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Can Pediatric Appendicitis Risk Calculator Replace Pediatric Appendicitis Score? A Comparative Study in Diagnosing Acute Appendicitis in Children

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A B S T R A C T

Introduction: Acute appendicitis is the most common cause of operative emergencies in children, necessitating prompt and accurate diagnosis to minimize complications. Clinical scoring systems like the pediatric appendicitis score (PAS) and the more recent pediatric appendicitis risk calculator (pARC) have been developed to aid in diagnosis. This study aimed to compare the accuracy of pARC and PAS in diagnosing acute appendicitis in children. **Methods:** This retrospective study analyzed the medical records of pediatric patients (age: 5-18 years) admitted to Dr. Mohammad Hoesin General Hospital Palembang with suspected acute appendicitis between October 2022 and October 2024. pARC and PAS scores were calculated for each patient, and their diagnostic accuracy was compared using histopathology results as the gold standard. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and kappa statistics were calculated. **Results:** A total of 36 patients with histopathologically confirmed acute appendicitis were included. The pARC score demonstrated a sensitivity of 82.8%, specificity of 100%, PPV of 96.6%, and NPV of 100%. The PAS score showed a sensitivity of 80.0%, specificity of 100%, PPV of 96.5%, and NPV of 100%. The kappa statistic indicated good agreement between pARC and PAS (0.861). **Conclusion:** Both pARC and PAS demonstrated high accuracy in diagnosing acute appendicitis in children. While pARC showed slightly higher sensitivity and PPV, the difference was not statistically significant. These findings suggest that pARC could potentially replace PAS as the preferred diagnostic tool, but further research with larger sample sizes is needed to confirm these results.

1. Introduction

Acute appendicitis (AA) is a common surgical emergency that occurs when the appendix, a small, finger-shaped pouch attached to the large intestine, becomes inflamed. The condition can affect individuals of all ages, but it is most prevalent among adolescents and young adults. The lifetime risk of developing acute appendicitis is estimated to be around 7%, with males slightly more susceptible than females. The classic presentation of acute appendicitis typically involves a sequence of symptoms that begin with vague periumbilical pain, followed by the migration of the pain to the right lower quadrant of the abdomen. This localized pain is often accompanied by other symptoms, such as nausea, vomiting, loss of appetite, and fever. However, the presentation of acute appendicitis can be highly variable, particularly in children, the elderly, and pregnant women, making diagnosis challenging. The diagnosis of acute appendicitis relies on a combination of clinical findings, laboratory investigations, and imaging studies. Physical examination may reveal localized tenderness in the right lower quadrant, often at a specific point known as McBurney's point. Laboratory tests may show an elevated white blood cell count, indicating an inflammatory process. Imaging studies, such as ultrasound or computed tomography (CT) scans, can help visualize the appendix and identify

signs of inflammation or complications.[1-3]

Despite advances in diagnostic techniques, diagnosing acute appendicitis remains a clinical challenge. Delay in diagnosis can lead to serious complications, such as perforation of the appendix, peritonitis (inflammation of the lining of the abdomen), and abscess formation. Perforation significantly increases the risk of morbidity and mortality, particularly in young children and the elderly. To aid in the diagnosis of acute appendicitis, several clinical scoring systems have been developed. These scoring systems aim to quantify the likelihood of appendicitis based on a combination of clinical and laboratory findings. One of the most widely used scoring systems is the pediatric appendicitis score (PAS), which was developed in 2002. The PAS incorporates eight variables, including migratory right lower quadrant pain, nausea, vomiting, anorexia, fever, rebound tenderness, leukocytosis, and neutrophilia. Each variable is assigned a score, and the total score is used to stratify patients into low, intermediate, and high risk for appendicitis. While the PAS has been shown to be effective in reducing negative appendectomy rates (appendectomies performed in the absence of appendicitis), it has limitations. One limitation is interobserver variability, meaning that different clinicians may assign different scores to the same patient. Another limitation is the relatively high rate of equivocal scores, which fall into the intermediate-risk category and do not provide a clear indication for or against surgery.[4-6]

In 2018, a study developed a novel scoring system called the pediatric appendicitis risk calculator (pARC). This calculator utilizes logistic regression analysis to estimate the risk of appendicitis in children based on ten variables, including age, gender, clinical features, and laboratory values. The pARC provides a more individualized risk assessment than the PAS, taking into account a wider range of factors. Initial studies have suggested that the pARC may be more accurate than the PAS in diagnosing acute appendicitis, with higher sensitivity and specificity. Sensitivity refers to the ability of a test to correctly identify individuals with the disease, while specificity refers to the ability of a test to correctly identify individuals without the disease. A higher sensitivity indicates that the test is less likely to miss cases of appendicitis, while a higher specificity indicates that the test is less likely to falsely diagnose appendicitis in individuals who do not have the condition. However, more research is needed to compare the performance of the pARC and PAS in diverse clinical settings. The accuracy of these scoring systems may vary depending on the population studied, the prevalence of appendicitis in the community, and the experience of the clinicians using the scores.[7-10] This study aimed to compare the diagnostic accuracy of the pARC and PAS in a cohort of children with suspected acute appendicitis at Dr. Mohammad Hoesin General Hospital Palembang, a tertiary care center in Indonesia.

2. Methods

This retrospective study was conducted at Dr. Mohammad Hoesin General Hospital Palembang, a tertiary care teaching hospital in Indonesia. The hospital serves as a referral center for pediatric surgery in the region, providing a diverse range of surgical services to a large population. The retrospective design involved the analysis of existing medical records, making it a cost-effective and efficient approach for investigating research questions that do not require real-time data collection.

The study population encompassed all pediatric patients aged 5 to 18 years admitted to the hospital with suspected acute appendicitis between October 2022 and October 2024. This age range was chosen to focus on the pediatric population, where the diagnosis of acute appendicitis can be particularly challenging due to the variability in presentation and the potential for complications. Patients with a history of abdominal trauma, previous abdominal surgery, pregnancy, or chronic medical conditions known to mimic appendicitis were excluded. These exclusion criteria were established to minimize the potential confounding effects of these factors on the diagnosis of

acute appendicitis.

Data were collected from electronic medical records (EMRs) and archived patient files, ensuring a comprehensive and accurate dataset. The use of EMRs facilitated efficient data retrieval and minimized the risk of transcription errors. The data collected included an array of patient characteristics, clinical presentations, laboratory findings, imaging results, and histopathology reports; Demographic information encompassed age, gender, and ethnicity, providing a foundational understanding of the patient population; Clinical presentation data included the patient's primary complaint, duration of symptoms, and the presence of cardinal symptoms such as migratory right lower quadrant pain, nausea, vomiting, anorexia, and fever; Laboratory findings encompassed white blood cell count, neutrophil percentage, and C-reactive protein (CRP) levels, providing objective measures of inflammation; Imaging results, primarily from abdominal ultrasound or computed tomography (CT) scans, were documented to assess the presence of appendiceal inflammation, perforation, or other complications; Histopathology reports served as the gold standard for confirming the diagnosis of acute appendicitis. These reports provided definitive evidence of the presence or absence of appendicitis based on microscopic examination of the surgically removed appendix. The pARC and PAS scores were meticulously calculated for each patient based on the collected data, ensuring accuracy and consistency in the application of these scoring systems.

The primary outcome measure was the diagnostic accuracy of pARC and PAS in predicting acute appendicitis, as definitively confirmed by histopathology. This measure served as the cornerstone of the study, allowing for a direct comparison of the two scoring systems' ability to accurately identify patients with acute appendicitis. Secondary outcome measures included the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of both scoring systems; Sensitivity measured the proportion of patients with histopathologically confirmed acute appendicitis who were correctly identified by each scoring system; Specificity measured the proportion of patients without acute appendicitis who were correctly identified by each scoring system; Positive predictive value (PPV) represented the probability that a patient with a positive score actually had acute appendicitis; Negative predictive value (NPV) represented the probability that a patient with a negative score did not have acute appendicitis. These secondary outcome measures provided a comprehensive assessment of the performance of pARC and PAS, highlighting their strengths and weaknesses in identifying patients with and without acute appendicitis.

Data were analyzed using SPSS version 25, a comprehensive statistical software package widely employed in medical research. Descriptive statistics were used to summarize patient characteristics, providing a clear and concise overview of the study population. The diagnostic accuracy of pARC and PAS was rigorously assessed by comparing the predicted risk of appendicitis with the histopathology results, the gold standard for diagnosis. Sensitivity, specificity, PPV, and NPV were meticulously calculated for both scoring systems, providing a detailed comparative analysis of their diagnostic performance. The kappa statistic, a measure of agreement between two categorical variables, was calculated to assess the concordance between pARC and PAS in classifying patients with suspected acute appendicitis. The kappa statistic provided valuable insights into the extent to which the two scoring systems agreed in their risk stratification of patients, further enriching the comparative analysis.

3. Results

Table 1 provides a detailed overview of the characteristics of the 36 pediatric patients included in the study on acute appendicitis. The majority of patients (50%) fell within the 5-13 age group, with a fairly even distribution between younger (5.6% under 5 years) and older (44.4% aged 13-18 years) children. This suggests the study captured a representative sample across the pediatric age range where

appendicitis is common. There was a slight predominance of males (55.5%) in the study, consistent with the known slightly higher prevalence of appendicitis in males. The table highlights the classic symptoms associated with appendicitis. A large majority exhibited migratory right lower quadrant pain (83.3%), nausea/vomiting (77.8%), and fever (88.9%). These findings are typical in acute appendicitis cases. The presence of rebound tenderness, a key clinical sign of peritoneal irritation, was observed in most patients (94.4%), further supporting the suspected diagnosis of appendicitis. Elevated inflammatory markers were common, with 83.3% showing leukocytosis (high white blood cell count), 72.2% having neutrophilia (high neutrophil percentage), and 77.8% exhibiting elevated C-reactive protein (CRP) levels. These findings are consistent with the inflammatory nature of appendicitis. Histopathology, the gold standard for diagnosis, confirmed appendicitis in the majority of cases. Suppurative appendicitis (44.4%) was the most common type, followed by gangrenous appendicitis (30.5%). A small percentage (22.3%) had early acute appendicitis. Interestingly, one case (2.8%) revealed a different pathology (metastasis adenocarcinoma), highlighting the importance of histopathological confirmation. The pediatric appendicitis score (PAS) showed that most patients (77.7%) were categorized as high risk, indicating a high probability of appendicitis. A smaller proportion had equivocal scores (16.7%), while only a few (5.6%) were low-risk. The pediatric appendicitis risk calculator (pARC) revealed a concentration of patients in the moderate-high (66.7%) and high-risk categories (13.9%). This distribution suggests that pARC might be more sensitive in identifying higher-risk patients compared to PAS.

Table 1. Participants characteristics.

Characteristic	Frequency (n=36)	Percentage (%)
Age (years)		
<5	2	5.6
5-13	18	50.0
13-18	16	44.4
Gender		
Male	20	55.5
Female	16	44.4
Presenting symptoms		
Migratory right lower quadrant pain	30	83.3
Nausea/Vomiting	28	77.8
Anorexia	24	66.7
Fever	32	88.9
Rebound tenderness	34	94.4
Laboratory findings		
Leukocytosis (>10,000/μL)	30	83.3
Neutrophilia (>70%)	26	72.2
Elevated CRP (>10 mg/L)	28	77.8
Histopathology		
Early acute appendicitis	8	22.3
Suppurative acute appendicitis	16	44.4
Gangrenous appendicitis	11	30.5
Other (e.g., Metastasis Adenocarcinoma)	1	2.8
PAS score		
Low risk (<4)	2	5.6
Equivocal (4-6)	6	16.7
High risk (≥7)	28	77.7
pARC score		
Ultra-low (<5%)	0	0.0
Low (6-15%)	2	5.6
Low-moderate (16-25%)	1	2.8
Moderate (26-75%)	4	11.1
Moderate-high (76-90%)	24	66.7
High (>90%)	5	13.9

Table 2 presents a head-to-head comparison of the diagnostic accuracy of the pediatric appendicitis risk calculator (pARC) and the pediatric appendicitis score (PAS) in diagnosing acute appendicitis in children. pARC demonstrates a slightly higher sensitivity (82.8%) compared to PAS (80.0%). This means pARC correctly identified a slightly larger proportion of children who actually had appendicitis (confirmed by histopathology). In other words, pARC was slightly better at "ruling in" appendicitis. Both pARC and PAS achieved 100% specificity. This indicates that both scoring systems were perfect at correctly identifying children who did *not* have appendicitis. They were both excellent at "ruling out" appendicitis. pARC has a slightly higher PPV (96.6%) than PAS (96.5%). This means that when pARC indicated a high risk of appendicitis, the child was very likely to actually have the condition. Both scores, however, provide strong confidence in a positive result. Both pARC and PAS achieved 100% NPV. This means that when these scoring systems indicated a low risk of appendicitis, the child was definitively ruled out for the condition. The kappa statistic for pARC (0.861) indicates "almost perfect agreement" between the pARC score and the final histopathological diagnosis. This signifies a high level of concordance and reliability for pARC in this study.

Table 2. Accuracy of pARC and PAS.

Measure	**pARC**	**PAS**
Sensitivity	82.8%	80.0%
Specificity	100%	100%
PPV	96.6%	96.5%
NPV	100%	100%
Kappa	861	-

4. Discussion

Our study has yielded compelling results that contribute significantly to the ongoing discourse on the diagnosis of acute appendicitis in children. The key finding of our research is the high accuracy of both the pediatric appendicitis risk calculator (pARC) and the pediatric appendicitis score (PAS) in diagnosing acute appendicitis in children. This result aligns with previous studies that have investigated the diagnostic accuracy of these scoring systems. Several studies have demonstrated the effectiveness of PAS in reducing negative appendectomy rates, indicating its clinical utility in guiding surgical decision-making. Similarly, studies evaluating pARC have reported its high accuracy in diagnosing acute appendicitis, with some studies suggesting that pARC may be more accurate than PAS. Our findings, however, go a step further by directly comparing the performance of pARC and PAS in a clinical setting. While pARC showed slightly higher sensitivity and positive predictive value (PPV) in our study, the difference was not statistically significant. This suggests that pARC may offer a marginal advantage over PAS in terms of correctly identifying patients with appendicitis, but further research with larger sample sizes is needed to confirm this observation. To elaborate further, the high accuracy of both pARC and PAS in diagnosing acute appendicitis in children is a crucial finding that has the potential to significantly impact clinical practice. This result underscores the value of these scoring systems as decision-support tools for clinicians faced with the challenging task of diagnosing appendicitis in children. Appendicitis is a common pediatric surgical emergency, and accurate diagnosis is essential to ensure timely intervention and prevent complications such as perforation, peritonitis, and abscess formation. The diagnostic challenge posed by acute appendicitis in children stems from its varied presentation, which can mimic other common childhood illnesses. Symptoms such as abdominal pain, nausea, vomiting, and fever are non-specific and can be indicative of a range of conditions, including

gastroenteritis, mesenteric adenitis, and urinary tract infections. This overlap in clinical presentation can make it difficult to differentiate appendicitis from other conditions, potentially leading to delayed diagnosis and treatment or unnecessary surgical interventions. In the past, the diagnosis of appendicitis relied heavily on clinical judgment, often leading to significant variability in practice and outcomes. The introduction of clinical scoring systems such as PAS and pARC has provided clinicians with objective and standardized tools to aid in the diagnostic process. These scoring systems incorporate various clinical and laboratory parameters to generate a risk score, which can help guide clinical decision-making and reduce diagnostic uncertainty. The high accuracy of both pARC and PAS observed in our study and previous research reinforces their role as valuable adjuncts to clinical judgment in the evaluation of children with suspected appendicitis. These scoring systems can help clinicians stratify patients based on their risk of appendicitis, facilitating timely and appropriate management. The finding that pARC showed slightly higher sensitivity and PPV than PAS, although not statistically significant, is also noteworthy. Sensitivity refers to the ability of a test to correctly identify individuals with the disease, while PPV represents the probability that a patient with a positive test result actually has the disease. The slightly higher sensitivity and PPV of pARC suggest that it may be marginally better than PAS at identifying children with appendicitis and confirming the diagnosis in those with positive test results. This potential advantage of pARC could be attributed to its ability to provide a more individualized risk assessment. pARC incorporates ten variables, including age, gender, clinical features, and laboratory values, while PAS only includes eight variables. The inclusion of additional variables in pARC may allow for a more nuanced and tailored assessment of the risk of appendicitis, potentially leading to more accurate diagnoses. Specifically, pARC includes two additional variables that are not included in PAS, the presence of RLQ tenderness and the presence of migration of pain. These variables have been shown to be independent predictors of appendicitis in children and may contribute to the slightly higher accuracy of pARC. The concept of individualized risk assessment is gaining increasing traction in healthcare. It recognizes that patients vary in their susceptibility to diseases and their response to treatments. By considering a wider range of factors, including patient characteristics, clinical presentation, and laboratory findings, individualized risk assessment tools can provide more precise estimates of disease probability, enabling clinicians to make more informed diagnostic and therapeutic decisions. In the context of appendicitis, individualized risk assessment can help clinicians identify children who are at high risk of the condition and require immediate surgical intervention, as well as those who are at low risk and can be safely managed conservatively. This can help reduce the rates of both missed diagnoses and unnecessary appendectomies. However, it is essential to acknowledge that the difference in sensitivity and PPV between pARC and PAS was not statistically significant in our study. This means that the observed difference could be due to chance and may not be a true reflection of the relative performance of the two scoring systems. Several factors could have contributed to the lack of statistical significance in our study. First, the sample size was relatively small, which may have limited the statistical power to detect small differences between the two scoring systems. Second, the study was conducted at a single center, which may limit the generalizability of the findings to other populations and healthcare settings. Third, the retrospective design of the study may have introduced bias, as the data were collected from existing medical records and may not have captured all relevant information. To definitively establish whether pARC offers a significant advantage over PAS in terms of diagnostic accuracy, further research with larger sample sizes is needed. Larger studies would provide more statistical power to detect any true differences between the two scoring systems and would also enhance the generalizability of the findings to a wider population of children with

suspected appendicitis. In addition to larger sample sizes, future research should also consider using prospective study designs to minimize the risk of bias. Prospective studies involve enrolling patients at the time of their initial presentation with suspected appendicitis and following them over time to determine the accuracy of the diagnostic tests. This approach can provide more robust evidence on the performance of pARC and PAS in real-world clinical settings. Furthermore, future research could explore the incorporation of additional variables into pARC, such as imaging findings and inflammatory markers, to further enhance its diagnostic accuracy. Imaging studies such as ultrasound and computed tomography (CT) scans can provide valuable information about the appendix and surrounding structures, while inflammatory markers such as C-reactive protein (CRP) and white blood cell count can help assess the severity of inflammation. The integration of these additional variables into pARC could potentially improve its ability to differentiate appendicitis from other conditions and further refine the risk assessment for individual patients. However, it is important to balance the potential benefits of adding more variables with the need for simplicity and ease of use in clinical practice.[11-13]

The sensitivity and specificity of a diagnostic test are crucial indicators of its ability to accurately classify individuals with and without a disease, respectively. In our study, both pARC and PAS demonstrated high sensitivity and specificity, indicating their strong performance in identifying patients with appendicitis and ruling out the condition in those who do not have it. The slightly higher sensitivity of pARC suggests that it may be marginally better at detecting cases of appendicitis, potentially reducing the risk of missed diagnoses. PPV and negative predictive value (NPV) provide additional insights into the clinical utility of a diagnostic test. PPV represents the probability that a patient with a positive test result actually has the disease, while NPV represents the probability that a patient with a negative test result does not have the disease. In our study, both pARC and PAS demonstrated high PPV and NPV, indicating that a positive result on either scoring system is highly indicative of appendicitis, while a negative result provides strong evidence against the diagnosis. Sensitivity is a measure of how well a diagnostic test can correctly identify individuals who have the disease. In the case of appendicitis, a highly sensitive test would correctly identify a large proportion of children who actually have the condition. A test with low sensitivity would miss a significant number of cases, potentially leading to delayed treatment and serious complications. The consequences of a missed diagnosis of appendicitis can be severe. Delayed treatment can increase the risk of perforation, which is a rupture of the appendix. Perforation can lead to peritonitis, a serious infection of the lining of the abdomen. Peritonitis can cause sepsis, a life-threatening condition that can lead to organ failure and death. In our study, both pARC and PAS demonstrated high sensitivity, indicating their ability to accurately detect appendicitis in children. The slightly higher sensitivity of pARC suggests that it may be marginally better at identifying children with the condition, potentially reducing the risk of missed diagnoses and associated complications. This potential advantage of pARC in terms of sensitivity could be attributed to its inclusion of additional clinical variables that are not considered in PAS. pARC incorporates ten variables, including age, gender, clinical features, and laboratory values, while PAS only includes eight variables. The two additional variables in pARC, the presence of RLQ tenderness and the presence of migration of pain have been shown to be independent predictors of appendicitis in children. By considering these additional factors, pARC may be able to capture a wider range of clinical presentations and provide a more nuanced assessment of the risk of appendicitis, leading to improved sensitivity in detecting cases. Specificity is a measure of how well a diagnostic test can correctly identify individuals who do not have the disease. In the context of appendicitis, a highly specific test would correctly identify a large proportion of children who do not have the condition.

A test with low specificity would generate a high number of false positives, leading to unnecessary investigations, treatments, and anxiety. Unnecessary appendectomies, which are surgical removals of the appendix, can result in complications such as infection, bleeding, and scarring. They can also lead to prolonged hospital stays, increased healthcare costs, and psychological distress for the child and their family. Both pARC and PAS demonstrated 100% specificity in our study, indicating their excellent ability to rule out appendicitis in children who do not have the condition. This finding provides strong reassurance that a negative result on either scoring system can be confidently used to exclude appendicitis, avoiding unnecessary interventions and associated risks. The high specificity of both scoring systems can be attributed to their careful selection of clinical and laboratory variables that are highly discriminatory for appendicitis. By incorporating these variables into their algorithms, pARC and PAS can effectively differentiate appendicitis from other conditions that may mimic its presentation. PPV is the probability that a patient with a positive test result actually has the disease. In the case of appendicitis, a high PPV indicates that a child with a positive pARC or PAS score is very likely to have the condition. A low PPV would mean that a positive result is less reliable and may require further investigations to confirm the diagnosis. A high PPV is crucial in guiding clinical decision-making, particularly when considering surgical intervention. A high PPV for pARC and PAS provides clinicians with confidence that a positive score can be used to support the decision to proceed with an appendectomy, minimizing the delay in treatment and reducing the risk of complications. Both pARC and PAS demonstrated high PPV in our study, indicating that a positive result on either scoring system is highly indicative of appendicitis. This finding provides clinicians with confidence that a positive pARC or PAS score can be used to guide treatment decisions, such as surgical intervention. The high PPV of both scoring systems can be attributed to their ability to effectively identify children who are at high risk of appendicitis. By incorporating multiple clinical and laboratory variables, pARC and PAS can provide a comprehensive assessment of the risk of appendicitis, leading to a high probability of a true positive result. NPV is the probability that a patient with a negative test result does not have the disease. In the context of appendicitis, a high NPV indicates that a child with a negative pARC or PAS score is very unlikely to have the condition. A low NPV would mean that a negative result is less reliable and may require further monitoring or investigations to definitively rule out appendicitis. A high NPV is important in reassuring clinicians and families that a child with a negative pARC or PAS score can be safely managed conservatively, avoiding unnecessary hospitalizations and interventions. This can help reduce healthcare costs, minimize the disruption to the child's life, and alleviate anxiety for both the child and their family. Both pARC and PAS demonstrated 100% NPV in our study, indicating that a negative result on either scoring system can be confidently used to exclude appendicitis. This finding provides clinicians with reassurance that children with a negative pARC or PAS score can be safely managed conservatively, avoiding unnecessary hospitalizations and interventions. The high NPV of both scoring systems can be attributed to their ability to effectively rule out appendicitis in children who do not have the condition. By incorporating multiple clinical and laboratory variables, pARC and PAS can provide a comprehensive assessment of the risk of appendicitis, leading to a high probability of a true negative result. The high sensitivity, specificity, PPV, and NPV of both pARC and PAS observed in our study underscore their value as decision-support tools for clinicians evaluating children with suspected appendicitis. These scoring systems can help clinicians stratify patients based on their risk of appendicitis, facilitating timely and appropriate management. A high sensitivity and NPV provide confidence that a negative result on either scoring system can be used to safely rule out appendicitis, avoiding unnecessary investigations and interventions. On the other hand, a high specificity

and PPV provide confidence that a positive result is highly indicative of appendicitis, guiding clinicians towards prompt surgical intervention. The slightly higher sensitivity of pARC suggests that it may offer a marginal advantage in detecting cases of appendicitis, potentially reducing the risk of missed diagnoses. However, the 100% specificity and NPV of both scoring systems provide strong reassurance that a negative result can be confidently used to exclude the condition.[14-16]

The slightly higher sensitivity and PPV of pARC in our study may be attributed to its ability to provide a more individualized risk assessment. pARC incorporates ten variables, including age, gender, clinical features, and laboratory values, while PAS only includes eight variables. The inclusion of additional variables in pARC may allow for a more nuanced assessment of the risk of appendicitis, potentially leading to more accurate diagnoses. The concept of individualized risk assessment is gaining increasing traction in healthcare. It recognizes that patients vary in their susceptibility to diseases and their response to treatments. By considering a wider range of factors, including patient characteristics, clinical presentation, and laboratory findings, individualized risk assessment tools can provide more precise estimates of disease probability, enabling clinicians to make more informed diagnostic and therapeutic decisions. In the context of appendicitis, individualized risk assessment can help clinicians identify children who are at high risk of the condition and require immediate surgical intervention, as well as those who are at low risk and can be safely managed conservatively. This can help reduce the rates of both missed diagnoses and unnecessary appendectomies. Traditional diagnostic approaches for appendicitis often relied heavily on clinical judgment, which can be subjective and prone to variability. Individualized risk assessment tools, such as pARC and PAS, provide a more objective and standardized approach to evaluating children with suspected appendicitis. These tools incorporate a range of clinical and laboratory variables to generate a risk score, which can help guide clinical decision-making. By considering a wider range of factors, these tools can provide a more nuanced assessment of the risk of appendicitis, potentially leading to more accurate diagnoses and more appropriate management. By considering a wider range of factors, individualized risk assessment tools can help improve the accuracy of diagnosing appendicitis, reducing the risk of both missed diagnoses and false positives. This is particularly crucial in the case of appendicitis, where a missed diagnosis can have serious consequences, including perforation, peritonitis, and even death. Conversely, false positives can lead to unnecessary appendectomies, which carry their own set of risks and complications. By more accurately identifying children who do not have appendicitis, individualized risk assessment tools can help reduce the number of unnecessary appendectomies. This not only reduces the risk of surgical complications but also minimizes healthcare costs and emotional distress for patients and their families. Individualized risk assessment can help guide personalized treatment decisions, ensuring that children receive the most appropriate care based on their individual risk factors. This may involve immediate surgical intervention for high-risk patients or conservative management with close monitoring for low-risk patients. By improving diagnostic accuracy and guiding personalized treatment decisions, individualized risk assessment can help improve patient outcomes, reducing the risk of complications and improving quality of life. This can lead to shorter hospital stays, faster recovery times, and reduced healthcare costs. pARC is a promising tool for individualized risk assessment in children with suspected appendicitis. It incorporates ten variables, including age, gender, clinical features, and laboratory values, to provide a comprehensive assessment of the risk of appendicitis. The inclusion of additional variables in pARC, such as the presence of RLQ tenderness and the presence of migration of pain, may contribute to its slightly higher sensitivity and PPV compared to PAS. These variables have been shown to be independent predictors of appendicitis in children

and may help pARC capture a wider range of clinical presentations. Moreover, pARC's ability to integrate these variables into a quantitative risk score provides clinicians with a more objective and standardized approach to evaluating children with suspected appendicitis. This can help reduce variability in clinical practice and improve the consistency of care. While individualized risk assessment tools like pARC and PAS provide valuable support for clinical decision-making, it is important to emphasize that they should not replace clinical judgment. These tools are intended to be used as adjuncts to, not substitutes for, a thorough clinical evaluation. Clinicians should always consider the individual patient's clinical presentation, medical history, and other relevant factors when making diagnostic and therapeutic decisions. Individualized risk assessment tools can help inform these decisions, but they should not be the sole determinant of care.[17,18]

The findings of our study have important implications for clinical practice. Both pARC and PAS have demonstrated high accuracy in diagnosing acute appendicitis in children, providing clinicians with valuable tools to aid in decision-making. The choice between pARC and PAS may depend on several factors, including clinician preference, availability of data, and the specific clinical context. pARC's slightly higher sensitivity and PPV suggest that it may be a preferred choice in situations where minimizing the risk of missed diagnoses is paramount. However, the marginal difference in performance and the need for additional data may make PAS a more practical option in some settings. Ultimately, the decision of which scoring system to use should be guided by clinical judgment and the individual needs of the patient. The diagnosis of acute appendicitis in children can be challenging due to the variable nature of its presentation and the potential for overlap with other common childhood illnesses. Clinical scoring systems, such as pARC and PAS, provide clinicians with objective and standardized tools to aid in decision-making, enhancing the accuracy and consistency of care. Our study has demonstrated the high accuracy of both pARC and PAS in diagnosing acute appendicitis in children. This finding reinforces their value as decision-support tools for clinicians, helping them stratify patients based on their risk of appendicitis and guide appropriate management. While both pARC and PAS have demonstrated high accuracy, there are some key differences between the two scoring systems that may influence clinical practice. pARC showed slightly higher sensitivity and PPV in our study, suggesting that it may be marginally better at identifying children with appendicitis and confirming the diagnosis in those with positive test results. pARC incorporates ten variables, including age, gender, clinical features, and laboratory values, while PAS only includes eight variables. The inclusion of additional variables in pARC may allow for a more nuanced and tailored assessment of the risk of appendicitis. PAS may be easier to use in some settings due to its simpler scoring system and fewer variables. pARC requires the input of more data, which may not always be readily available. The choice between pARC and PAS may depend on several factors, including clinician preference, availability of data, and the specific clinical context. In situations where minimizing the risk of missed diagnoses is paramount, pARC's slightly higher sensitivity and PPV may make it a preferred choice. However, the marginal difference in performance and the need for additional data may make PAS a more practical option in some settings. Ultimately, the decision of which scoring system to use should be guided by clinical judgment and the individual needs of the patient. Clinicians should consider the child's clinical presentation, medical history, and other relevant factors when making diagnostic and therapeutic decisions. To maximize the benefits of pARC and PAS in clinical practice, it is important to integrate these scoring systems into existing clinical workflows. This may involve incorporating them into electronic health records (EHRs) or developing standardized protocols for their use. By integrating pARC and PAS into clinical workflows, we can ensure that these tools are readily available to clinicians and that they are used

consistently and appropriately. This can help improve the accuracy and efficiency of diagnosing appendicitis in children, leading to better patient outcomes. Education is key to the successful implementation of pARC and PAS in clinical practice. Clinicians need to be adequately trained in the appropriate use and interpretation of these scoring systems. They should also be aware of their limitations and the importance of considering other clinical factors when making diagnostic and therapeutic decisions. Patients and their families also need to be educated about the role of pARC and PAS in the diagnosis of appendicitis. This can help them understand the rationale for using these tools and alleviate any anxiety they may have about the diagnostic process. The use of pARC and PAS in clinical practice raises some ethical considerations that need to be addressed. Clinicians should obtain informed consent from patients or their parents/guardians before using pARC or PAS. This involves explaining the purpose of these tools, their potential benefits and limitations, and the implications of their results. Clinicians should ensure that patient data used in pARC and PAS is collected and stored in accordance with relevant privacy regulations. Clinicians should ensure that all children with suspected appendicitis have equitable access to pARC and PAS, regardless of their race, ethnicity, socioeconomic status, or other factors. By addressing these ethical considerations, we can ensure that pARC and PAS are used responsibly and ethically in clinical practice.[19,20]

5. Conclusion

This study underscores the high diagnostic accuracy of both the pARC and PAS in evaluating children with suspected acute appendicitis. While pARC exhibited slightly higher sensitivity and PPV, the differences were not statistically significant. These findings suggest that pARC could potentially replace PAS as the preferred diagnostic tool, but further research with larger sample sizes is needed to confirm these results. The study's findings have significant implications for clinical practice, particularly in the management of children with suspected acute appendicitis. Both pARC and PAS offer clinicians valuable support in decision-making, enhancing the accuracy and consistency of care. The choice between pARC and PAS may depend on factors such as clinician preference, data availability, and the specific clinical context. It is crucial to acknowledge that clinical scoring systems should complement, not replace, thorough clinical evaluation. Clinicians must consider the individual patient's clinical presentation, medical history, and other relevant factors when making diagnostic and therapeutic decisions. Future research should focus on larger, prospective studies to definitively establish the relative performance of pARC and PAS. Exploring the incorporation of additional variables into pARC could further enhance its diagnostic accuracy. This study contributes to the ongoing discussion on the diagnosis of acute appendicitis in children. By highlighting the accuracy of pARC and PAS, this research emphasizes the importance of clinical scoring systems in improving the diagnostic process and optimizing patient management.

6. References

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