

**Critical Review Form  
Therapy**

**[Non-operative management of early, acute appendicitis in children: is it safe and effective? J Pediatr Surg. 2014 May.](#)**

**Objectives:** "to determine if early, uncomplicated acute appendicitis in children could safely be managed with antibiotics alone." (p. 1)

**Methods:** This retrospective case control series was conducted with patients under age 18 treated for acute appendicitis by a single surgeon Children's Hospital in London, Ontario. Patients treated non-operatively between May 2012 and February 2013 were compared to controls treated surgically between January and October 2011. During the later time period, the surgeon's practice was to offer non-operative management to all patients with acute uncomplicated appendicitis. Eligibility criteria included a "classic presentation of appendicitis," symptoms < 48 hours duration, and appendicitis confirmed by imaging. Exclusion criteria included hemodynamic compromise at presentation or the presence of an abscess or phlegmon on imaging.

Non-operative patients were treated with IV ciprofloxacin and metronidazole or ampicillin, gentamicin, and metronidazole while hospitalized, followed by oral amoxicillin/clavulanate following discharge for a total of 7 days of antibiotics. If the patient's condition worsened or did not improve over a 24-hour observation period, the surgeon offered operative management. Patients treated with surgery were given a single dose of preoperative antibiotics prior to laparoscopic appendectomy.

The primary endpoint was failure of initial treatment or complication from initial treatment. In the non-operative group, this included the need for appendicitis during the initial hospitalization or perforation. In the operative group, this included peritonitis requiring re-operation or surgical site infection. Secondary endpoints included length of stay (LOS) for the initial visit, LOS for all documented admissions, recurrence of appendicitis, and repeat hospital visits.

There were 17 patients treated non-operatively during the recruitment period, of whom 12 met inclusion criteria. Twelve patients meeting inclusion criteria were identified among 24 patients treated with appendectomy for non-perforated acute appendicitis. The median follow-up for the non-operative group was 6.5 months and the operative patients were followed for 6 months.

<b>Guide</b>		<b>Comments</b>
<b>I.</b>	<b>Are the results valid?</b>	
<b>A.</b>	<b>Did experimental and control groups begin the study with a similar prognosis (answer the questions posed below)?</b>	
1.	Were patients randomized?	No. This was a retrospective study of patients treated by a single pediatric surgeon. The decision to perform surgery or attempt non-operative management was at the discretion of the treating physician whose "practice was to offer non-operative management to all patients diagnosed with early, uncomplicated acute appendicitis." (p. 782) Additionally, the authors only included patients in the non-operative group if they had a "classic presentation of appendicitis, less than 48 h of symptoms at presentation, and the diagnosis of acute appendicitis was confirmed with imaging." (p. 783) The surgical group was obtained by chart review of patients treated by the same surgeon, using the same inclusion and exclusion criteria.
2.	Was randomization concealed (blinded)?	N/A
3.	Were patients analyzed in the groups to which they were randomized?	Yes. Patients treated with initial non-operative management were analyzed as such, regardless of the eventual need for surgical intervention. Therefore an <a href="#">intention to treat analysis</a> was used.
4.	Were patients in the treatment and control groups similar with respect to known prognostic factors?	Yes. The two groups were similar with respect to age, gender, duration of symptoms, WBC, CRP, and appendiceal diameter.
<b>B.</b>	<b>Did experimental and control groups retain a similar prognosis after the study started (answer the questions posed below)?</b>	
1.	Were patients aware of group allocation?	Yes. This was a retrospective, observational study and the decision to perform urgent surgery or attempt non-operative management was at the treating surgeon's discretion. Given the nature of the study and involvement of children, it seems unlikely that <a href="#">performance bias</a> on the part of the patients or families would affect the outcomes.
2.	Were clinicians aware of group	Yes. It is possible as a result that some form of

	allocation?	<a href="#">performance bias</a> on the part of the clinicians could influence the outcomes (i.e. earlier discharge).
3.	Were outcome assessors aware of group allocation?	Yes. The outcomes were fairly objective (need for appendectomy), and hence it seems unlikely that <a href="#">observer bias</a> would affect the results.
4.	Was follow-up complete?	Yes. Reportedly all patients had outcome data available, although the method of follow-up was not detailed.
<b>II.</b>	<b>What are the results (answer the questions posed below)?</b>	
1.	How large was the treatment effect?	<p><b>Two of 12 patients (16.7%, 95% CI 4.7 to 45%) treated non-operatively failed initial management:</b> one failed to improve in the hospital and had surgery within 24 hours of admission, and one had ongoing pain at 6 weeks and underwent elective appendectomy. One additional patient developed recurrent appendicitis at 7 months and required appendectomy.</p> <p>There was one post-operative complication observed in the non-operative group (8.3%) compared to two in the operative group (16.7%).</p> <p>Mean length of stay during the initial visit was 1.5 (SD 0.5) days in the non-operative group compared to 1.3 (SD = 0.5) days in the operative group (<math>p = 0.61</math>).</p> <p>Total mean length of stay was 1.8 (SD = 1.1) days in the non-operative group compared to 1.7 (SD = 1.5) days in the operative group (<math>p = 0.97</math>).</p> <p>There were 4 repeat visits to the emergency department in the non-operative group versus 2 in the operative group.</p>
2.	How precise was the estimate of the treatment effect?	See above. This was a very small study with large confidence intervals.
<b>III.</b>	<b>How can I apply the results to patient care (answer the questions posed below)?</b>	
1.	Were the study patients similar to my patient?	Yes. These were pediatric patients with acute appendicitis diagnosed by ultrasound. While this

		study was conducted in Canada, the pathophysiology and management of pediatric appendicitis would be expected to be similar to patients in our Children's Hospital.
2.	Were all clinically important outcomes considered?	No. The authors failed to consider other important <a href="#">patient-centered outcomes</a> , such as days of school/work missed, time to return to normal activity, and parental or patient satisfaction. Additionally, healthcare costs were not compared between the groups.
3.	Are the likely treatment benefits worth the potential harm and costs?	Uncertain. This was a small, open-label, nonrandomized study and could potentially have been subject to <a href="#">selection bias</a> , <a href="#">performance bias</a> , and <a href="#">observer bias</a> . The results do suggest that selective non-operative management of acute, uncomplicated, pediatric appendicitis is safe and may prevent a significant number of children from requiring surgical intervention, however the small sample size and resulting wide confidence intervals make it difficult to draw a firm conclusion: 3 of 12 patients initially treated non-operative eventually required appendectomy (25%, 95% CI 8.9 to 53%). Larger randomized trials will need to be performed to confirm the potential benefits of non-operative management, and should focus differences in time to return to normal activity and days of school/work missed.

**Limitations:**

- 1. The study included a very small sample size with wide 95% confidence intervals.**
- 2. Chart review methods not detailed ([Gilbert 1996](#), [Worster 2004](#))**
- 3. Failure to adhere to reporting guidelines ([STROBE Statement](#)):**
  - a. The rationale for the study size was not provided**
  - b. 95% confidence intervals not provided**
  - c. Follow-up methods not described**
- 4. Improper statistical methods were used: means (with standard deviation) were reported for [length of stay](#), which is likely not normally distributed; medians should have been reported.**

### **Bottom Line:**

**The results of this small, open-label, nonrandomized study suggest that selective non-operative management of acute, uncomplicated, pediatric appendicitis is safe and may prevent a significant number of children from requiring surgical intervention: 3 of 12 patients initially treated non-operative eventually required appendectomy (25%, 95% CI 8.9 to 53%), and therefore surgery was avoided in 9 children. The small sample size and resulting wide confidence intervals make it difficult to draw a firm conclusion. Larger randomized trials will need to be performed to confirm the potential benefits of non-operative management, and should focus differences in time to return to normal activity and days of school/work missed.**