

# Does This Adult Patient Have Appendicitis?

## EBEM Commentator Contact

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## RATIONAL CLINICAL EXAMINATION REVIEW SOURCE

This is a rational clinical examination abstract, a regular feature of the *Annals'* Evidence-Based Emergency Medicine (EBEM) series. Each features an abstract of a rational clinical examination review from the *Journal of the American Medical Association* and a commentary by an emergency physician knowledgeable in the subject area.

The source for this rational clinical examination review abstract is: Wagner JM, McKinney WP, Carpenter JL. Does this patient have appendicitis? *JAMA*. 1996;276:1589-1594. The *Annals'* EBEM editors assisted in the preparation of the abstract of this rational clinical examination review, as well as the selection of the Evidence-Based Medicine Teaching Points.

## OBJECTIVE

To report the likelihood ratios associated with symptoms and signs of appendicitis.

## DATA SOURCES

Only publications in English were chosen from the MEDLINE database from 1966 to 1996. The search strategy, perhaps up to date in 1996, could be made broader by the use of wildcard characters, and a more comprehensive search could be performed today.

## STUDY SELECTION

Studies involving adult patients were screened by reviewing titles and abstracts of the search results. Studies were included if data were available to construct a 2×2 table for likelihood ratios. Overall, 10 studies of 300 were selected; 4 studies were retrospective and 6 were prospective. These 10 studies were deemed to be of the "highest quality, based on the number of patients studied, study design, and completeness of reported data." However, the authors did not report a predetermined scoring system to assess for methodologic quality.

## DATA EXTRACTION AND ANALYSIS

The authors did not attempt to qualify the studies in this meta-analysis. They do note that "the studies are of varying quality and design." Of the 10 studies included, approximately half were focused on patients suspected of having appendicitis.

The other half focused on patients with an "acute abdomen," not rigorously defined. The pooled effects were tested for homogeneity by the Breslow-Day statistic. *P* values and associated confidence intervals (CIs) were generated for each symptom and sign. Likelihood ratios were generated by using the Mantel-Haenszel method.

## MAIN RESULTS

Referring to Table 1, there were 3 significant likelihood ratios reported. The presence of right lower quadrant pain generated a positive likelihood ratio of 7.31 to 8.46. The absence of right lower quadrant pain generated a negative likelihood ratio of 0 to 0.28. Last, a history of not having similar pain previously had a negative likelihood ratio of 0.32 (95% CI 0.25 to 0.42).

The authors report no studies identified evaluating the precision of the clinical examination for appendicitis.

## CONCLUSIONS

Migration of pain in the characteristic manner, right lower quadrant pain, and the presence of pain before vomiting are historical findings that suggest appendicitis. The presence of rigidity, a positive psoas sign, fever, or rebound tenderness is a sign on physical examination indicating an increased likelihood of appendicitis. The absence of right lower quadrant pain, the absence of the classic migration of pain, and the presence of similar pain previously are powerful symptoms in the medical history that make appendicitis less likely. In the physical examination, the lack of right lower quadrant pain, rigidity, or guarding makes appendicitis less likely. There are no findings on the clinical examination that can effectively rule out appendicitis.

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## COMMENTARY: CLINICAL IMPLICATION

In the United States, the lifetime risk for developing appendicitis is 12% for men and 25% for women. Misdiagnosis rates are higher in women. Moreover, women of childbearing ages have an even higher rate of negative appendectomies. The

**Table 1.** Likelihood ratios associated with various historical factors.

Symptom	Positive LR (95% CI)	Negative LR (95% CI)
Right lower quadrant pain*	7.31–8.46	0–0.28
No similar pain previously	1.50 (1.36–1.66)	0.323 (0.246–0.424)
Migration	3.18 (2.41–4.21)	0.50 (0.42–0.59)
Pain before vomiting†	2.76 (1.94–3.94)	NA
Anorexia	1.27 (1.16–1.38)	0.64 (0.54–0.75)
Nausea*	0.69–1.20	0.70–0.84
Vomiting	0.92 (0.82–1.04)	1.12 (0.95–1.33)

LR, Likelihood ratio.

\*In heterogeneous studies, the LRs are reported as ranges without CIs because a meta-analysis could not be performed.

†Only 1 study in meta-analysis.

current mortality is less than 1% but increases to 3% if the appendix is ruptured and increases to 15% mortality if ruptured in the elderly.<sup>1</sup>

The clinical diagnosis of appendicitis in the emergency department remains a humbling experience. Even with the advent of computed tomographic and ultrasonographic scans, clinical assessments are still a critical component, with some suggesting that adjunctive testing may be detrimental.<sup>2,3</sup> The overall pretest probability for appendicitis for emergency acute abdominal pain of less than 1 week's duration is 12% to 26%.<sup>4</sup> Emergency physicians use their clinical acumen in deciding between diagnostic tests and early surgical consultation. This rational clinical examination article reports sensitivities, specificities, and likelihood ratios for some of the historical and physical findings associated with appendicitis. Historical information significantly associated with appendicitis includes pain before vomiting, the classic migration of vague epigastric or periumbilical pain to the right lower quadrant, and the presence of right lower quadrant pain. The finding of right lower quadrant pain has heterogeneity and was reported as a range of values; however, this should not alter the usefulness of this finding, because the range of values is fairly consistent (95% CI 7.31 to 8.46). Traditional evidence-based medicine teaching states that a positive likelihood ratio between 5 and 10 moderately increases posttest probability for disease.<sup>5</sup> Thus, the finding of right lower quadrant pain has a moderately significant positive impact on the diagnosis for appendicitis. The findings of pain before vomiting (positive likelihood ratio=2.76) and the classic migration of pain (positive likelihood ratio=3.18) generate a small but potentially important increase in the probability of appendicitis. Clinically nonsignificant symptoms include anorexia, nausea, and vomiting. On the surface, it is surprising that anorexia does not correlate with an increased likelihood of appendicitis; however, many patients without appendicitis complain of anorexia, which decreases its specificity and therefore its overall usefulness to rule in appendicitis. The absence of right lower quadrant pain moderately decreases the likelihood of appendicitis, whereas a history of having similar

**Table 2.** Likelihood ratios associated with various physical examination findings.

Signs	Positive LR (95% CI)	Negative LR (95% CI)
Rigidity	3.76 (2.96–4.78)	0.82 (0.79–0.85)
Psoas sign	2.38 (1.21–4.67)	0.90 (0.83–0.98)
Fever	1.94 (1.63–2.32)	0.58 (0.51–0.67)
Rebound tenderness test*	1.10–6.30	0–0.86
Guarding*	1.65–1.78	0–0.54
Rectal tenderness*	0.83–5.34	0.36–1.15

\*In heterogeneous studies, the LRs are reported as ranges without CIs because a meta-analysis could not be performed.

pains indicates a small but also potentially important decrease in the likelihood of disease.

As seen in Table 2, physical findings of rigidity, psoas sign, fever, or rebound tenderness generate small increases in the likelihood of appendicitis. Classic but nonsignificant signs include guarding or rectal tenderness. Thus, there appears to be no reliable physical finding that will rule out appendicitis.

### TAKE HOME MESSAGE

No medical history or physical finding can effectively rule out appendicitis; however, right lower quadrant pain, abdominal rigidity, and a psoas sign all make appendicitis more likely, whereas the absence of right lower quadrant pain and the presence of previous similar pain make the diagnosis significantly less likely. Appendicitis will continue to be a diagnosis that calls for a composite approach that integrates all available factors and uses clinical judgment to determine the need for further imaging.

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### EBEM TEACHING POINT

In the search strategy, the use of wildcard characters may significantly increase the number of relevant results in searching the medical databases. Frequently, search engines such as PubMed and Ovid offer the use of wildcard characters. Wildcards are usually symbolic characters that are used in place of specific spellings of words. For example, searches that only look for "appendicitis" may miss relevant articles such as "appendicolith," "appendiceal rupture," or "appendiceal abscess." A wildcard truncation with the symbol \$ (Ovid) or \* (PubMed) of the stem "appendi" to "appendi\$" or "appendi\*" may reveal significant articles in your search. Thus, when searching for all relevant articles, consider the use of wildcards in your search strategy.

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**REFERENCES**

1. Brunicaudi C, Andersen DK, Billiar TR, et al. *Schwartz's Principles of Surgery*. 8th ed. New York, NY: McGraw-Hill Professional; 2005.
2. Wilson EB, Cole JC, Nipper ML, et al. Computed tomography and ultrasonography in the diagnosis of appendicitis: when are they indicated? *Arch Surg*. 2001;136:670-675.
3. Lee SL, Walsh AJ, Ho HS. Computed tomography and ultrasonography do not improve and may delay the diagnosis and treatment of acute appendicitis. *Arch Surg*. 2001;136:556-562.
4. Wagner JM, McKinney WP, Carpenter JL. Does this patient have appendicitis? *JAMA*. 1996;276:1589-1594.
5. The Evidence-Based Medicine Working Group. Guyatt G, Rennie D, eds. *Users' Guide to the Medical Literature: A Manual for Evidence-Based Clinical Practice*. Chicago, IL: AMA Press; 2002.

**2009 Pediatric Emergency Medicine  
Subspecialty Certification Examination**

The American Board of Emergency Medicine (ABEM) and the American Board of Pediatrics (ABP) will administer the certifying examination in Pediatric Emergency Medicine on Monday, March 30, 2009.

Physicians who are certified in Emergency Medicine by ABEM must submit an application to ABEM. Physicians who are certified in General Pediatrics by ABP must submit an application to ABP. Physicians who are certified by both boards may apply through either ABEM or ABP. Upon successful completion of the examination, certification is awarded by the board through which the physician applied.

ABEM must have received independent verification on or before March 16, 2009, that applicants completed an Accreditation Council for Graduate Medical Education (ACGME) accredited fellowship program in Pediatric Emergency Medicine to be eligible to take the examination in 2009. The complete eligibility criteria are available from each board office or at [www.abem.org](http://www.abem.org) and [www.abp.org](http://www.abp.org).

Application materials will be available for physicians applying through ABEM starting August 1, 2008. Completed applications must be submitted to ABEM on or before October 31, 2008. ABP diplomates should contact ABP for application information.

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