THE ROLE OF CLINICAL ASSESSMENT, LABORATORY TESTS, AND ULTRASONOGRAPHY IN THE EARLY DIAGNOSIS OF ACUTE APPENDICITIS

Xalilov Shukurillo Qo'chqarbayevich

Assistant, Department of Pediatric Surgery

Andijan State Medical Institute, Andijan, Uzbekistan

Article type: Narrative review

ABSTRACT

Background: Early diagnosis of acute appendicitis requires the interpretation of clinical findings alongside laboratory and imaging results. Diagnostic uncertainty remains important because neither individual inflammatory markers nor ultrasonography consistently excludes the disease.

Objective: To examine the complementary contributions of clinical assessment, laboratory investigations, and ultrasonography to the early diagnosis of acute appendicitis.

Methods: A focused narrative review was conducted using targeted web searches to identify PubMed-indexed studies and professional guidelines. Evidence was organized into clinical risk assessment, inflammatory biomarkers, ultrasound performance, and the interpretation of discordant findings. No original patient data were collected, and no quantitative pooling was performed.

Results: The reviewed evidence supports risk-based diagnostic assessment. Clinical scoring systems help structure initial evaluation, while laboratory tests modify disease probability. In a multicentre cohort of 1,303 adults with confirmed appendicitis, 23 patients (1.8%) had normal white blood cell counts and C-reactive

protein concentrations. Ultrasound findings were useful but showed substantial variation across clinical settings. An inconclusive examination therefore requires interpretation within the broader clinical context.

Conclusion: Early diagnosis is best approached through the integration of complementary findings and reassessment when uncertainty persists. Normal inflammatory markers or an inconclusive ultrasound examination should not independently terminate the diagnostic process.

Keywords: acute appendicitis; early diagnosis; clinical assessment; inflammatory markers; C-reactive protein; ultrasonography; diagnostic accuracy.

INTRODUCTION

Acute appendicitis is a major cause of emergency surgical admission. Its diagnosis remains clinically important because the presenting features and available diagnostic resources vary between patients and healthcare settings. The 2025 edition of the World Society of Emergency Surgery (WSES) Jerusalem Guidelines, published in 2026, identifies clinical risk scores and imaging as important components of diagnostic assessment and the reduction of negative appendectomy rates [1].

The diagnostic challenge involves more than identifying a positive test. Clinicians must determine whether the available findings are sufficiently consistent to support appendicitis, whether an alternative diagnosis is more likely, or whether further observation and investigation are necessary. Clinical assessment, laboratory testing, and imaging provide different forms of evidence rather than interchangeable answers.

This review aims to evaluate their complementary roles, with particular attention to the limitations of normal inflammatory markers, variability in ultrasound performance, and the interpretation of apparently conflicting results.

MATERIALS AND METHODS

This article was developed as a focused narrative review rather than an original clinical study or systematic review. Targeted searches were undertaken on 12 October 2026 to locate relevant PubMed-indexed publications, WSES guidelines, and American College of Radiology (ACR) recommendations.

Search phrases addressed acute appendicitis diagnosis, clinical risk assessment, white blood cell count, C-reactive protein, ultrasound diagnostic accuracy, and right lower quadrant imaging. Sources were selected for their direct relevance to diagnostic decision-making. Primary observational studies were used to illustrate laboratory and ultrasound performance, while professional guidelines provided the clinical framework.

Extracted information included study population, diagnostic test, reported performance, and limitations affecting interpretation. Numerical results were retained in their original study context. No combined sensitivity, specificity, or effect estimate was calculated.

The review did not include exhaustive database searching, independent duplicate screening, or a formal risk-of-bias assessment. Consequently, its findings represent a selective synthesis and should not be interpreted as a comprehensive systematic evaluation. No patient records or identifiable personal data were accessed.

RESULTS

Clinical assessment and risk stratification

The 2020 WSES guidelines recommend an individualized diagnostic approach incorporating age, sex, symptoms, and clinical findings. The Appendicitis Inflammatory Response score and Adult Appendicitis Score can support risk stratification. Their principal value is to organize diagnostic probability and identify

patients who require further investigation; a score should not substitute for clinical judgment.

The guidelines also distinguish between identifying low-risk patients and positively establishing the diagnosis. In particular, the Alvarado score is insufficiently specific to confirm appendicitis in adults. Intermediate-risk patients may benefit from observation and timely imaging [2].

Laboratory investigations

Laboratory evidence demonstrates why normal inflammatory markers cannot be treated as an absolute exclusion criterion. De Jonge and colleagues examined 1,303 adults with histologically confirmed acute appendicitis. Both preoperative white blood cell count and C-reactive protein were normal in 23 patients, representing 1.8% of the cohort. Four patients with normal markers had complicated appendicitis.

These findings establish that appendicitis can occur without elevated routine inflammatory markers. However, because the cohort contained confirmed cases, the reported percentage does not represent the probability of appendicitis among all emergency patients with normal blood tests [3].

A separate prospective study of 422 adults evaluated white blood cell count and absolute neutrophil count combined with a proprietary C-reactive protein assay. The white blood cell count–CRP combination achieved 97.5% sensitivity and a negative predictive value of 98.8%, with 50.0% specificity. Two appendicitis cases were missed by that combination. The authors emphasized the need for validation using commercially available CRP assays. Accordingly, the reported performance should not be generalized automatically to every laboratory platform or patient population [4].

Ultrasonography

Primary studies illustrate both the diagnostic contribution and limitations of ultrasonography. In a prospective study involving 110 patients, ultrasound had a sensitivity of 85.5% and specificity of 84.4%. Its overall accuracy exceeded the surgeon's initial clinical impression. Nevertheless, appendicitis was subsequently identified in some patients whose ultrasound findings had been classified as normal, reinforcing the importance of repeated clinical evaluation [5].

A prospective multicentre investigation reported substantially different performance: overall ultrasound sensitivity was 55% and specificity was 95%, with considerable variation between centres. These older studies should not be presented as estimates of current universal performance. Their continuing relevance is methodological: ultrasound accuracy depends on the setting, and results from one institution cannot simply be transferred to another [6].

Selection of additional imaging

The imaging pathway should reflect the patient population and clinical circumstances. ACR guidance classifies contrast-enhanced abdominal and pelvic computed tomography as usually appropriate for adult right lower quadrant pain, including suspected appendicitis with fever and leukocytosis. Ultrasound is classified as potentially appropriate in these adult scenarios. This prevents the assumption that an ultrasound-first pathway is mandatory for every patient [7].

DISCUSSION

The reviewed findings support interpreting diagnostic evidence as a sequence of probability updates. Clinical assessment establishes the initial level of concern; laboratory and imaging results then strengthen or weaken that concern. The practical implication of this synthesis is that disagreement between findings deserves attention rather than automatic preference for one test.

Laboratory studies also illustrate the importance of patient selection. A multicentre study of 949 patients who underwent appendectomy found appendicitis in 39.8% of those with normal white cell count and CRP. This percentage applies to a selected surgical population, not all patients presenting with abdominal pain. The investigators concluded that normal inflammatory markers could not independently exclude appendicitis [8].

There is no necessary contradiction between this finding and a high negative predictive value in a broader emergency-department cohort. Predictive values are influenced by disease prevalence and the characteristics of the patients included. Comparing percentages without examining their denominators can therefore produce misleading conclusions. For a future local study, recruitment should ideally include consecutive patients with suspected appendicitis, rather than only those who undergo surgery.

Ultrasound evidence requires similar caution. A positive, clinically concordant examination may be useful, but a nondiagnostic scan is not equivalent to a confidently demonstrated normal appendix. The 2020 WSES framework supports combining clinical assessment with ultrasound and proceeding to additional evaluation when symptoms persist. It also supports ultrasound followed by MRI, where available, in pregnant patients with inconclusive initial imaging [2].

A useful implication for institutional practice is to evaluate the entire diagnostic pathway. Future research could measure time to diagnostic decision, frequency of nondiagnostic scans, additional imaging, missed appendicitis, and negative appendectomy. Ultrasound reports should distinguish a visualized normal appendix from nonvisualization, allowing these outcomes to be studied separately. These are methodological recommendations arising from this review, rather than outcomes demonstrated by a new intervention.

Several limitations must be acknowledged. This review used selective retrieval, included studies from different periods and populations, and did not formally assess bias. Some evidence was available through abstracts rather than complete reports. The ultrasound studies discussed are historical and illustrate variability rather than contemporary benchmark accuracy. No claim can therefore be made that the proposed integration produces a specific numerical improvement in diagnosis.

CONCLUSION

Clinical assessment, laboratory investigations, and ultrasonography contribute complementary evidence to the early diagnosis of acute appendicitis. Their greatest practical value lies in integrated interpretation. Normal inflammatory markers cannot independently exclude appendicitis, and uncertain imaging should be considered alongside the patient's clinical course. Diagnostic pathways should accommodate reassessment and appropriate additional imaging while reflecting local expertise and resources.

REFERENCES

1. Podda M, Ceresoli M, De Simone B, et al. Diagnosis and Treatment of Acute Appendicitis: 2025 Edition of the World Society of Emergency Surgery Jerusalem Guidelines. JAMA Surgery. 2026;161(3):283–295. https://doi.org/10.1001/jamasurg.2025.6218

2. Di Saverio S, Podda M, De Simone B, et al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. World Journal of Emergency Surgery. 2020;15:27. https://doi.org/10.1186/s13017-020-00306-3

3. De Jonge J, Scheijmans JCG, van Rossem CC, et al. Normal inflammatory markers and acute appendicitis: a national multicentre prospective cohort analysis. International Journal of Colorectal Disease. 2021;36:1507–1513. https://doi.org/10.1007/s00384-021-03933-7

4. Diagnostic accuracy of combined WBC, ANC and CRP in adult emergency department patients suspected of acute appendicitis. PubMed record, PMID: 32482481. https://pubmed.ncbi.nlm.nih.gov/32482481/

5. Accuracy of ultrasound in the diagnosis of acute appendicitis compared with the surgeon's clinical impression. PubMed record, PMID: 8368922. https://pubmed.ncbi.nlm.nih.gov/8368922/

6. Franke C, et al. Ultrasonography for diagnosis of acute appendicitis: results of a prospective multicenter trial. Acute Abdominal Pain Study Group. World Journal of Surgery. 1999. https://pubmed.ncbi.nlm.nih.gov/9880422/

7. American College of Radiology. ACR Appropriateness Criteria: Right Lower Quadrant Pain. Revised 2022. https://acsearch.acr.org/docs/69357/narrative/

8. Can normal inflammatory markers rule out acute appendicitis? The reliability of biochemical investigations in diagnosis. PubMed record, PMID: 31721396. https://pubmed.ncbi.nlm.nih.gov/31721396/