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Research Article

Accuracy of Pediatric Appendicitis Score

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ABSTRACT

Background: Acute appendicitis is a common surgical problem in childhood, and its prompt diagnosis is an important issue to avoid complications and decrease the negative appendectomy rate. Pediatric appendicitis score (PAS) is one tool developed to help in making decisions during the evaluation of patients with suspected acute appendicitis.

Objectives: to evaluate the accuracy of PAS in diagnosing acute appendicitis in children.

Subjects and Methods: A retrospective study included patients who underwent appendectomy for acute appendicitis over a period of two years. Patients were divided into two groups, positive and negative appendectomy groups. PAS was calculated for every patient, and score accuracy for every cutoff point was measured. A receiver operating characteristic curve was constructed to define the best score performance.

Results: A total of 436 patients were included in the study, 374 (85.8%) patients with proved positive appendectomy. The mean PAS in the positive and negative appendectomy groups was (7.3) and (4.2) respectively, (P-value=0.001). All PAS variables were significantly more in the positive appendectomy group, except for anorexia (P-value=0.71), nausea/vomiting (P-value=0.075), and fever (P-value=0.518). The best score performance was at cutoff point 6 with a sensitivity, specificity, and accuracy of 91.71%, 87.10%, and 91.06%, respectively.

Conclusions: PAS is a simple tool that can be used during the evaluation of abdominal pain in children with good diagnostic accuracy. At a score < 4, acute appendicitis could be excluded with a low missed appendicitis rate, and a score ≥ 6 could support the diagnosis of acute appendicitis with a low negative appendectomy rate.

Introduction

Acute appendicitis is a common surgical cause of acute abdominal pain in children, and appendectomy is relatively a routine surgical procedure done by pediatric surgeons worldwide (1,2). The estimated lifetime risk of acute appendicitis is about 7-8%, and the highest incidence is reported in teenagers (10-19) years (3). The clinical presentation of acute appendicitis is highly variable, ranging from mild abdominal pain to generalized peritonitis, and depending on many factors as time of presentation, severity of inflammation, patient age, and the anatomical site of the appendix (4,5).

The diagnosis of acute appendicitis in children is sometimes a challenging process as the clinical manifestations of acute appendicitis are overlapped with many other clinical problems, both medical and surgical. Similarly, acute appendicitis is included in the differential diagnoses of many clinical conditions (6). An additional factor for difficult diagnosis is the inability of children, especially young ones, to express their feelings and symptoms clearly (7). Prompt and early diagnosis of acute appendicitis is thus essential, to avoid potential complications of delayed diagnosis such as perforation, abscess formation, peritonitis, and sepsis, and to decrease the negative appendectomy rate (removal of a normal appendix) (8). Delayed diagnosis and misdiagnosis of acute appendicitis have negative impacts and burdens on patients and the health care systems, as there is prolonged hospital stay, increased utilization of hospital resources, social isolation of patients, and cost (9,10). As a result, many scoring systems have been developed to help clinicians to predicate the diagnosis of acute appendicitis, by providing clear evidence that support or exclude the diagnosis of acute appendicitis (11,12). Most scoring systems use clinical symptoms, physical signs, and simple laboratory investigations to define patients who need surgical referral and intervention. Pediatric appendicitis score (PAS) is one common scoring system that was designed especially for children between the ages of 4 and 15 years (11). The score consists of 8 variables and has total points of 10 (Table 1). Many studies discussed the validity of PAS worldwide with different results. Some studies found PAS was a suitable tool in the workup for patients who were suspected of having acute appendicitis, while others did not.

Table 1: Pediatric Appendicitis Score (11).

Variable	Score value
Migration of pain	1
Anorexia	1
Nausea and vomiting	1
Right lower quadrant tenderness on palpation	2
Right lower quadrant tenderness on cough, percussion, or hopping	2
Fever (> 37.5 °C)	1
Leukocytosis (> 10000/ µL)	1
Neutrophilia (> 75%)	1
Total	10

The aim of this study was to evaluate the accuracy of PAS in diagnosing acute appendicitis in children and to define the best cutoff points that support or exclude the diagnosis of acute appendicitis at our institution.

Subjects and Methods

A retrospective cross-sectional study was done at a specialized pediatric surgery center in Baghdad, Iraq. The medical files of patients diagnosed with acute appendicitis and underwent appendectomy were reviewed. The inclusion criteria included patients with ages ranging from 4 to 15 years, who underwent appendectomy for acute appendicitis over a period of two years (from the first of September 2021 to the end of August 2023), with complete medical records. The exclusion criteria included patients who underwent interval or incidental appendectomy, patients whose age was beyond the target age of the study or had incomplete data. Informed consent was not taken due to the retrospective nature of the study. The institutional review board (IRB) of Al Mustansiriyah Medical College, Department of Surgery, Baghdad, Iraq, had approved the study (Reference No. 216, on November 2023).

Patients were divided into two groups according to the status of the appendix, positive and negative appendectomy groups. At our institution, it is a usual practice to send the appendix for histopathological examination when its macroscopical appearance looks normal, or there is a suspicious lesion in it. Otherwise, the appendix specimen is not sent for histopathological examination as long as the inflammatory process or its complications are clear and obvious, such as a swollen congested appendix, fecalith obstructing appendiceal lumen or present freely in the peritoneal cavity, visible perforation in the appendix, or pus collection in the peritoneal cavity. Therefore, Positive appendectomy was defined as a clear operative note indicating acute appendicitis +/- its complications, or appendiceal inflammation on histopathological report. While negative appendectomy was defined as normal appendiceal histology in the pathology report.

Pediatric appendicitis score (PAS) was calculated for all patients in both groups. Two variables in the score were not defined clearly by the score's author, which were fever and neutrophilia, and were defined in this study as a temperature > 37.5° C, and neutrophile count > 75% of the total white blood cell count, respectively. For every cutoff point of PAS, a 2x2 table was constructed, and sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy were calculated, in addition to the missed appendicitis, and negative appendectomy rates. The missed appendicitis rate was calculated by dividing the false negative value by all diseased populations. The false negative value here represented the number of patients who had score values less than the cutoff point of PAS, but proved to have acute appendicitis by operative findings or histopathological examination. The negative appendectomy rate was calculated by dividing the false positive value by all positives. The false positive value represented the number of patients who had score values equal to or more than the cutoff point of PAS, but proved by histopathological reports to have a normal appendix. A receiver operating characteristic (ROC) curve was constructed, and the AUC was measured, to determine the performance of PAS and the best cutoff point.

Data was first entered in a Microsoft Excel sheet, and Statistical Package for Social Science version 28 (SPSS-28) was used for data analysis. Continuous variables were expressed as mean and standard deviation (SD), and tested by student *t*-test. While categorical variables were expressed as frequencies and percentages, and tested by Pearson chi-square test (χ^2-test). Statistical significance was set at a P-value <0.05.

Results

A total of 1086 patients underwent appendectomy during the study period; 436 patients met the eligibility criteria and were included in the study. Sixty-two patients [14.2%] had a normal appendix, proved by histopathological examination, and represented the negative appendectomy group. The remaining 374 [85.8%]

patients had acute appendicitis proved by either operative findings or histopathological examination, and constituted the positive appendectomy group.

The mean [±SD] age of patients in the positive and negative appendectomy groups was 9.5 [±1.8] and 9.1 [±1.4] years, respectively, and the difference in the mean age of patients between the two groups was insignificant [P-value = 0.096]. More than half of the patients [58.56%] in the positive appendectomy group were male, in contrast to the negative appendectomy group which was formed mainly by female patients [54.84%]. The difference in the male: female ratio between the two groups [1.4:1 vs 0.8:1, respectively] was significant [P-value = 0.048]. The mean [±SD] PAS in the positive appendectomy group was 7.3 [±1.3], in comparison to 4.2 [±1.2] in the negative appendectomy group, which was extremely significant [P-value = 0.0001]. All variables of PAS were more pronounced in the positive appendectomy group, and the differences with the negative appendectomy group were significant for most variables, except for anorexia, nausea/vomiting, and fever as shown in (Table 2).

Table 2: Patients demographics and PAS variables in positive and negative appendectomy groups

Variable	Positive appendectomy group (n=374)	Negative appendectomy group (n=62)	P-value
Mean age (±SD), year	9.5 (±1.8)	9.1 (±1.4)	0.096
Sex:			
Male, n (%)	219 (58.6%)	28 (45.2%)	0.048*
Female, n (%)	155 (41.4%)	34 (54.8%)	
Mean PAS (±SD)	7.3 (±1.3)	4.2 (±1.2)	0.0001*
Migration of pain, n (%)	231 (61.8%)	27 (43.6%)	0.006*
Anorexia, n (%)	266 (71.1%)	43 (69.4%)	0.710
Nausea and vomiting, n (%)	292 (78.1%)	42 (67.7%)	0.075
Fever, n (%)	325 (86.9%)	52 (83.9%)	0.518
RLQ tenderness on palpation, n (%)	338 (90.4%)	49 (79 %)	0.008*
RLQ tenderness on cough/ percussion/ hopping, n (%)	268 (71.7%)	33 (53.2%)	0.003*
Leukocytosis (>10000/ml), n (%)	288 (77%)	36 (58.1%)	0.001*
Neutrophilia (> 75%), n (%)	213 (56.9%)	26 (41.9%)	0.027*

PAS: pediatric appendicitis score, SD: standard deviation, RLQ: right lower quadrant, * Significant at P-value < 0.05.

From scores 1 to 10, the sensitivity of PAS decreased from 100% to 2.67%, and specificity increased from 0% to 100%. The accuracy of PAS was in the range of 16.51% - 91.28% as illustrated in (Table 3).

Table 3: Accuracy of PAS at different cutoff points

PAS	Sensitivity	Specificity	PPV	NPV	Accuracy
≥ 1	100.00%	0.00%	85.78%	NA	85.78%
≥ 2	100.00%	0.00%	85.78%	NA	85.78%
≥ 3	99.73%	8.06%	86.74%	83.33%	86.70%
≥ 4	98.66%	25.81%	88.92%	76.19%	88.30%
≥ 5	96.26%	61.29%	93.75%	73.08%	91.28%
≥ 6	91.71%	87.10%	97.72%	63.53%	91.06%
≥ 7	76.20%	95.16%	98.96%	39.86%	78.90%
≥ 8	41.44%	98.39%	99.36%	21.79%	49.54%
≥ 9	18.98%	100.00%	100.00%	16.99%	30.50%
= 10	2.67%	100.00%	100.00%	14.55%	16.51%

PAS: pediatric appendicitis score, PPV: positive predictive value, NPV: negative predictive value, NA: not applicable.

The receiver operating characteristic (ROC) curve for the performance of PAS is shown in Figure (1). The numbers on the curve represent the sensitivity of PAS, and the total AUC was about 0.93. Accordingly, score 6 had the best performance and accuracy (nearest point to the left upper corner).

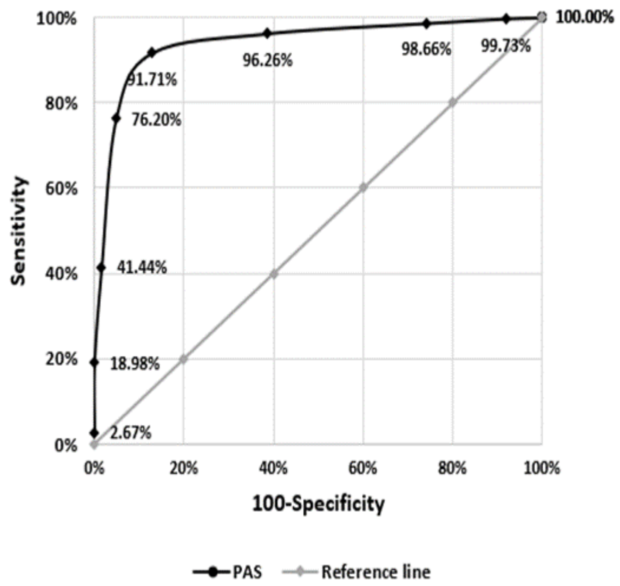

Figure 1: Receiver operating characteristic curve

Table (4) shows the total number of patients at each cutoff point of PAS, in addition to the negative appendectomy and missed appendicitis rates. The negative appendectomy rate was inversely related to the PAS value, and the reverse was observed in the missed appendicitis rate.

Table 4: Number of patients, negative appendectomy and missed appendicitis rates at different PAS cutoff points

PAS	No. of patients (%)			Negative appendectomy rate (%)	Missed appendicitis rate (%)
	Positive appendectomy n (%)	Negative appendectomy n (%)	Total n (%)		
1	0 (0%)	0 (0%)	0 (0%)	14.2%	0%
2	1 (0.3%)	5 (8.1%)	6 (1.4%)	14.2%	0%
3	4 (1.1%)	11(17.7%)	15(3.4%)	13.3%	0.3%
4	9 (2.4%)	22(35.5%)	31(7.1%)	11.1%	1.3%
5	17(4.6%)	16(25.8%)	33(7.6%)	6.3%	3.7%
6	58(15.4%)	5 (8.1%)	63(14.4%)	2.3%	8.3%
7	130(34.7%)	2 (3.2%)	132(30.3%)	1.1%	23.8%
8	84(22.5%)	1 (1.6%)	85(19.5%)	0.6%	58.6%
9	61(16.3%)	0 (0%)	61(14%)	0%	81.1%
10	10(2.7%)	0 (0%)	10(2.3%)	0%	97.3%
Total	374(100%)	62(100%)	436(100%)		

PAS: pediatric appendicitis score

Discussion

The diagnosis of acute appendicitis is usually made by a combination of information involving the patient´s history, findings on physical examination, and results of investigations, both laboratory and radiological (13). However, the diagnosis of acute appendicitis is still sometimes difficult to predict, despite its high incidence in children. This diagnostic difficulty may lead to delayed diagnosis with a subsequent increased morbidity and mortality, or overdiagnosis with a subsequent removal of a normal appendix and loss of its function or uses if needed in the future (1,2).

In this study, we retrospectively evaluated the accuracy of PAS in patients who underwent appendectomy for suspected acute appendicitis. The pediatric appendicitis score had been developed by Madan Samuel from England, to help in decision-making for patients presented with abdominal pain with a suspicion of acute appendicitis. The score consists of eight variables, including symptoms (migration of pain from periumbilical area to RLQ, anorexia, and nausea/vomiting), signs (RLQ tenderness on palpation, RLQ tenderness on coughing, hopping, or percussion, and fever), and laboratory results (leukocytosis and polymorphonuclear neutrophilia). Each variable was given a score of 1, except for RLQ tenderness on palpation, and on coughing, hopping, or percussion, which were scored 2. Hence, the total score consists of 10 points (Table 1). In the original article, Samuel evaluated the validity of PAS prospectively in 1170 patients [734 patients with appendicitis, and 436 patients without appendicitis]. All these variables were significantly more in appendicitis patients [P-value = 0.001], and the mean [±SD] PAS was 9.1 [±0.1] and 3.1[±1.1] in appendicitis and non-appendicitis cases, respectively. The sensitivity, specificity, PPV, NPV of the score were 100%, 92%, 96%, and 99%, respectively (11).

In our study, there were some differences in comparison to Samuel's findings. Three variables of PAS have insignificantly differed between positive and negative appendectomy groups, which were anorexia, nausea/vomiting, and fever. All these variables are common presenting features of many clinical conditions, both abdominal and extra-abdominal, surgical and medical, and are not unique or specific to acute appendicitis. The mean PAS in the negative appendectomy group in our study was higher than those found by Samuel [4.2 vs 3.1], as more than one-third of patients in this group had a score of five or more. This finding may be related to the retrospective nature of our study, as we included patients who underwent appendectomy, and not patients presenting with a complaint of abdominal pain. Therefore, the clinical manifestations of the patients were expected to be severe enough that mandated a surgical intervention. In the positive appendectomy group, more than three-quarters of patients had a score of seven or more. The last result was attributed to our definition of positive appendectomy in this study, which included not only cases with positive histopathological reports, but also cases with obvious pathology found intraoperatively, such as frank appendiceal inflammation, visible perforation, or pus collection. In all these cases, PAS is expected to be high (14). As mentioned in the methodology, the appendix in these scenarios was not sent for histopathological examination according to our institution's protocol, as the pathology was clear and obvious. If these cases were excluded due to a lack of pathology reports, the mean PAS in the positive appendectomy group would be expected to be lower. However, despite the inclusion of these cases; the mean PAS in this group didn't match that found by Samuel [7.3 vs 9.1].

According to the ROC curve, the best cutoff point of PAS in our study was score 6, as it was the nearest point to the left upper corner. At this cutoff point, PAS had a sensitivity of 91.71%, a specificity of 87.10%, and an accuracy of 91.06%, which were relatively good. In addition, the PPV revealed that nearly most patients who tested positive had acute appendicitis, but NPV indicated only [63.53%] of cases that tested negative didn't have acute appendicitis. These high PPV and a relatively low NPV were attributed to the high prevalence of acute appendicitis in our cohort [85.8%]. The total AUC was excellent [0.93] and indicated an extreme discrimination between positive and negative appendectomy groups.

For further assessment of PAS performance in patients suspected to have acute appendicitis, we evaluated the effects of score application on the negative appendectomy and missed appendicitis rates. The negative appendectomy rate in our study population was 14.2%, but the missed appendicitis rate was unknown as the study was retrospective and appendectomy was done to all patients. Therefore, the missed appendicitis rate at every cutoff point of PAS was assessed speculatively from the 2x2 table, through the number of patients who had score values less than the cutoff point but proved to have acute appendicitis by operative findings or histopathological reports. Similarly, the negative appendectomy rate at every cutoff point of PAS was assessed by the number of patients who had score values equal to or more than the cutoff point, but proved by histopathology reports to have a normal appendix. Samuel concluded in his study that a score of five or less was incompatible with acute appendicitis, whereas a score of six was compatible, and a score of seven or more was highly indicative of acute appendicitis. This conclusion was based on the missed appendicitis rate which was zero at score 5 and below. On application of the same recommendations in our study; taking patients with scores six or more to operative theaters, and discharging patients with scores five or below to home would decrease the negative appendectomy rate dramatically from 14.2 to 2.3%, but in turn, there would be 8.3% missed appendicitis rate. On analysis of the negative appendectomy and missed appendicitis rates in all cutoff points of PAS, it was clear that the negative appendectomy rate was inversely related with the PAS value, and the reverse was true for the missed appendicitis rate. In other words, both rates were inversely related, as a reduction of one rate was associated with an increment in the other. This result was expected as higher PAS values mean a more advanced stage of the disease, and negative appendectomy would be less likely, but mild cases of acute appendicitis might be missed and discharged to home. This result was found by many other studies and made the authors recommend using two cutoff points in the PAS, instead of one as Samuel did, one for the diagnosis with no or low negative appendectomy rate, and the other for exclusion with no or low missed appendicitis rate. Patients with scores between these cutoff points represented quarry cases that need observation, frequent examination, and/or radiological evaluations (15,16). As a result, score 6 was the best score to support the diagnosis of acute appendicitis in our study as it had the best performance according to the ROC curve analysis, and was associated with a low negative appendectomy rate [2.3%]. And score < 4 could be used to exclude the diagnosis of acute appendicitis as it was associated with a very low missed appendicitis rate [1.3%]. Although the findings of this study may not reflect the actual picture of acute appendicitis at our institution, especially for the missed appendicitis rate, due to the retrospective nature of the study, it enabled us to identify the changes in the missed appendicitis and negative appendectomy rates with each cutoff point of PAS. However, further prospective studies involving patients with abdominal pain are warranted to confirm or disprove our findings, and to define the validity of PAS more accurately at our institution.

Many studies discussed the validity of PAS worldwide with different results. Some studies found PAS was useful during evaluation of patients with suspected acute appendicitis (17–19). Salahuddin SM et al. from Pakistan studied the validity of PAS retrospectively and found the score had good diagnostic accuracy, as score 4-6 had a sensitivity, specificity, and PPV of 96.8%, 80%, and 98.9% respectively, with AUC of 0.84 (17). In an Egyptian study, PAS was retrospectively assessed in 140 patients, and score ≥ 5 was found to be the best cutoff point as it had an accuracy of 89%. The authors also found using PAS at cutoff points ≤ 2 and ≥ 7 for exclusion of acute appendicitis and surgical referral respectively, would decrease the usage of computed tomography (CT) scans by about 34% (18). In contrast, many other studies failed to find a diagnostic usefulness of PAS (20,21) . In a Croatian study, for example, both PAS and Alvarado scores were assessed for validity in 311 patients. PAS was found to be sensitive [86%] but not specific [50%], and cannot be used exclusively for the diagnosis of acute appendicitis in children (20).

Given these findings, most studies about appendicitis scoring systems including PAS, recommended using them as a supportive tool in the evaluation of abdominal pain with a suspicion of acute appendicitis (22–24). This is because the score value may vary depending on patient and doctor factors. Some score variables are subjective as migration of pain and anorexia, and their explanation by children is sometimes difficult (7). On the other hand, the finding of variables that included physical signs depends on the experience of the examining doctor, and the cooperation of the patient and his/her family (9). As a result, these scoring systems cannot be used alone, but are useful to classify patients according to the severity of illness into groups, low, intermediate, and high-risk groups (23). The low-risk group can be discharged to home with the possibility to come back for persistent symptoms, intermediate risk group needs observation +/- further investigations, while the high-risk group needs immediate surgical referral and intervention. This in turn has the advantage of decreasing load in the emergency departments, especially busy ones, and provision of optimal utilization of hospital resources. Although we didn’t reach the amazing diagnostic accuracy obtained by Samuel, PAS appeared to be a useful tool during the evaluation process of abdominal pain in children.

There were some limitations present in this study. First, the study was done retrospectively, and as a result, any cases were excluded due to lack of necessary data. Second, the study included patients who underwent appendectomy, so the missed appendicitis rate at our institution was unknown, and the influence of score application on it cannot be assessed accurately from this cohort. Third, the generalizability of findings cannot be made as the study was carried out at a single institution. Finally, all patients enrolled in this study were evaluated and examined by pediatric surgery residents and/or specialized pediatric surgeons, who were familiar with the variable presentations of acute appendicitis in children. Therefore, the applicability of the score by other medical personnel as pediatricians and general practitioners needs to be assessed.

Conclusion

Pediatric appendicitis score is a simple and easily applicable tool that can aid in the evaluation of patients with suspected acute appendicitis. At score 6 and more, it had a sensitivity, specificity, and accuracy of 91.71%, 87.10%, and 91.06%, respectively, and application of the score would decrease the negative appendectomy rate from 14.2% to 2.3%. At a score < 4, acute appendicitis could be excluded with a very low missed appendicitis rate. Efforts must be undertaken to schedule pediatric appendicitis scores as a supportive tool to be used in the workup for patients with suspected acute appendicitis. Further aspects of score application need to be addressed, such as its ability to differentiate simple appendicitis from non-appendicitis, or complicated appendicitis cases, and its influence on the usage of radiological investigations such as ultrasound and CT scans. Hopefully, these aspects will be addressed in further studies in the near future

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Conflict of Interest

The author declares no conflict of interest.

Data availability

Data are available upon reasonable request.

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References

[1] Rentea RM, Peter SD. Pediatric appendicitis. Surgical Clinics. 2017 Feb 1;97(1):93-112. https://doi.org/10.1016/j.suc.2016.08.009

[2] Guaitoli E, Gallo G, Cardone E, Conti L, Famularo S, Formisano G, Galli F, Giuliani G, Martino A, Pasculli A, Patini R. Consensus statement of the italian polispecialistic society of young surgeons (SPIGC): diagnosis and treatment of acute appendicitis. Journal of Investigative Surgery. 2021 Sep 17;34(10):1089-103 https://doi.org/10.1080/08941939.2020.1740360

[3] Ferris M, Quan S, Kaplan BS, Molodecky N, Ball CG, Chernoff GW, Bhala N, Ghosh S, Dixon E, Ng S, Kaplan GG. The global incidence of appendicitis: a systematic review of population-based studies. Annals of surgery. 2017 Aug 1;266(2):237-41. https://doi.org/10.1097/sla.0000000000002188

[4] Michelson KA, Reeves SD, Grubenhoff JA, Cruz AT, Chaudhari PP, Dart AH, Finkelstein JA, Bachur RG. Clinical features and preventability of delayed diagnosis of pediatric appendicitis. JAMA network open. 2021 Aug 2;4(8):e2122248-. https://doi.org/10.1001/jamanetworkopen.2021.22248

[5] He K, Rangel SJ. Advances in the Diagnosis and Management of Appendicitis in Children. Advances in surgery. 2021 Sep 1;55:9-33. https://doi.org/10.1016/j.yasu.2021.05.002

[6] Di Saverio S, Podda M, De Simone B, Ceresoli M, Augustin G, Gori A, Boermeester M, Sartelli M, Coccolini F, Tarasconi A, de' Angelis N. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. World journal of emergency surgery. 2020 Dec;15:1-42. https://doi.org/10.1186/s13017-020-00306-3

[7] Pogorelić Z, Domjanović J, Jukić M, Poklepović Peričić T. Acute appendicitis in children younger than five years of age: diagnostic challenge for pediatric surgeons. Surgical infections. 2020 Apr 1;21(3):239-45. https://doi.org/10.1089/sur.2019.175

[8] Anandalwar SP, Cameron DB, Graham DA, Melvin P, Dunlap JL, Kashtan M, Hall M, Saito JM, Barnhart DC, Kenney BD, Rangel SJ. Association of intraoperative findings with outcomes and resource use in children with complicated appendicitis. JAMA surgery. 2018 Nov 1;153(11):1021-7. https://doi.org/10.1001/jamasurg.2018.2085

[9] Gudjonsdottir J, Marklund E, Hagander L, Salö M. Clinical prediction scores for pediatric appendicitis. European Journal of Pediatric Surgery. 2021 Jun;31(03):252-60. https://doi.org/10.1055/s-0040-1710534

[10] Khan S, Siow VS, Lewis A, Butler G, Narr M, Srinivasan S, Michaels M, Mollen K. An evidence-based care protocol improves outcomes and decreases cost in pediatric appendicitis. Journal of Surgical Research. 2020 Dec 1;256:390-6. https://doi.org/10.1016/j.jss.2020.05.067

[11] Samuel M. Pediatric appendicitis score. Journal of pediatric surgery. 2002 Jun 1;37(6):877-81. https://doi.org/10.1053/jpsu.2002.32893

[12] Andersson M, Andersson RE. The appendicitis inflammatory response score: a tool for the diagnosis of acute appendicitis that outperforms the Alvarado score. World journal of surgery. 2008 Aug;32(8):1843-9. https://doi.org/10.1007/s00268-008-9649-y

[13] Akgül F, Er A, Ulusoy E, Çağlar A, Çitlenbik H, Keskinoğlu P, Şişman AR, Karakuş OZ, Özer E, Duman M, Yılmaz D. Integration of physical examination, old and new biomarkers, and ultrasonography by using neural networks for pediatric appendicitis. Pediatric emergency care. 2021 Dec 1;37(12):e1075-81. https://doi.org/10.1097/pec.0000000000001904

[14] Fujii T, Tanaka A, Katami H, Shimono R. Usefulness of the pediatric appendicitis score for assessing the severity of acute appendicitis in children. Pediatrics International. 2020 Jan;62(1):70-3. https://doi.org/10.1111/ped.14032

[15] Kim DY, Shim DH, Cho KY. Use of the pediatric appendicitis score in a community hospital. Indian pediatrics. 2016 Mar;53:217-20. https://doi.org/10.1007/s13312-016-0823-2

[16] Bhatt M, Joseph L, Ducharme FM, Dougherty G, McGillivray D. Prospective validation of the pediatric appendicitis score in a Canadian pediatric emergency department. Academic Emergency Medicine. 2009 Jul;16(7):591-6. https://doi.org/10.1111/j.1553-2712.2009.00445.x

[17] Salahuddin SM, Ayaz O, Jaffer M, Naeem R, Tikmani SS, Mian AI. Pediatric appendicitis score for identifying acute appendicitis in children presenting with acute abdominal pain to the emergency department. Indian pediatrics. 2022 Oct;59(10):774-7. http://dx.doi.org/10.1007/s13312-022-2620-4

[18] Sayed AO, Zeidan NS, Fahmy DM, Ibrahim HA. Diagnostic reliability of pediatric appendicitis score, ultrasound and low-dose computed tomography scan in children with suspected acute appendicitis. Therapeutics and clinical risk management. 2017 Jul 6:847-54. https://doi.org/10.2147/tcrm.s134153

[19] Cesur İB, Gökay SS. Comparison of Appendicitis Scoring Systems in Pediatric Patients. Journal of Contemporary Medicine. 2021;11(4):510-4. https://doi.org/10.16899/jcm.876825

[20] Pogorelic Z, Rak S, Mrklic I, Juric I. Prospective validation of Alvarado score and Pediatric Appendicitis Score for the diagnosis of acute appendicitis in children. Pediatric emergency care. 2015 Mar 1;31(3):164-8. https://doi.org/10.1097/pec.0000000000000375

[21] Goulder F, Simpson T. Pediatric appendicitis score: A retrospective analysis. Journal of Indian Association of Pediatric Surgeons. 2008 Oct 1;13(4):125-7. https://doi.org/10.4103/0971-9261.44761

[22] Sağ S, Basar D, Yurdadoğan F, Pehlivan Y, Elemen L. Comparison of appendicitis scoring systems in childhood appendicitis. Turkish Archives of Pediatrics. 2022 Sep;57(5):532. https://doi.org/10.5152/TurkArchPediatr.2022.22076

[23] Teng TZ, Thong XR, Lau KY, Balasubramaniam S, Shelat VG. Acute appendicitis–advances and controversies. World Journal of Gastrointestinal Surgery. 2021 Nov 11;13(11):1293. https://doi.org/10.4240/wjgs.v13.i11.1293

[24] van Amstel P, Gorter RR, van der Lee JH, Cense HA, Bakx R, Heij HA. Ruling out appendicitis in children: can we use clinical prediction rules?. Journal of Gastrointestinal Surgery. 2019 Oct 1;23(10):2027-48. https://doi.org/10.1007/s11605-018-3997-1

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