Suspected Appendicitis Care Guideline

Postoperative Management – p. 2
Non-operative Management – p. 3

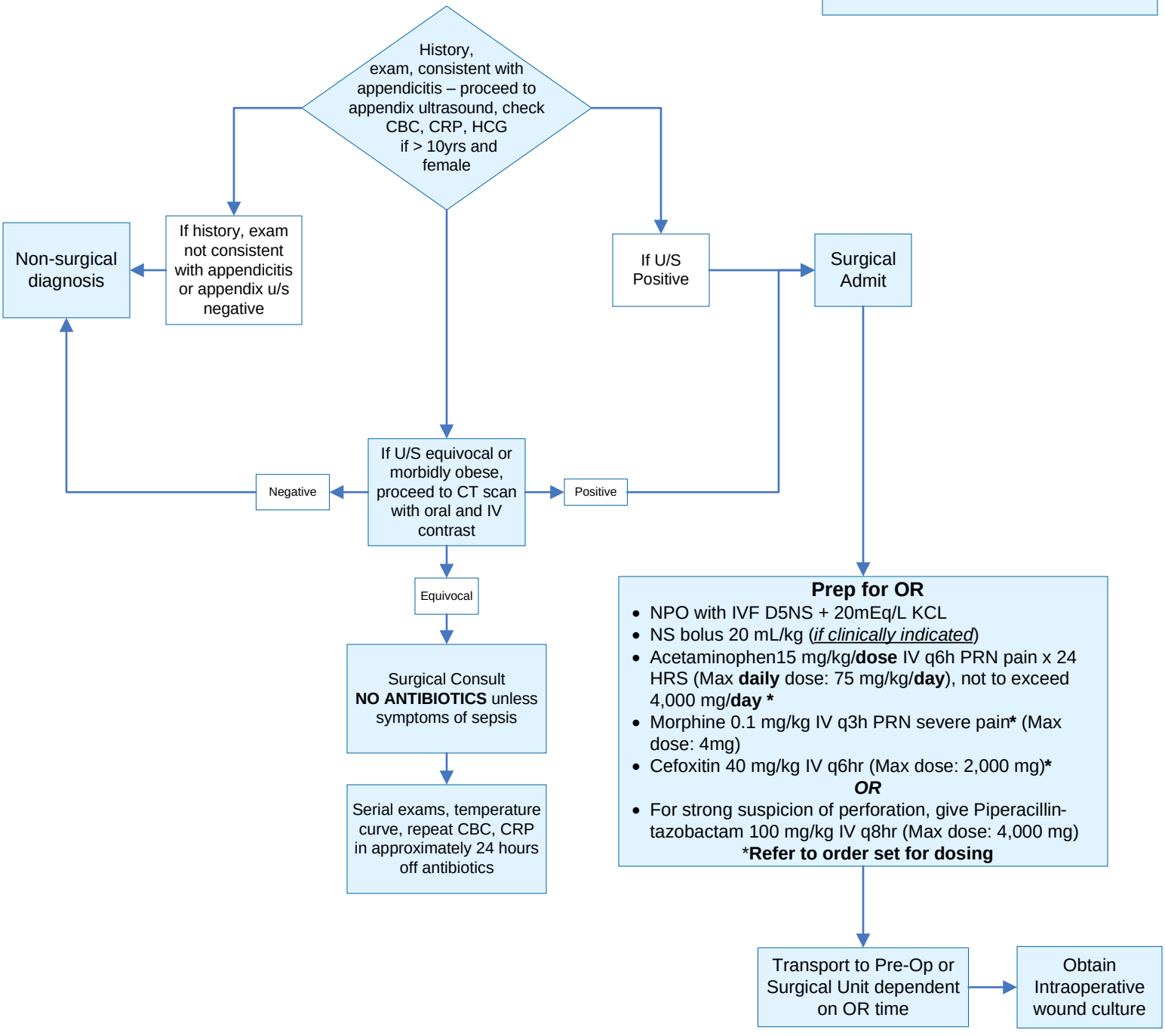
Inclusion Criteria: patients with acute periumbilical and/or RLQ abdominal pain
Exclusion Criteria: history of trauma, previous abdominal surgery

Assessment

History: Inquire specifically about onset & intensity of symptoms, anorexia, nausea/vomiting, diarrhea, migration of pain
Clinical examination: Guarding/rigidity, localized tenderness, presence of rebound, observe walking, note fever

Recommendations / Considerations

- Appendicitis is the most common atraumatic surgical condition in children who present with abdominal pain
- Most common signs/symptoms in young children are periumbilical pain with migration to RLQ, anorexia, nausea/emesis, guarding, cough/ percussion tenderness
- Laboratory findings commonly include, leukocytosis, bandemia, and elevated CRP.



Approved Evidence Based Medicine Committee:12/16/09
Reviewed/Revised: 5/15/2024; 9/15/2021; 3/15/2017; 7/19/2013; 3/28/2013

Reassess the appropriateness of Care Guidelines as condition changes and 24 hrs after admission. This guideline is a tool to aid clinical decision making. It is not a standard of care. The physician should deviate from the guideline when clinical judgment so indicates.

Appendectomy (Post-operative) Care Guideline

Inclusion Criteria: Postoperative laparoscopic or open appendectomy patients; Interval/ delayed appendectomy for perforated appendicitis
Exclusion criteria: Incidental appendectomy

Postoperative – All Patients

- Vital signs per protocol, strict I/O.
- Start diet in PACU, unless patient has NGT or otherwise indicated by surgeon.
- Out of Bed/Ambulate QID; begin POD 0.
- IVF D5NS + 20 mEq/L KCL until tolerating adequate PO with adequate UOP for age and weight, then stop IVF.
- Incentive spirometry q1h while awake.
- Medications: Refer to order set for dosing:
  - Scheduled Ketorolac 0.5 mg/kg q6h IV x 48hrs, then q6h PRN x 3 days (Max dose: 15 mg/**dose**)
  - Scheduled Acetaminophen 15 mg/kg/**dose** PO q6h (Max daily dose: 75 mg/kg/**day**) or 15 mg/kg/**dose** IV q6h x 24 HRS (Max daily dose: 75 mg/kg/**day**), not to exceed 4,000 mg/**day**
  - Ondansetron 0.1 mg/kg IV q8h PRN nausea/vomiting (Dosing Guidelines > 40 kg)

Patient / Family Education

- Appendicitis/Appendectomy Handout
- Over-the-counter Pain Medication for Home Handout
- Over-the-counter Constipation Medication for Home Handout

Simple Appendicitis (acute suppurative, or gangrenous) or Normal Appendix

Same day protocol or overnight protocol

- No antibiotics postoperatively.
- Clear liquid diet when awake, then regular diet as tolerated.
- No morphine.

Same Day Discharge Criteria Met

POD 1 Discharge Criteria Met

Discharge home without oral antibiotics

Complicated Appendicitis (perforated)

Medications: Refer to order set for dosing:

- Piperacillin/tazobactam 100 mg/kg IV q8hr (Max dose: 4,000 mg)

- ***For Penicillin Allergy:*** Ceftriaxone 50 mg/kg IV q24hr (Max dose: 2,000 mg)
  AND
- Metronidazole 30 mg/kg IV q24hr (Max dose: 1,500 mg)
- Adjust antibiotics based on cultures, if any. Consider ID consult for complex cultures.

- Morphine – 0.1 mg/kg IV q3h PRN severe pain (Max dose: 4 mg)

Start clears when awake in PACU and advance as tolerated/ordered to goal of regular diet unless otherwise ordered by surgeon.

If patient has NGT place to low intermittent suction: document amount & color of output.
Flush q6hr to maintain patency.
May ambulate with NGT to gravity.
Assess for removal daily, and plan to advance diet as tolerated once removed.

If JP drain - to bulb suction: document amount & color of output.

Consider loperamide PO for frequent diarrhea once patient has return of bowel function (follow weight-based dosing).

POD 2-7

- Discharge if criteria met.
- Total 4 (+/-1) days of PO+IV antibiotics
  - Discharge with Levofloxacin 10 mg/kg PO daily (Max dose: 500 mg) **+** Metronidazole 10 mg/kg PO TID (Max dose: 500mg) or adjust antibiotics based on cultures to complete treatment.

POD 7+

- If hasn't met DC criteria/not improving plan for CT scan abdomen/pelvis w/ oral and IV contrast to assess for postoperative intra-abdominal abscess on POD 7.
- CT with PO + IV contrast for postoperative small bowel obstruction if patient not passing flatus/stool.
- Consider rechecking labs as needed.
- ID consult if remains febrile or resistant organism.

CT shows intra-abdominal abscess

- See *non-operative management on page 3.*
- If uncontrolled sepsis consider returning to OR.

CT shows bowel obstruction

- Consider conservative management vs return to OR per surgeon discretion.

Remove Patient from Guideline

Discharge Criteria

- Afebrile x 24 hours.
- Ambulating/baseline activity.
- Pain controlled with oral medications.
- Tolerating regular diet.
- Abdominal exam reassuring.
- Stooling or passing gas.
- Family comfortable with discharge.

Original Version – 11/2005
Approved by Evidence Based Medicine Committee: 12/16/09
Reviewed/Revised: 5/15/2024; 9/15/2021; 3/15/2017; 3/28/2013

Non-Operative Management of Perforated Appendicitis Care Guideline

Inclusion Criteria: patients with:
- Symptoms ≥ 5 days and/or
- CT confirmed appendicitis with significant inflammation +/- abscess
- Postop with intrabdominal abscess

Interventions

- Admit to surgery service.
- If drainable abscess on CT scan - consult interventional radiology (IR) for percutaneous drainage and culture, with wound culture.
- NPO with MIVF D5NS + KCL 20mEq/L, for procedure then advance diet as tolerated.
- Saline Lock or TKO when tolerating diet.

Medications - Refer to order set for dosing:

- Scheduled Ketorolac
  - 0.5 mg/kg/**dose** IV q6h x 48h, then PRN x 3 days (Max dose: 15 mg/**dose**)
- Scheduled Acetaminophen
  - PO - 15 mg/kg/**dose** q6h (Max **daily** dose: 75 mg/kg/**day)** not to exceed 4,000 mg/**day**
  - IV - 15mg/kg/**dose** q6h x 24HRS (Max **daily** dose: 75 mg/kg/**day**), not to exceed 4,000 mg/**day**
- Morphine
  - 0.1 mg/kg IV q3h PRN severe pain (Max dose: 4 mg)
- Ondansetron
  - 0.1 mg/kg IV q8h PRN Nausea/Vomiting (Max dose: 4 mg)

Recommendations/ Considerations

- There are no randomized trials comparing different antibiotic regimens for the nonoperative treatment of perforated appendicitis in children. The Surgical Infection Society recommends either multi-drug therapy or monotherapy as long as adequate Gram-negative and anaerobic coverage is provided.
- Consider ID consult for cultures with resistant organisms or failure to respond to standard antibiotics
- Pain Assessment and Management (see Patient Care Policy F918)

Antibiotics

- Piperacillin-tazobactam 100 mg/kg IV q8hr (Max dose: 4,000 mg)

- ***For penicillin allergy:*** Ceftriaxone 50 mg/kg IV q24hr (Max dose: 2,000 mg)

AND

- Metronidazole 30 mg/kg IV q24hr (Max dose: 1,500 mg)

***Refer to order set for dosing**

- Adjust antibiotics based on cultures. See continued considerations below.

Parent/Patient Education

- HELPS class for PICC line teaching if applicable
- Drain Care Handout
- Return Precautions Handout
- Non-Operative Appendicitis Handout

Considerations

- Consider drain removal prior to d/c if output not purulent and minimal output for several days.
- Consider CBC and CRP prior to discharge.
- Consider follow up imaging hospital day 7 if not meeting d/c criteria.
- If uncontrolled sepsis or bowel obstruction develops, consider proceeding to appendectomy.
- Anticipate d/c home with PO antibiotics based on culture results for total 14 days.
- If no cultures (undrainable abscess or no growth) discharge with PO Levofloxacin + metronidazole.
- If discharged home with IV antibiotic with PICC (resistant to any PO) consult ID and consider changing antibiotics to single agent home regimen before discharge, if cultures allow.

Discharge Criteria

- Afebrile for a minimum of 24 hours.
- Tolerating regular diet.
- If repeating labs CRP and WBC trending down.
- Ambulating – baseline activity.
- Pain well controlled with oral meds.
- Stooling or passing gas.
- Arrange Home Care for PICC with: RN visits, meds, supplies, labs and/or drain care, if needed.

Approved by Evidenced Based Medicine Committee
Original: 12/16/09
Revised/Revised: 5/15/2024; 9/15/2021; 3/15/2017; 3/28/2013

Appendicitis Care Guideline References

Children's Hospital of Philadelphia. (2021). Inpatient Clinical Pathway for Evaluation/Treatment of Children with Appendicitis. Retrieved from https://www.chop.edu/clinical-pathway/appendicitis-inpatient-care-clinical-pathway

Daskalakis, K., Juhlin, C., & Påhlman, L. (2014). The use of pre- or postoperative antibiotics in surgery for appendicitis: a systematic review. *Scandinavian Journal of Surgery: SJS: Official Organ for the Finnish Surgical Society and the Scandinavian Surgical Society, 103*(1), 14-20. https://doi.org/10.1177/1457496913497433 (Level III)

Dell Children's Medical Center. (2015). Acute Appendicitis Pathway Guidelines. Retrieved from https://www.dellchildrens.net/wp-content/uploads/sites/60/2015/10/DCMCAppendicitisGuideline1.pdf

Fugazzola, P., Coccolini, F., Tomasoni, M., Stella, M., & Ansaloni, L. (2019). Early appendectomy vs. conservative management in complicated acute appendicitis in children: A meta-analysis. *54*(11), 2234-2241. https://doi.org/10.1016/j.jpedsurg.2019.01.065 (Level II)

Gonzalez, D. O., Deans, K. J., & Minneci, P. C. (2016). Role of non-operative management in pediatric appendicitis. *Seminars in Pediatric Surgery, 25*(4), 204-207. https://doi.org/10.1053/j.sempedsurg.2016.05.002 (Level IV)

Hughes, M. J., Harrison, E., & Paterson-Brown, S. (2013). Post-operative antibiotics after appendectomy and post-operative abscess development: a retrospective analysis. *Surgical Infections, 14*(1), 56-61. https://doi.org/10.1089/sur.2011.100 (Level IV)

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. https://doi.org/10.1016/j.jpedsurg.2010.06.038 (Level II)

Sallinen, V., Akl, E. A., You, J. J., Agarwal, A., Shoucair, S., Vandvik, P. O., . . . Tikkinen, K. A. (2016). Meta-analysis of antibiotics versus appendicectomy for non-perforated acute appendicitis. *The British Journal of Surgery, 103*(6), 656-667. https://doi.org/10.1002/bjs.10147 (Level II)

Shbat, L., Emil, S., Elkady, S., Baird, R., Laberge, J.-M., Puligandla, P., & Shaw, K. (2014). Benefits of an abridged antibiotic protocol for treatment of gangrenous appendicitis. *Journal of Pediatric Surgery, 49*(12), 1723-1725. https://doi.org/10.1016/j.jpedsurg.2014.09.039 (Level IV)

Skarda, D. E., Schall, K., Rollins, M., Andrews, S., Olson, J., Greene, T., . . . Scaife, E. (2015). A dynamic postoperative protocol provides efficient care for pediatric patients with non-ruptured appendicitis. *Journal of Pediatric Surgery, 50*(1), 149-152. https://doi.org/10.1016/j.jpedsurg.2014.10.032 (Level IV)