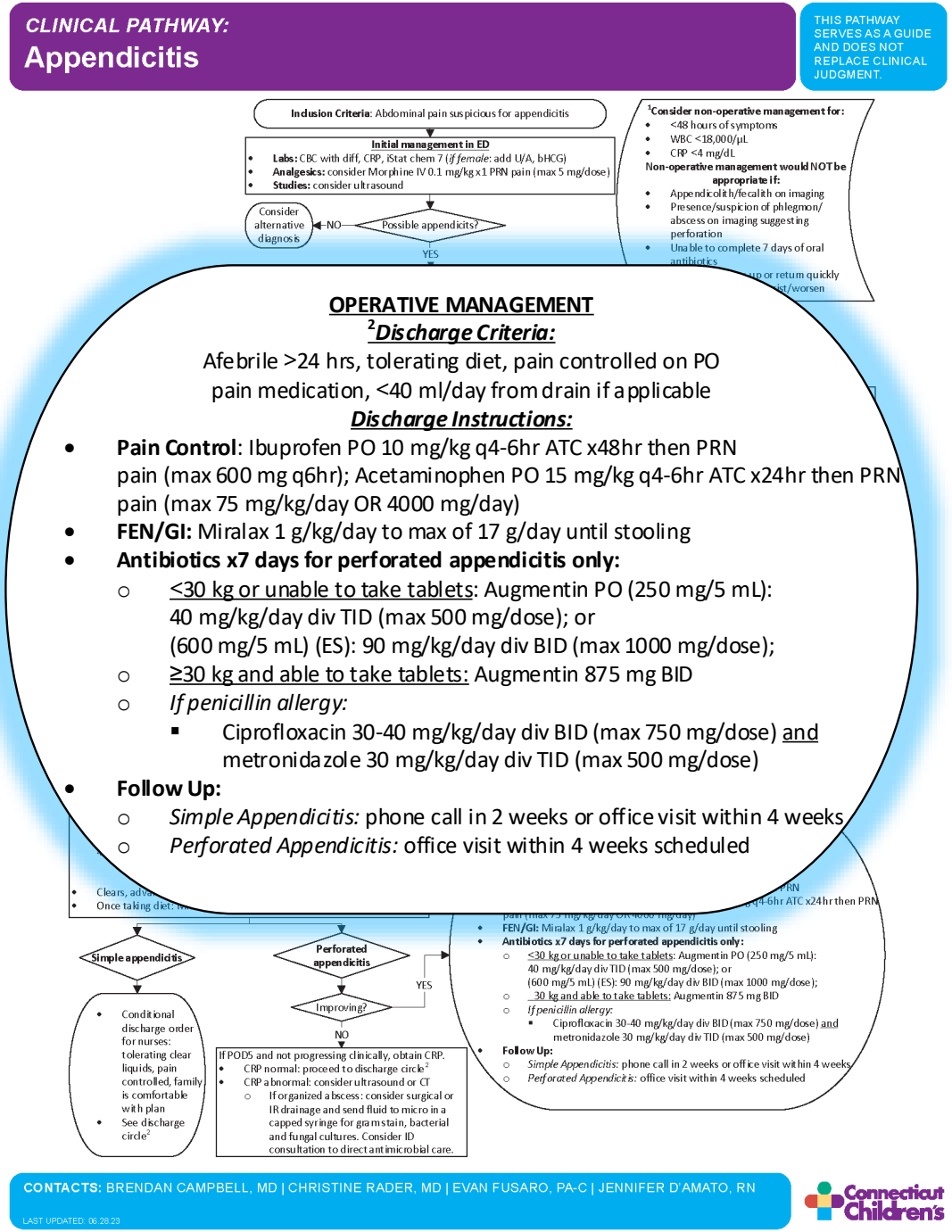
Simple Appendicitis Management:

During surgery, if the appendix is noted to be normal, inflamed, or abnormal *without* perforation:

- No additional antibiotics post-op should be given
- To facilitate discharge, there is a conditional discharge order for nurses. Patients can be discharged when they are tolerating clears, pain is well controlled, and the family is comfortable with the plan.
- Discharge instructions include pain control, Miralax, and follow up via phone or office visit





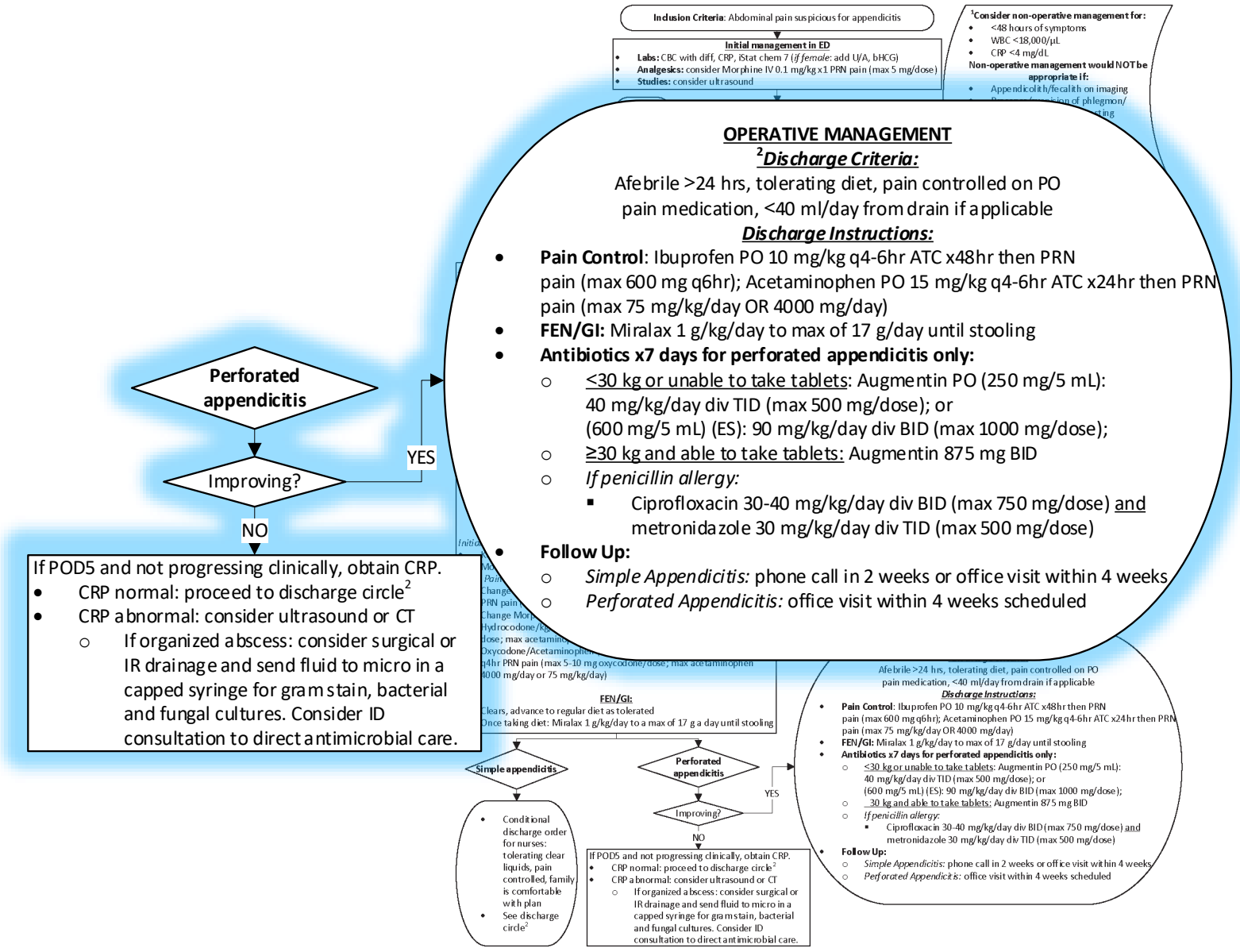
Perforated Appendicitis:

The appendix may be noted to be ruptured on imaging or during surgery. There is often purulent fluid in the abdomen.

If the patient is not improving, a CRP should be obtained to determine next steps for management.

If the patient is improving as expected, then they can be considered for discharge.

Remember that antibiotic management should be given for those with perforated appendicitis.



Review of Key Points

- Once pediatric surgeon attending has confirmed diagnosis of appendicitis, Ceftriaxone (or Ciprofloxacin) AND Metronidazole should be given promptly
  - Antibiotics should be given prior to surgery
- There are certain situations where non-operative management may be appropriate
- Simple appendicitis does not require additional antibiotic therapy post-operatively
- Duration of antibiotics for perforated appendicitis is 7 days
- Pain relief should include Ketorolac, and should be transitioned to oral medication as soon as patient is tolerating a regular diet
- Uncomplicated patients with simple appendicitis may have a conditional discharge order placed in the PACU

Quality Metrics

- Percentage of eligible patients treated per pathway
- Percentage of eligible patients with appendicitis order set usage
- Percentage of patients with appropriate post-op antibiotic selection
- Average duration of post-op antibiotic course (days) for complicated appendicitis
- Mean length of stay (simple, complicated stratified)

Pathway Contacts

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- Evan Fusaro, PA-C
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References

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- Lee, S.L., Islam, S., Cassidy, L.D., Abdullah, F., Arca, M.J. (2010). Antibiotics and appendicitis in the pediatric population: an American Pediatric Surgical Association Outcomes and Clinical Trials Committee Systematic Review. *Journal of Pediatric Surgery.* 45(11):2181-2185.

Thank You!

About Connecticut Children's Pathways Program

Clinical pathways guide the management of patients to optimize consistent use of evidence-based practice. Clinical pathways have been shown to improve guideline adherence and quality outcomes, while decreasing length of stay and cost. Here at Connecticut Children's, our Clinical Pathways Program aims to deliver evidence-based, high value care to the greatest number of children in a diversity of patient settings. These pathways serve as a guide for providers and do not replace clinical judgment.