

## **IDSA GUIDELINES**

# **2024 Clinical Practice Guideline Update by the Infectious Diseases Society of America on Complicated Intra-abdominal Infections: Diagnostic Imaging of Suspected Acute Intra-abdominal Abscess in Adults, Children, and Pregnant People**

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This paper is part of a clinical practice guideline update on the risk assessment, diagnostic imaging, and microbiological evaluation of complicated intra-abdominal infections in adults, children, and pregnant people, developed by the Infectious Diseases Society of America. In this paper, the panel provides recommendations for diagnostic imaging of suspected acute intra-abdominal abscess. The panel's recommendations are based upon evidence derived from systematic literature reviews and adhere to a standardized methodology for rating the certainty of evidence and strength of recommendation according to the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach.

**Key words.** intra-abdominal infection; abscess; guideline

**In adults with suspected acute intra-abdominal abscess, should abdominal ultrasound (US) or CT be obtained as the initial imaging modality?**

**In adults with suspected acute intra-abdominal abscess, if initial imaging is inconclusive, should MRI be obtained for subsequent imaging?**

**Recommendation:** In non-pregnant adults and adolescents with suspected acute intra-abdominal abscess, the panel suggests obtaining an abdominal CT as the initial diagnostic imaging modality (*conditional recommendation, very low certainty of evidence*).

**Remarks:**

- When CT is obtained, the use of intravenous contrast may improve visualization of the abscess wall [1].
- Because of CT's accuracy, immediate additional imaging studies beyond CT are usually not necessary.

**In children with suspected acute intra-abdominal abscess, should abdominal US or CT be obtained as the initial imaging modality?**

**In children with suspected acute intra-abdominal abscess, if initial imaging is inconclusive, should MRI be obtained for subsequent imaging?**

**Recommendation:** In children with suspected acute intra-abdominal abscess, the panel suggests obtaining an abdominal US as the initial diagnostic imaging modality (*conditional recommendation, very low certainty of evidence*).

**Remarks:**

- At least one study [2] suggests MRI as a reasonable option for initial imaging of suspected acute intra-abdominal abscess in children.
- US is generally available but is also operator-dependent and can yield equivocal results. MRI is not always readily available, and sedation may be required for young children. CT is generally readily available but involves radiation exposure and may require use of IV contrast or sedation.

**Recommendation:** In children with suspected acute intra-abdominal abscess, if initial US is negative/equivocal/non-diagnostic and clinical suspicion persists, the panel suggests either CT or MRI as subsequent imaging to diagnose acute intra-abdominal abscess (*conditional recommendation, very low certainty of evidence*).

**Remarks:**

- US is generally available but is also operator-dependent and can yield equivocal results. MRI is not always readily available, and sedation may be required for young children. CT is generally readily available but involves radiation exposure and may require use of IV contrast or sedation.

**In pregnant people with suspected acute intra-abdominal abscess, should abdominal US or MRI be obtained as the initial imaging modality?**

**Recommendation:** In pregnant people with suspected acute intra-abdominal abscess, US or MRI can be considered as the initial diagnostic imaging modality; however, the panel is unable to recommend one versus the other (*knowledge gap*).

## INTRODUCTION

This paper is part of a clinical practice guideline update on the risk assessment, diagnostic imaging, and microbiological evaluation of complicated intra-abdominal infections in adults, children, and pregnant people, developed by the Infectious Diseases Society of America [3-9]. Here, the guideline panel provides recommendations for diagnostic imaging of suspected acute intra-

abdominal abscess in adults, children, and pregnant people. Recommendations are stratified by initial imaging and then subsequent imaging if initial imaging is inconclusive. These recommendations replace previous statements in the last iteration of this guideline [10].

A complicated intra-abdominal infection extends beyond the hollow viscus of origin into the peritoneal space and is associated with either abscess formation or peritonitis; this term is not meant to describe the infection's severity or anatomy. An uncomplicated intra-abdominal infection involves intramural inflammation of the gastrointestinal tract and has a substantial probability of progressing to complicated infection if not adequately treated.

These recommendations are intended for use by healthcare professionals who care for patients with suspected intra-abdominal infections.

## METHODS

The panel's recommendations are based upon evidence derived from systematic literature reviews and adhere to a standardized methodology for rating the certainty of evidence and strength of recommendation according to the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) approach (Supplementary Figure 1) [11]. The recommendations have been endorsed by the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and the Pediatric Infectious Diseases Society (PIDS). Strong recommendations are made when the recommended course of action would apply to most people with few exceptions. Conditional recommendations are made when the suggested course of action would apply to the majority of people with many exceptions and shared decision-making is important.

A comprehensive literature search (through October 2022) was conducted as part of a systematic review. Key eligibility criteria at both the topic and clinical question levels guided the search and selection of studies. For the clinical questions addressed here, patients with suspected intra-abdominal abscess were considered, including abscesses developing postoperatively; liver abscess was excluded. US, CT (including multidetector CT), and MRI were reviewed as possible imaging modalities; due to a lack of evidence for CT and MRI, CT enterography and MR enterography were also included as approximations for CT and MRI, respectively. Contrast-enhanced US and point-of-care US (POCUS) were excluded. Though POCUS is used frequently, only studies assessing US performed in a controlled manner and interpreted by a radiologist were included, primarily due to the variability in interpretation of POCUS. Observational studies published after 2010 and RCTs were screened for inclusion. Refer to the full list of eligibility criteria in the Supplementary Material.

Sensitivities, specificities, and corresponding 2X2 tables were plotted in RevMan based on the population and imaging study [12]. Included studies underwent critical appraisal according to the GRADE approach, and then an assessment of benefits and harms of care options informed the

recommendation(s) [11,13]. Details of the systematic review and guideline development processes are available in the Supplementary Material.

## Summary of Evidence

Eight observational studies [2,14-20] were included in the analysis on whether to use CT, US, or MRI to identify acute intra-abdominal abscess (Supplementary Tables 1-2). Only one study [18] addressed the sensitivity of CT in the targeted patient population, i.e., patients with suspected acute intra-abdominal abscess; however, that study only included 7 patients with intra-abdominal abscess. Nevertheless, 100% sensitivity was reported for identifying intra-abdominal abscess with no specificity data reported (Supplementary Figure 2). One additional study [16] assessed diagnostic accuracy of CT for identifying 5 postsurgical intra-abdominal abscesses following bariatric surgery (100% sensitivity, 100% specificity reported) (Supplementary Figure 3). Five studies were identified that addressed the diagnostic accuracy of US and MR enterography in adult and adolescent patients with Crohn's disease with suspected intra-abdominal abscess [14,15,17,19,20]. Patients with Crohn's disease have a higher baseline risk of developing intra-abdominal abscess than the general population and, therefore, a higher pre-test probability. In these studies, US yielded sensitivities of 90-100% (median 95%) and specificities of 97-99% (median 98%) (Supplementary Figure 4), and contrast-enhanced US yielded a sensitivity and specificity of 97% and 100%, respectively (Supplementary Figure 5). MR enterography yielded sensitivities of 80-89% (median 85%) and specificities of 90-98% (median 94%) (Supplementary Figure 6).

Studies addressing diagnostic accuracy in children were not identified; however, a single comparative study addressing the utility of MRI vs. US to find a safe drainage pathway in children with a known or suspected appendiceal abscess was identified [2] (Supplementary Table 2). A safe drainage pathway was identified in 86-98% vs. 75-81% of abdominal abscesses comparing MRI vs. US, respectively (Supplementary Table 3). When formulating recommendations for children, evidence for CT and MRI in adults was considered as indirect evidence.

The evidence for CT vs. US in adults [15,16,18-20] is of very low certainty due to indirect comparisons (i.e., each study compared only one imaging modality to various clinical reference standards), indirect population (e.g., patients with Crohn's disease), high risk of bias as determined by the QUADAS-2 tool (Supplementary Table 4) [21,22], imprecision based on small sample size, and wide confidence intervals around the effect estimates for CT sensitivities. (Supplementary Tables 5 and 6)

The evidence for CT vs. MRI in adults [14,16-18] is of very low certainty due to high risk of bias (Supplementary Table 4); indirectness of population, intervention, and comparison; and imprecision (Supplementary Tables 5 and 7).

The evidence for MRI vs. US in children [2] is of very low certainty due to indirectness of outcome (i.e., clinical utility of imaging to find a safe drainage pathway in lieu of diagnostic accuracy) (Supplementary Tables 8 and 9).

No studies addressing diagnostic accuracy of imaging modalities for pregnant patients with suspected acute intra-abdominal abscess were identified.

### **Rationale for Recommendations**

Intra-abdominal abscess is typically a complication of perforations of the abdominal viscus or a post-surgical complication. Common causes include perforated appendicitis, diverticulitis, or peptic ulcers; gangrenous cholecystitis, mesenteric ischemia with associated bowel infarction; complications from inflammatory bowel disease; sequelae from penetrating trauma; and postoperative complications such as anastomotic leakage or residual contamination (contaminated peritoneum with bowel contents), infected hematoma or seroma [23]. An intra-abdominal abscess is a localized collection of purulent material along with aerobic and anaerobic bacteria in the peritoneal cavity [24]. They are generally recognizable clinically by focal abdominal pain, fevers, ileus, abdominal distension, persistent tachycardia, leukocytosis, and/or polymicrobial bloodstream infections [23]. The development of these symptoms after initial improvement following a primary intra-abdominal process should heighten concern for the formation of an intra-abdominal abscess.

Prompt and accurate diagnosis of intra-abdominal abscess to ensure appropriate source control measures can reduce the likelihood of subsequent sepsis and septic shock. An important consideration with imaging is that it usually takes at least 5 days for an intra-abdominal abscess to form post-operatively. On the contrary, fluid collections associated with seromas, hematomas, or irrigation fluid administered intra-operatively can often persist for a few days postoperatively but generally resolve by day 5-7 [25-28].

CT is suggested as the initial imaging modality for adults and adolescents with suspected acute intra-abdominal abscess due to its acceptable diagnostic accuracy for identifying intra-abdominal abscess. Since a large proportion of intra-abdominal abscesses develop postoperatively, a benefit of CT compared to US is its ability to maintain accuracy in the presence of dressings, stomas, or drains. Compared to US, CT is also less operator-dependent [29,30] and less susceptible to decreases in accuracy when significant bowel gas is present, extensive surgical dressing or open wounds are in place, or with marked obesity [31]. Potential harms of CT include radiation exposure, contrast-associated side effects (e.g., contrast-induced nephropathy), and unnecessary imaging in patients with no or equivocal CT findings.

US is suggested as the initial imaging modality for children with suspected acute intra-abdominal abscess due to a slight preponderance of benefit vs. harm in comparison to either CT or MRI, as the panel placed a stronger weight on avoidance of radiation exposure and/or the need for sedation in children. However, when an intra-abdominal abscess is not observed on an US, but clinical suspicion persists, a low threshold should exist for performing a CT or MRI.

Evidence is not yet available to establish a recommendation for pregnant people though the panel agreed that either US or MRI would be appropriate. The panel considered evidence from non-

pregnant adults, along with the balance between benefits and harms (e.g., radiation exposure) of each imaging modality.

### **Implementation considerations**

When CT is obtained, the use of intravenous contrast may improve visualization of the abscess wall [1]. Abdominal US may require higher level of technical expertise to diagnose intra-abdominal abscess. However, abdominal US may have clinical utility as both a diagnostic and therapeutic modality for guiding percutaneous drainage procedures. Additionally, for patients with a known, well-defined abscess, US can be considered to follow the progression of the abscess over time. US is readily available and portable, which can be helpful when mobility is limited or patients are critically ill.

### **Research needs**

Future research on CT, US, or MRI as the initial diagnostic imaging modality in this patient population, especially among children and pregnant people with suspected intra-abdominal abscess is necessary as there is a persistent need for direct evidence to address this question. Head-to-head comparisons of different imaging modalities in these patient populations would also be welcome, as would subgroup analyses to determine any difference in diagnostic accuracy among pre- and postoperative patients.

**Acknowledgments:** The expert panel would like to acknowledge the previous panel, under the leadership of Dr. Joseph Solomkin, for their work on the previous iteration of this larger guideline. The panel would like to acknowledge the contributions of Elena Guadagno, medical librarian, for the creation and execution of PICO-specific literature searches; Dr. Nigar Sekercioglu, methodologist, for contributions to the design of the analysis; and Sarah Pahlke, methodologist, for significant contributions to the finalization of the manuscripts and supplementary materials. Rebecca Goldwater and Imani Amponsah provided project coordination. When scoping the diagnostic imaging questions, Drs. Dean Nakamoto and Yngve Falck-Ytter provided clinical guidance. The panel would also like to acknowledge the following organizations and selected reviewers for their review of the draft manuscript: European Society of Clinical Microbiology and Infectious Diseases, Pediatric Infectious Diseases Society, and Drs. Sheldon Brown (infectious diseases), Eric Cober (infectious diseases), Patrick T. Delaplain (pediatric surgery), and Dean Nakamoto (radiology).

Dr. Robert A. Bonomo is chair of the panel. Drs. Pranita Tamma and Robert Bonomo served as clinical leads for the questions addressed in this manuscript. Remaining panelists assisted with conception and design of the analysis, interpretation of data, drafting and revising the recommendations and manuscript, and final approval of the recommendations and manuscript to be published. Jennifer Loveless and Katelyn Donnelly, methodologists, were responsible for general project management, designing and performing the data analyses, and leading the panel according to the GRADE process.

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**Financial support:** This work was supported by the Infectious Diseases Society of America.

**Possible conflicts of interest:** Evaluation of relationships as potential conflicts of interest is determined by a review process. The assessment of disclosed relationships for possible COIs is based on the relative weight of the financial relationship (i.e., monetary amount) and the relevance of the relationship (i.e., the degree to which an association might reasonably be interpreted by an independent observer as related to the topic or recommendation of consideration). A.C. receives honoraria from UpToDate, Inc. and serves on an Agency for Healthcare Research and Quality technical expert panel for diagnosis of acute right lower quadrant abdominal pain (suspected acute appendicitis). J.R.B. serves as Past President of the European Society of Clinical Microbiology and Infectious Diseases. M.S.E. receives royalties from UpToDate, Inc. as Co-Section Editor of Pediatric Infectious Diseases. M.H. serves on the Society Healthcare Epidemiology of America (SHEA) Board of Directors. All other authors reported no relevant disclosures.



**Additional information:** More detailed information on the analysis and development of recommendations is available in the Supplementary Material.

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