

Review Article

Approach to acute abdominal pain in children with non-specific clinical signs

Rabie A. Shihab^{1*}, Yasir Mohammed Alasmari², Esraa F. Alfahidi³, Abdulaziz K. Alsaleh⁴,
Motasim E. Moamena⁵, Mashniyyah H. Ghazwani⁶, Afraa F. Saklou⁷, Fawziah M. Bulaqi⁸

¹Department of Pediatrics, Aziziyah Children Hospital, Jeddah, Saudi Arabia

²Department of Pediatrics, Ministry of Health, Aljouf, Saudi Arabia

³Department of Pediatrics Emergency Medicine, Ministry of Health, Madina, Saudi Arabia

⁴Department of Pediatrics, Maternity and Children Hospital, Sakaka, Saudi Arabia

⁵Department of Pediatrics, Ministry of Health, Jeddah, Saudi Arabia

⁶Department of Pediatrics, Maternity and Children Hospital, Aljouf, Saudi Arabia

⁷Department of Pediatrics, Armed Forces Hospital, King Abdul Aziz Naval Base, Jubail, Saudi Arabia

⁸Department of Pediatrics, King Abdulaziz Hospital, Jeddah, Saudi Arabia

Received: 03 July 2025

Accepted: 23 July 2025

*Correspondence:

Dr. Rabie A. Shihab,

E-mail: Rabie5297@yahoo.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Acute abdominal pain is a common presentation in pediatric emergency departments, yet the diagnostic process becomes complex when children exhibit non-specific clinical signs. Young patients often struggle to localize pain or describe their symptoms accurately, and classical signs may be absent or misleading. This diagnostic ambiguity broadens the differential diagnosis, ranging from benign, self-limiting conditions to urgent surgical emergencies. Atypical presentations can mask serious pathology such as appendicitis, intussusception, or volvulus, increasing the risk of delayed intervention or unnecessary procedures. Physical examination alone frequently lacks sensitivity in these scenarios, especially in very young children or those with neurodevelopmental delays. Laboratory tests, including inflammatory markers, may aid in identifying children at risk but are rarely definitive in isolation. Imaging, particularly ultrasound, plays a key role but is highly dependent on operator expertise and patient cooperation. Computed tomography and magnetic resonance imaging offer greater diagnostic clarity but come with concerns over radiation exposure and accessibility, respectively. Risk stratification tools and clinical scoring systems help guide decision-making by categorizing patients into low-, intermediate-, or high-risk groups. While these tools can support safer disposition planning, their accuracy is reduced in patients with vague symptoms. Serial clinical assessment remains a cornerstone of safe management, allowing time-dependent pathologies to evolve into more recognizable patterns. In ambiguous cases, a balanced, multidisciplinary strategy that considers clinical progression, investigation findings, and resource availability is essential. Contextual factors such as institutional capabilities, parental input, and geographic access to pediatric care further shape the diagnostic pathway. Ultimately, a nuanced and vigilant approach is required to avoid missed diagnoses while minimizing unnecessary interventions in children with unclear abdominal presentations.

Keywords: Pediatric abdominal pain, Non-specific signs, Diagnostic imaging, Risk stratification, Clinical decision-making

INTRODUCTION

Acute abdominal pain is among the most frequent reasons for emergency department visits in pediatric populations. Despite its commonality, establishing a timely and accurate diagnosis remains a clinical challenge, particularly in children presenting with nonspecific signs and symptoms. Pediatric patients often struggle to localize or articulate the nature of their discomfort, and the classical clinical patterns seen in adults are frequently absent in children, especially in early stages of illness. This diagnostic ambiguity contributes to delays in management and increases the risk of complications associated with missed or late diagnoses.

The differential diagnosis for acute abdominal pain in children is broad and spans benign, self-limiting conditions such as constipation and gastroenteritis, to life-threatening surgical emergencies like appendicitis, intussusception, and volvulus. However, when children present with vague clinical signs—such as diffuse tenderness, irritability, or anorexia—the clinical picture becomes difficult to interpret, leading to both underdiagnosis and overuse of diagnostic imaging and laboratory testing.¹ For example, classic signs of appendicitis, including right lower quadrant tenderness and rebound pain, are often absent in young children, making reliance on physical examination alone insufficient for definitive diagnosis.²

The challenge is compounded by age-specific variations in disease presentation and the overlapping features of many abdominal conditions. Infants and toddlers are particularly susceptible to atypical symptomatology. For instance, a child with intussusception may present solely with lethargy and intermittent crying rather than the triad of abdominal pain, vomiting, and red currant jelly stools.³ Similarly, early stages of mesenteric adenitis may mimic viral illness, misleading clinicians away from abdominal pathology. These nonspecific clinical signs require the use of a structured and cautious diagnostic approach that balances the risks of invasive testing and unnecessary surgery against the consequences of a missed diagnosis.

Imaging, especially ultrasonography, has become a cornerstone of evaluation in such ambiguous presentations due to its non-invasive nature and absence of ionizing radiation. However, the sensitivity and specificity of imaging can vary significantly based on operator skill and the child's cooperation during the procedure. Laboratory tests, including white blood cell counts and inflammatory markers like C-reactive protein, may offer supportive evidence but are seldom diagnostic on their own. Therefore, integration of clinical, laboratory, and imaging findings, along with serial examinations, is often necessary to reach an accurate conclusion.⁴

Given the potential severity of undiagnosed surgical causes and the inherent limitations of isolated diagnostic modalities, an algorithmic and multidisciplinary approach is essential. In recent years, decision-support tools and

clinical scoring systems have been increasingly utilized to aid in risk stratification. These tools aim to reduce unnecessary imaging while identifying children at higher risk for surgical pathology, thus improving both diagnostic accuracy and resource utilization.

REVIEW

Children presenting with acute abdominal pain and nonspecific clinical signs pose a significant diagnostic challenge due to the variability of symptom presentation and communication barriers. In these cases, traditional clinical evaluation methods may lack the sensitivity to detect early or atypical forms of serious abdominal conditions. This often leads to reliance on serial examinations and adjunctive investigations to clarify the diagnosis. Studies have emphasized the importance of a systematic and vigilant approach, particularly in the early stages, when symptoms may not yet align with classical disease patterns.⁵

The increasing use of ultrasonography and clinical scoring systems such as the pediatric appendicitis score (PAS) has helped refine diagnostic accuracy while minimizing unnecessary surgical interventions. However, such tools should complement rather than replace clinical judgment. Decision-making should remain dynamic, incorporating ongoing assessments as the child's condition evolves. While overuse of imaging may raise concerns regarding healthcare costs and efficiency, the risks associated with missed diagnoses—such as delayed treatment of appendicitis or bowel obstruction—can have far more serious consequences.⁶ Therefore, integrating clinical, laboratory, and imaging data within a structured clinical pathway is essential for improving outcomes in pediatric patients with ambiguous abdominal presentations.

CHALLENGES IN DIAGNOSING ACUTE ABDOMINAL PAIN WITH NONSPECIFIC SIGNS

The clinical evaluation of a child presenting with nonspecific abdominal pain is inherently fraught with uncertainty. In younger age groups, the history is often unreliable or incomplete, and physical examination may be limited by poor cooperation, distress, or overlapping symptoms of benign and serious conditions. A child with periumbilical discomfort and mild fever may appear well but harbor an evolving surgical abdomen. In such instances, diagnostic clarity rarely emerges from the initial encounter, and the margin for error remains narrow.

Misleading clinical features are frequently reported in pediatric cases. For instance, appendicitis may be presented with constipation, diarrhea, or even urinary symptoms due to proximity to pelvic structures. Peritoneal signs can be subtle or entirely absent early in the disease course. Some children present with symptoms mimicking gastroenteritis or viral illness, only to deteriorate rapidly once the diagnosis becomes apparent. The implications of these presentations are significant; missing a diagnosis of

appendicitis can lead to perforation, while unnecessary surgery due to diagnostic uncertainty exposes the child to procedural risks and emotional trauma.⁶

Triage and initial evaluation often depend heavily on the clinician's experience. However, even among seasoned pediatric emergency physicians, diagnostic accuracy in nonspecific presentations is inconsistent. Retrospective analyses have shown that clinical judgment alone yields suboptimal sensitivity in early-stage appendicitis or mesenteric lymphadenitis when physical signs are equivocal. In children under five, the rate of misdiagnosis is especially high, contributing to delays in appropriate management. Children in this age group are not only less articulate but also more prone to presenting with systemic symptoms like lethargy or anorexia, which can easily be misattributed to viral infections or teething.⁷

Decision-support tools like clinical scoring systems provide structured methods for risk assessment but are not without limitations. While the PAS and Alvarado score offer some predictive value, they were not specifically designed for cases with nonspecific signs. Their sensitivity decreases substantially in populations that fall outside classical symptom profiles. Clinical decision rules must be applied cautiously, particularly in settings where radiological backup is limited or delayed. Furthermore, overreliance on scores may shift focus away from the nuanced clinical reasoning essential in ambiguous cases.⁸

Imaging studies, especially ultrasonography, are frequently employed to bridge diagnostic uncertainty. However, interpretation is often complicated by operator dependency and patient cooperation. In settings without pediatric-trained ultrasonographers, false-negative or inconclusive findings are common. Computed tomography offers higher accuracy but comes with the burden of ionizing radiation, a serious concern in the pediatric population. Magnetic resonance imaging, while free of radiation, remains impractical for routine emergency use due to cost, availability, and duration of the scan. The use of imaging, then, must be judicious and interpreted within the clinical context rather than in isolation.⁹

Serial examinations remain a cornerstone in managing unclear abdominal presentations. Observation units or short-stay wards are increasingly utilized to monitor evolution in clinical signs, particularly when initial assessments yield inconclusive results. Repeated examinations by the same clinician can improve diagnostic precision, especially when subtle changes in abdominal findings or behavior are detected. However, such an approach demands time, resources, and meticulous documentation—luxuries not always available in overburdened emergency settings.

Children with chronic medical conditions or developmental delays present yet another layer of complexity. Baseline behaviors altered pain responses, or atypical disease trajectories may obscure the underlying

pathology. Abdominal pain in children with cerebral palsy, for example, may stem from a wide array of causes, from constipation to volvulus, with little overt clinical evidence. In such populations, standard diagnostic pathways often fall short, necessitating a lower threshold for imaging and multidisciplinary involvement.¹⁰

EVALUATING THE ROLE OF IMAGING AND LABORATORY SUPPORT

When clinical signs are ambiguous, diagnostic investigations become essential extensions of the physical examination. Imaging and laboratory tests are frequently employed to narrow the differential diagnosis in children with abdominal pain who do not display textbook features of any specific condition. Yet, the interpretation of these tools is not always straightforward, and their utility varies greatly depending on context, timing, and institutional protocols. Ultrasound is typically the first-line imaging modality in pediatric abdominal evaluations due to its safety profile and diagnostic yield. In skilled hands, it is highly effective for identifying appendicitis, intussusception, and ovarian torsion. However, its sensitivity is diminished in the presence of bowel gas, obesity, or early-stage inflammation, especially when clinical findings are vague. Limited acoustic windows and patient distress can compromise accuracy, leading to inconclusive results or false reassurance. Studies evaluating pediatric appendicitis have shown that the negative predictive value of ultrasound significantly drops when the appendix is not visualized, particularly in settings without standardized imaging protocols or subspecialty-trained technicians.¹¹

Computed tomography (CT) offers superior anatomic detail and is less reliant on operator expertise, making it a powerful tool in complex or equivocal presentations. In children with nonspecific signs, CT can reveal alternative diagnoses such as Meckel's diverticulum, small bowel obstruction, or intra-abdominal abscesses that may not be suspected based on history and examination alone. However, the benefit of enhanced diagnostic clarity must be weighed against radiation exposure. Pediatric tissue is particularly radiosensitive, and cumulative exposure has been linked to increased long-term malignancy risk. This concern has led to efforts aimed at dose reduction strategies and selective use protocols, especially in institutions adopting the "as low as reasonably achievable" (ALARA) principle.¹²

Magnetic resonance imaging (MRI), though less commonly used in acute pediatric settings, is emerging as a viable alternative for conditions like appendicitis, particularly in adolescents and pregnant adolescents. Its radiation-free advantage is offset by longer scan times, higher cost, and limited availability in emergency contexts. Sedation requirements for younger or uncooperative patients further restrict its practicality in many centers. Still, in tertiary care environments with immediate MRI access and dedicated pediatric teams, it can offer high

sensitivity without the risks associated with ionizing radiation.¹³

Laboratory investigations serve as supplementary tools for refining diagnostic impressions. Elevated white blood cell count, neutrophilia, and C-reactive protein (CRP) levels are frequently used markers to detect inflammation or infection. While none are individually diagnostic, combinations of these markers have shown improved predictive value. A child with borderline clinical features but elevated inflammatory markers may warrant imaging or inpatient observation, whereas normal values can support a watch-and-wait approach under close supervision. However, the kinetics of these markers vary, and normal results early in the disease process do not exclude serious pathology. Their interpretation must be tied to clinical timing and progression rather than isolated numerical thresholds.¹⁴

Point-of-care testing (POCT) is also gaining traction in pediatric emergency departments for its rapid turnaround and potential to inform real-time decision-making. Tests like urinalysis can quickly exclude urinary tract infections, while focused POCT abdominal ultrasound has been piloted as a frontline tool in centers with trained staff. These innovations hold promise, particularly in streamlining patient flow and reducing diagnostic delays, but also raise concerns about consistency and standardization across diverse clinical settings.¹⁵ In children with overlapping or atypical symptom clusters, the temptation to lean heavily on tests is strong. However, even advanced imaging and laboratory panels rarely yield definitive answers without context. A normal scan does not rule out surgical pathology in evolution, just as mildly elevated CRP does not confirm bacterial infection. The key lies in integration—where data from multiple modalities are synthesized alongside physical findings, clinical intuition, and observed progression—to guide further intervention or restraint.¹⁶

RISK STRATIFICATION AND CLINICAL DECISION PATHWAYS IN UNCLEAR PRESENTATIONS

Clinical ambiguity in pediatric abdominal pain often pushes decision-making into a gray zone where the threshold for further testing or intervention varies between clinicians, institutions, and available resources. In these scenarios, risk stratification becomes not just helpful but necessary providing a framework for organizing uncertainty. The ultimate goal is not to pinpoint a diagnosis immediately but to assess whether a child is safe to observe, needs urgent imaging, or should proceed to surgical evaluation.

Decision-support tools have gained ground as an effort to bring consistency to the triage of these uncertain cases. Algorithms such as the PAS, Samuel score, and more recently the appendicitis inflammatory response score, integrate symptoms, physical findings, and laboratory

markers into a numerical risk category. While these models do not remove diagnostic ambiguity, they help partition patients into low-, intermediate-, and high-risk groups. Low-risk children can often be managed conservatively or observed, while high-risk profiles are more likely to benefit from prompt imaging or surgical consultation. Yet, these scores tend to perform best in populations with relatively clear clinical signs and show reduced accuracy in the nonspecific subset of patients who often defy standard pattern recognition.⁵

Institutions with high patient volume have adapted their protocols to accommodate intermediate-risk children by incorporating serial exams into structured observation pathways. Instead of immediate imaging, the patient is re-evaluated at regular intervals, often by the same clinician, to detect subtle shifts in symptoms or examination findings. This model places emphasis on time as a diagnostic tool, allowing evolving pathology to declare itself and often avoiding unnecessary exposure to radiation or surgical procedures. It demands, however, adequate staffing, documentation, and access to pediatric expertise, which may be challenging to maintain in community hospitals or overcrowded emergency departments.¹⁷

Shared decision-making between caregivers and clinicians also plays a central role in shaping these pathways. In situations where diagnostic clarity remains elusive but no red flags are present, families are often offered a spectrum of options ranging from discharge with strict return precautions to hospital admission for monitoring. Communicating risk in a transparent yet non-alarming way requires clinical maturity and cultural sensitivity, particularly when dealing with concerned parents facing an unclear diagnosis. The subjective threshold for tolerating uncertainty varies, and decisions are often influenced by prior medical experiences, access to follow-up care, or underlying parental anxiety.¹⁸

Technology is beginning to influence these decision pathways in subtle but meaningful ways. Electronic medical record systems can now integrate scoring tools directly into triage workflows, prompting providers with suggested risk categories and next steps. While these digital prompts can enhance consistency, they also risk over-reliance and mechanical thinking if not interpreted in the context of clinical nuance. Artificial intelligence and machine learning tools, trained on large datasets, are being explored to predict the likelihood of appendicitis or surgical abdomen from symptom clusters and lab results. These models have shown early promise, but they remain experimental and raise questions about generalizability across diverse populations.¹⁹

Environmental context often shapes the application of these decision tools. In rural settings where access to pediatric surgeons or advanced imaging is limited, risk stratification must adapt accordingly. A child considered low risk in a tertiary center with 24/7 surgical backup might be referred preemptively from a remote clinic where

delayed transfer could pose harm. Conversely, over-referral from low-resource settings can strain regional centers and lead to over-treatment. Tailoring decision pathways to account for geographic, logistical, and systemic variables is as important as the tools themselves.²⁰

CONCLUSION

Timely and accurate evaluation of acute abdominal pain in children with nonspecific signs remains a diagnostic challenge. Integrating clinical judgment with structured decision tools, imaging, and laboratory data can improve risk assessment and reduce unnecessary interventions. Observation and serial examinations remain indispensable, particularly in ambiguous cases. A tailored, context-sensitive approach ensures both diagnostic safety and optimal resource utilization.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

1. Saucier A, Huang EY, Emeremni CA, Pershad J. Prospective evaluation of a clinical pathway for suspected appendicitis. *Pediatrics*. 2014;133(1):e88-95.
2. Bundy DG, Byerley JS, Liles EA, Perrin EM, Katznelson J, Rice HE. Does this child have appendicitis? *JAMA*. 2007;298(4):438-51.
3. Lehnert T, Sorge I, Till H, Rolle U. Intussusception in children—clinical presentation, diagnosis and management. *Int J Colorectal Dis*. 2009;24(10):1187-92.
4. Sack U, Biereder B, Elouahidi T, Bauer K, Keller T, Tröbs R-B. Diagnostic value of blood inflammatory markers for detection of acute appendicitis in children. *BMC Surg*. 2006;6(1):15.
5. Goldman RD, Carter S, Stephens D, Antoon R, Mounstephen W, Langer JC. Prospective validation of the pediatric appendicitis score. *J Pediatr*. 2008;153(2):278-82.
6. Benabbas R, Hanna M, Shah J, Sinert R. Diagnostic accuracy of history, physical examination, laboratory tests, and point-of-care ultrasound for pediatric acute appendicitis in the emergency department: a systematic review and meta-analysis. *Acad Emerg Med*. 2017;24(5):523-51.
7. Becker T, Kharbanda A, Bachur R. Atypical clinical features of pediatric appendicitis. *Acad Emerg Med*. 2007;14(2):124-9.
8. Blitman NM, Anwar M, Brady KB, Taragin BH, Freeman K. Value of focused appendicitis ultrasound and Alvarado score in predicting appendicitis in children: can we reduce the use of CT? *Am J Roentgenol*. 2015;204(6):W707-12.
9. Aspelund G, Fingeret A, Gross E. Ultrasonography/MRI versus CT for diagnosing appendicitis. *Pediatrics*. 2014;133(4):586-93.
10. Kim JH, Kang HS, Han KH. Systemic classification for a new diagnostic approach to acute abdominal pain in children. *Pediatr Gastroenterol Hepatol Nutr*. 2014;17(4):223.
11. Reddan T, Corness J, Harden F, Mengersen K. Improving the value of ultrasound in children with suspected appendicitis: a prospective study integrating secondary sonographic signs. *Ultrasonography*. 2019;38(1):67-75.
12. Miglioretti DL, Johnson E, Williams A, Greenlee RT, Weinmann S, Solberg LI, et al. The use of computed tomography in pediatrics and the associated radiation exposure and estimated cancer risk. *JAMA Pediatr*. 2013;167(8):700-7.
13. Moore MM, Gustas CN, Choudhary AK, Methratta ST, Hulse MA, Geeting G, et al. MRI for clinically suspected pediatric appendicitis: an implemented program. *Pediatr Radiol*. 2012;42(9):1056-63.
14. Kharbanda AB, Stevenson MD, Macias CG, Sinclair K, Dudley NC, Bennett J, et al. Interrater reliability of clinical findings in children with possible appendicitis. *Pediatrics*. 2012;129(4):695-700.
15. O'Brien AJ, Brady RM. Point-of-care ultrasound in paediatric emergency medicine. *J Paediatr Child Health*. 2016;52(2):174-80.
16. Hijaz NM, Friesen CA. Managing acute abdominal pain in pediatric patients: current perspectives. *Pediatr Health Med Ther*. 2017;83-91.
17. Garcia Pena BM, Cook EF, Mandl KD. Selective imaging strategies for the diagnosis of appendicitis in children. *Pediatrics*. 2004;113(1):24-8.
18. Bachoo P, Mahomed A, Ninan G, Youngson G. Acute appendicitis: the continuing role for active observation. *Pediatr Surg Int*. 2001;17(2):125-8.
19. Aydin E, Türkmen İU, Namli G, Öztürk Ç, Esen AB, Eray YN, et al. A novel and simple machine learning algorithm for preoperative diagnosis of acute appendicitis in children. *Pediatr Surg Int*. 2020;36(6):735-42.
20. Buss R, SenthilKumar G, Bouchard M, Bowder A, Marquart J, Cooke-Barber J, et al. Geographic barriers to children's surgical care: a systematic review of existing evidence. *J Pediatr Surg*. 2022;57(9):107-17.

Cite this article as: Shihab RA, Alasmari YM, Alfehidi EF, Alsaleh AK, Moamena ME, Ghazwani MH, et al. Approach to acute abdominal pain in children with non-specific clinical signs. *Int J Community Med Public Health* 2025;12:3800-4.