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"KAPPA" CONFORMANCE TEST BETWEEN THREE ACUTE APPENDICITIS SCORING SYSTEMS (PEDIATRIC APPENDICITIS SCORE/PEDIATRIC APPENDICITIS RISK CALCULATOR/ALVARADO) IN PREDICTING APPENDICITIS IN CHILDREN

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Appendicitis is the most common abdominal emergency in the pediatric population. The clinical features of appendicitis in children are usually atypical, leading to misdiagnosis in 19–57% of preschool age children, which can result in complications. Thus, scoring systems are used to estimate the risk of appendicitis based on symptomatology and laboratory results.

Aim of the study: The aims of this study were to analyze the conformance of the Pediatric Appendicitis Score (PAS), the Pediatric Appendicitis Risk Calculator (pARC), and the Alvarado score as screening tools for appendicitis in children attending a public hospital emergency department.

Material and methods: The inclusion criteria were all children aged < 14 years who presented with symptoms of appendicitis and were confirmed to have appendicitis either by imaging or surgery. The exclusion criteria were incomplete medical records. Data was collected retrospectively from medical records. Data analysis included examination of the proportion and distribution of data, and statistical analysis in the form of the Kappa conformance test.

Results: The result of the conformance test between the PAS and the Alvarado score was 75%, but the Kappa conformance value between them was only 46.8κ although statistically significant (p value = 0.013). The conformance test between the PAS and the pARC was 50%, but the Kappa conformance value was only 19.4κ and not statistically significant (p value = 0.143). The conformance test between the Alvarado score and the pARC was 55%, but the Kappa conformance value was 13.5κ and not statistically significant (p value = 0.492).

Conclusions: The PAS has advantages over other appendicitis screening questionnaires with greatest conformance between PAS and Alvarado.

KEYWORDS: Conformance test, acute appendicitis, PAS, pARC, Alvarado

Background

Acute abdominal pain in children is common and merits further research due to its unique diagnostic challenges (1). Causes of acute abdominal pain in the pediatric population is extensive, including infectious, inflammatory, musculoskeletal, traumatic, gynecological, and other etiologies, with acute appendicitis being an essential differential diagnosis due to the advantages of early surgical intervention (2).

Appendicitis is the most common abdominal emergency in the pediatric population (2–5) and accounts for 10–30% of pediatric abdominal pain presenting to emergency departments (6, 7). Early diagnosis of acute appendicitis is essential to avoid complications such as perforation and abscess formation (8, 9) which can lead to significant morbidity and occasional mortality (10). Yet, overdiagnosis of appendicitis can lead to unnecessary surgery (10).

The incidence of appendicitis in the general population United States is 1 per 1,000, and is higher in South Korea but lower in Africa (11). It is estimated that about 70,000 appendectomies are performed annually in the pediatric population in the United States (2, 4). The incidence of appendicitis is found to be higher in Hispanics, Asians, and Native Americans, and lower in Caucasians and African Americans (11). Appendicitis typically presents between 10–19 years of age, being less common in very young children (11). The incidence of acute appendicitis nowadays is reported as 1.1/10,000 in preschoolers, 6.8/10,000 in children aged 5–9 years, and 19.3/10,000 in children aged 10–14 (12).

The clinical features of appendicitis in children are usually atypical, leading to misdiagnosis in 19–57% of preschool age children, which can result in the development of complications. Appendicitis in the adult population typically presents as periumbilical pain that migrates to the right lower quadrant (RLQ), followed by nausea, vomiting, anorexia, fever, and diarrhea (5, 11). Due to the varied clinical presentations that appear in pediatric appendicitis, scoring systems are often used to estimate the risk of appendicitis based on history, clinical presentation and preliminary laboratory results (3, 6, 11).

The Alvarado score is the oldest scoring tool for acute appendicitis, and is frequently used in the general population (13). The most well-established clinical prediction scores for appendicitis are the pediatric appendicitis score (PAS) and the novel pediatric appendicitis risk calculator (pARC)(3). The Alvarado score and PAS are the most widely used in the pediatric population (14).

The Alvarado score includes nausea/vomiting, anorexia, RLQ tenderness, migration of pain to the RLQ, rebound tenderness, fever, leukocytosis, and polymorphonuclear leukocyte shift (15). PAS variables include migration of pain, anorexia, nausea/vomiting, tenderness in the RLQ, cough/percussion tenderness, fever, leukocytosis, and polymorphonuclear neutrophilia (11). Variables used in the pARC are sex, age, duration of pain, guarding, pain migration, maximal tenderness in the RLQ, and absolute neutrophil count (16). The PAS is the most widely used prediction tool, stratifying patients by risk group (6), whereas the pARC is a novel risk calculator which has not yet been validated thoroughly but appears to have a higher diagnostic accuracy. In a study by Kharbanda et al. (2018), the pARC score could accurately classify more than half of their population studied as at <15% or ≥ 85% risk of appendicitis, whereas only 23% would be identified as having a PAS score of < 3 or > 8 (17).

Aim of the study

Our study aims to analyze the conformance of the PAS, pARC and Alvarado scoring systems as screening tools for acute appendicitis in children in a public hospital emergency department.

Material and methods

Study design

This is a retrospective cross sectional study of cases of appendicitis in children obtained from medical records, and includes use of recorded variables for various scoring systems applicable to assessing risk of appendicitis.

Study setting

Data collection took place at Depati Hamzah Regional Public Hospital from 1st August 2020 to 14th August 2020. This study's accessible population were children with confirmed appendicitis attending Depati Hamzah Regional Public Hospital in the period January 2019 to July 2020.

Study participants

The cases studied were part of an accessible population meeting the inclusion criteria. Twenty cases were used according to the preliminary test sample size, and according to the number of samples required to find the proportion in an infinite population (p = 13/10,000, 5% type 1 error, and clinical judgment (the limit of the study considered significant for the sample size) of 0.015). The inclusion criteria in this study were children aged less than 14 years who presented with symptoms of appendicitis and were confirmed to have appendicitis either by imaging or surgery. The exclusion criteria in this study were incomplete medical records.

Sampling technique

The sampling technique used in this study was total sampling.

Data collection

The data used in this study was extracted from medical records. The research procedure involved making a proposal, submitting to the hospital for ethical review and research permits, and coordinating obtaining medical records, data collection, and data processing. This study consisted of 2 variables, namely the dependent variable; the incidence of acute appendicitis evidenced by surgery and imaging and the independent variable; appendicitis screening. The three scoring systems examined in this study each consist of 8 questions, namely the PAS, the pARC, and the Alvarado score each with their interpretation according to the requirements or preferences of each questionnaire.

Data analysis

Data analysis includes descriptive terms comprising the proportion (%) and distribution of data (mean, standard deviation, median, minimum, and maximum), as well as statistical tests in the form of the Kappa conformance test (Kappa conformance/Kappa's value). Cohen's kappa coefficient (κ) is a statistic that is used to measure inter-rater reliability (and

also Intra-rater reliability) for qualitative (categorical) items. The p-value < 0.050 is considered significant for confidence interval of 95%.

Results

Twenty respondents met the inclusion criteria in this study (Figure 1). The participants were predominantly male (n = 13, 65%) and the average age was 11.7 (+/- 3.2) years. Clinical symptoms and laboratory results of participants are presented in Table 1. Using the PAS, 16 patients (80%) scored > 5, indicating 'appendicitis likely', and 3 patients (15%) scored 5 and 1 patient (5%) scored < 5. Using the pARC, 6 patients (30%) scored 76–90% (moderate–high risk), 8 patients (40%) scored 51–75% (moderate risk), 1 patient (5%) scored 26–50% (moderate risk), 4 patients (20%) scored 16–25% (moderate risk) and 1 patient (5%) scored 6–15% (low risk). Using the Alvarado score, 11 patients (55%) scored 7–8, (appendicitis probable), 6 patients (30%) scored 5–6 (appendicitis possible) and 3 patients (15%) scored 1–4 (appendicitis unlikely) (Table 1).

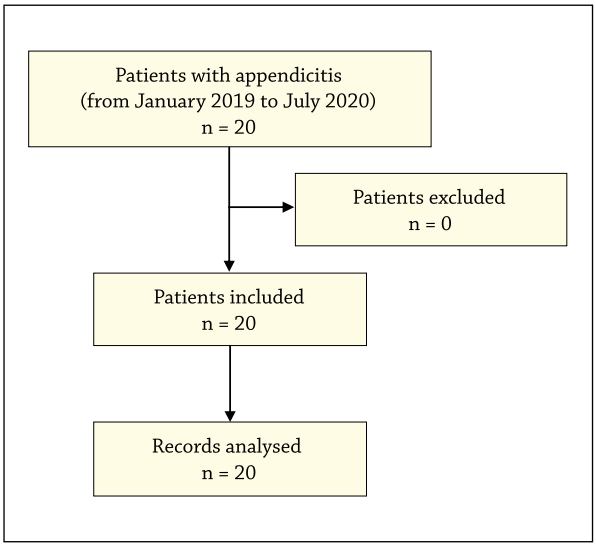

Figure 1. Flow diagram

The data extracted from each medical record was used to provide an estimation of risk of acute appendicitis in the three diagnostic scoring systems. The PAS was found to have the highest true positive rate, with a positive predictive value of 80% when compared to the gold standard of diagnostic imaging and/or surgery. The Alvarado score had a positive predictive value of 55%, and the pARC had a positive predictive value of only 30% (Table 2).

Conformance testing was performed to compare the Alvarado Score and the pARC to the PAS scoring system which had the highest positive predictive value. The result of the conformance test between the PAS and the Alvarado score was 75%, but according to the Kappa conformance statistical test, the Kappa conformance value between the two scores was only 46.8κ and statistically significant (p value = 0.013). The result of

Table 1. Basic Characteristics of 20 Children with Acute Appendicitis in Depati Hamzah Public Hospital, January 2019 to July 2020.

Parameter		N (%)	Mean (SD)	Median (Min–Max)
Gender	– Male – Female	13 (65%) 7 (35%)		
Age			11.7 (3.2)	11.5 (6–18)
Diagnosis	– Appendicitis – Peritonitis	15 (75%) 5 (25%)		
Migration of pain	– Yes – No	6 (30%) 14 (70%)		
Anorexia	– Yes – No	17 (85%) 3 (15%)		
Nausea/vomiting	– Yes – No	13 (65%) 7 (35%)		
RLQ Tenderness	– Yes – No	19 (95%) 1 (5%)		
Cough/Hopping/ Percussion Tenderness in the RLQ	– Yes – No	12 (60%) 8 (40%)		
Elevated Temperature (>38°C)	– Yes – No	12 (60%) 8 (40%)		
Leukocytes > 10,000 cells/μL	– Yes – No	11 (55%) 9 (45%)		
Polymorphonuclear neutrophilia > 75%	– Yes – No	16 (80%) 4 (20%)		
Rebound Tenderness	– Yes – No	11 (55%) 9 (45%)		
Duration of Pain	– < 24 hours – 24–48 hours – 48–96 hours – > 96 hours	5 (25%) 5 (25%) 5 (25%) 5 (25%)		
Pain When Walking	– Yes – No	1 (5%) 19 (95%)		
Abdominal Guarding	– Yes – No	13 (65%) 7 (35%)		
Rovsing's Sign	– Yes – No	8 (40%) 12 (60%)		
PAS Interpretation	– > 5 appendicitis likely – 5 appendicitis possible – < 5 appendicitis unlikely	16 (80%) 3 (15%) 1 (5%)		
pARC Interpretation	– 76–90% (Moderate–High) – 51–75% (Moderate) – 26–50% (Moderate) – 16–25% (Moderate) – 6–15% (Low)	6 (30%) 8 (40%) 1 (5%) 4 (20%) 1 (5%)		
Alvarado Interpretation	– 7–8 appendicitis probable – 5–6 appendicitis possible – 1–4 appendicitis unlikely	11 (55%) 6 (30%) 3 (15%)		

Table 2. Value of Conformity/True Positive of 3 Diagnostic Scoring Systems for Acute Appendicitis in Children.

Scoring System	Interpretation	Score compared with gold standard	
		Number	Value of conformity (%)
PAS	> 5 appendicitis likely	16	80%
	5 appendicitis possible	3	15%
	< 5 appendicitis unlikely	1	5%
pARC	76–90% (moderate–high)	6	30%
	51–75% (moderate)	8	40%
	26–50% (moderate)	1	5%
	16–25% (low–moderate)	4	20%
	6–15% (low)	1	5%
Alvarado	7–8 appendicitis probable	11	55%
	5–6 appendicitis possible	6	30%
	1–4 appendicitis unlikely	3	15%

the conformance test between the PAS and the pARC was 50%. However, according to the Kappa conformance statistical test, the Kappa conformance value between the two scores was only 19.4κ and again not statistically significant (p value = 0.143). The result of the conformance test between the Alvarado score and the pARC was 55% and again according to the Kappa conformance statistical test, the Kappa conformance value between the two scores was only 13.5κ and not statistically significant (p value = 0.492). We categorized appendicitis likely in PAS, moderate-high risk in pARC and appendicitis probable in Alvarado score as positive (Table 3).

Table 3. The Kappa Conformity Test between 3 Types of Diagnostic Scoring Systems for Acute Appendicitis in Children.

Parameter		PAS		Kappa value	p value
		Positive	Negative		
Alvarado	Positive	11 (55%)	0	46.8%	0.013
	Negative	5 (25%)	4 (20%)		
pARC	Positive	6 (30%)	0	19.4%	0.143
	Negative	10 (50%)	4 (20%)		
Parameter		**Alvarado**		**Kappa value**	**p value**
		Positive	**Negative**		
pARC	Positive	4 (20%)	2 (10%)	13.5%	0.492
	Negative	7 (35%)	7 (35%)		

Discussion

Key results

The result of the conformance test between the PAS and the Alvarado score was 75%, but the Kappa conformance value between them was only 46.8κ and statistically significant (p value = 0.013). The conformance test between the PAS and the pARC was 50%, but the conformance value was 19.4κ and not statistically significant (p value = 0.143). The conformance test between the Alvarado Score and the pARC was 55%, but the Kappa value was 13.5κ and also not statistically significant (p value = 0.492).

Interpretation

This study found that acute appendicitis occurred in more male (65%) than female (35%) children. This findings is in agreement with a study by Badebarin et al. (2020) in Iran which found that the incidence of appendicitis in male vs. female children is 1.32:1 (18). There is no anatomical difference in the appendix between males and females, and reasoning behind this difference is yet unknown (19).

The most significant clinical variable used in prediction scoring for acute appendicitis in our study was RLQ tenderness (95%), followed by anorexia (85%). These findings are similar to a study by Badebarin et al. (2020) that showed that 90% of cases with appendicitis presented with RLQ tenderness, and 81.5% experienced anorexia (18). The percentage of nausea/vomiting (65%) and migration of pain (30%) in our sample was also similar to Al-Rudaini et al. (2018), which found that 63.3% and 25.5% respectively experienced these symptoms (20). The finding of cough/hopping/percussion RLQ tenderness in our study was 60%, which is similar to a study by Arias et al. (2018)(6). The presence of fever in 60% and rebound tenderness in 56% in our study is similar to findings by El-Shamy et al. (2017), who reported these findings in 60.5% and 56% of study participants (15). Temperature elevation in early appendicitis is rarely > 1°C, and temperatures of 38.2°C or higher usually appear after localized tenderness is apparent (21).

Samples displaying a polymorphonuclear neutrophilia were found in 80% of cases in our study, with leukocytosis in 55%, which contradicts other studies such as a study by Dhruv et al. (2016) which found neutrophilia in 44% of cases and leukocytosis in 76% (22). Elevated white blood cell count > 11,000 cells/μL with polymorphonuclear cell predominance is common in children and young adults (21) therefore leukocyte count alone cannot be used as a marker of appendicitis (23). In late presentations, a leukocytosis of over 20,000 cells/μL , with predominantly neutrophils suggests perforation of the appendix or another diagnosis such as an abscess (21, 24). Most cases of acute appendicitis do show a raised leukocyte count (26); however acute appendicitis with a normal leukocyte count has been documented (25, 27). The duration of acute appendicitis correlates with the diagnostic accuracy of several diagnostic markers (28). Kharbanda et al. (2011) showed that leukocyte count was more powerful in predicting appendicitis in children with pain for < 24 hours, while c-reactive protein (CRP) was more useful in those with pain for 24–48 hours (28, 29).

Scoring systems allow clinicians to approach a patient rationally by using common signs, symptoms,

and laboratory results to stratify risk of appendiceal pathology, thereby reducing the rate of imaging studies, unnecessary hospital admissions, and negative appendectomies (14, 22). However, the accuracy of the different scoring systems in identifying children at low or high risk for appendicitis also depends on the primary clinicians and their use remains unclear as most of the scoring systems do not consider variation in duration from symptom onset. The signs and symptoms of patients with acute appendicitis may vary and all symptoms might not be present at the time of admission. Thus, it is important to note the duration of signs and symptoms, and this should be considered when utilizing clinical scoring systems in the diagnostic workup for appendicitis (30).

Our study found that PAS has a positive predictive value of 80% when compared with the gold standard diagnostics, which is in agreement with research by El-Shamy et al. (2017), who found a conformity value of 84% (15). The Alvarado score had a positive predictive value of 55%, similar to the study by Chung et al. (2019) who reported a positive predictive value of 65.7% (9). The pARC showed a positive predictive value of only 30%. This contradicts findings in a study by Gudjonsdottir et al. (2020) that found that 88% of cases with appendicitis and complicated appendicitis scored as high risk on pARC scoring (3).

The conformance between the Alvarado score and the pARC was 55%, but according to the Kappa conformance statistical test, the Kappa conformance value between the two scoring systems was only 13.5κ and not statistically significant (p value = 0.492). These results are similar to those by Gudjonsdottir et al. (2020) which found that the sensitivity of the Alvarado scoring system was 84.1%, compared with 39.8% for the pARC (3).

The conformance between the PAS and the Alvarado score was 75%. However, according to the Kappa conformance statistical test, the Kappa conformance value between the two scoring systems was only 46.8κ and statistically significant (p value = 0.013). These results are similar to findings of a study by Pogorelić et al. (2015) who found that there was no significant difference between Alvarado score (sensitivity, 89%; specificity, 59%; positive predictive value, 93.1%) and PAS (sensitivity, 86%; specificity, 50%; positive predictive value, 90.1%)(31).

Limitation

This research has never been done before, hence there is no comparable data. Our data are limited by small sample size despite we have taken the entire sample from our hospital.

Conclusion

In conclusion, considering the three scoring systems analyzed for use in the diagnosis of appendicitis in children, we have found that the PAS has an advantage over the others with 46.8κ conformance with the Alvarado scoring system and 19.4κ conformance with the pARC scoring system. From the analysis conducted here, the author recommends the use of the PAS and Alvarado scoring systems in screening for appendicitis in children due to the evidence based medicine behind the questionnaires and ease of use.

References

1. Smith J, Fox SM. Pediatric abdominal pain: an emergency medicine perspective. Emerg Med Clin North Am 2016; 34(2): 341–361.
2. Koberlein GC, Trout AT, Rigsby CK, Iyer RS, Alazraki AL, Anupindi SA, et al. ACR Appropriateness Criteria® suspected appendicitis-child. J Am Coll Radiol 2019; 16(5): S252–263.
3. Gudjonsdottir J, Marklund E, Hagander L, Salö M. Clinical prediction scores for pediatric appendicitis. Eur J Pediatr Surg 2020; 30(3): 1–9.
4. Rentea RM, Peter SDS. Pediatric appendicitis. Surg Clin NA 2017; 97(1): 93–112.
5. Aneiros B, Cano I, García A, Yuste P, Ferrero E, Gómez A. Pediatric appendicitis: age does make a difference. Rev Paul Pediatr 2019; 37(3): 318–324.
6. Prada AM, Salgado BA, Montero SM, Fernández EP, García SS, Gómez VJ, et al. Appendicitis versus non-specific acute abdominal pain: Paediatric Appendicitis Score evaluation. An Pediatr 2018; 88(1): 32–38.
7. Stringer MD. Acute appendicitis. J Paediatr Child Health 2017; 53(11): 1071–1076.
8. 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): 523–551.
9. Chung PHY, Dai K, Yang Z, Wong KKY. Validity of Alvarado Score in predicting disease severity and postoperative complication in pediatric acute appendicitis. World J Pediatr Surg 2019; 2(1): e000003.
10. Craig S, Dalton S. Diagnosing appendicitis: what works, what does not and where to go from here? J Paediatr Child Health 2016; 52(2): 168–173.
11. Rentea RM, Peter SDS, Snyder CL. Pediatric appendicitis: state of the art review. Pediatr Surg Int 2017; 33(3): 269–283.
12. Almaramhy HH. Acute appendicitis in young children less than 5 years: review article. Ital J Pediatr 2017; 43: 1–9.
13. Macco S, Vrouenraets BC, de Castro SMM. Evaluation of scoring systems in predicting acute appendicitis in children. Surg (United States) 2016; 160(6): 1599–604.
14. Choi YM, Moulton S. Making the diagnosis: the use of clinical features and scoring systems. In: Hunter CJ, ed. Controversies in pediatric appendicitis. Cham: Springer; 2019: 13–21.
15. Ahmed E-S. Prognostication of pediatric appendicitis with three scoring systems. Life Sci J 2017; 14(6): 17–24.
16. Cotton DM, Vinson DR, Vazquez-Benitez G, Margaret Warton E, Reed ME, Chettipally UK, et al. Validation of the Pediatric

Appendicitis Risk Calculator (pARC) in a community emergency department setting. Ann Emerg Med 2019; 74(4): 471–480.
17. Kharbanda AB, Vazquez-Benitez G, Ballard DW, Vinson DR, Chettipally UK, Kene MV, et al. Development and validation of a novel pediatric appendicitis risk calculator (pARC). Pediatrics 2018; 141(4): e20172699.
18. Badebarin D, Parsay S, Aslanabadi S. Alvarado vs. Pediatric Appendicitis Score (PAS) in acute appendicitis of keywords. Iran J Pediatr Surg 2020; 6(1): 1–9.
19. Windy C, Sabir M. Perbandingan antara suhu tubuh, kadar leukosit, dan Platelet Distribution Width (PDW) pada apendisitis akut dan perforasi. J Kesehat Tadulako 2016; 2(2): 24–32. (In Indonesian).
20. Al-Rudaini MAL, Al-Bayati KFK, Moayad Z, Altaee Y. Evaluation of Pediatric Appendicitis Score in predicting appendicitis. Iraqi Postgrad Med J 2018; 17(3): 255–261.
21. Iurii B, Vahtang G, Alin B. Acute appendicitis. Mold Med J 2018; 61(2): 28–37.
22. Dhruv KK, Singh KK, D.R. P, U.S. P. Paediatric appendicitis scoring: a useful guide to diagnose acute appendicitis in children. Int Surg J 2016; 3(1): 84–89.
23. Sytnik OL, Leonov VV, Petrenko VJu. Surgery. Emergency abdominal surgery: study aid recommended by the Ministry of Education, Science, Youth and Sports of Ukraine. Sumy: Sumy State University; 2012.
24. Chandrashekar S, Lokesh MG, Avinash SR. Prevalence of perforated appendicitis and its determinants in pediatric appendicitis patients admitted in tertiary care centre, South India: a cross sectional study. Int Surg J 2018; 5(12): 3926.
25. Jamaluddin M, Sma H, Ahmad H. Acute appendicitis with normal total leukocyte count. J Surg Acad 2013; 3(1): 2–6.
26. Kwan KY, Nager AL. Diagnosing pediatric appendicitis: usefulness of laboratory markers. Am J Emerg Med 2010; 28(9): 1009–1015.
27. Grönroos JM. Clinical suspicion of acute appendicitis is the time ripe for more conservative treatment? Minim Invasive Ther Allied Technol 2011; 20(1): 42–45.
28. Atema JJ, Gans SL, Beenen LF, Toorenvliet BR, Laurell H, Stoker J, et al. Accuracy of white blood cell count and c-reactive protein levels related to duration of symptoms in patients suspected of acute appendicitis. Soc Acad Emerg Med 2015; 22: 1015–1024.
29. Kharbanda AB, Cosme Y, Liu K, Spitalnik SL, Dayan PS. Discriminative accuracy of novel and traditional biomarkers in children with suspected appendicitis adjusted for duration of abdominal pain. Acad Emerg Med 2011; 18(6): 567–574.
30. Wu HP, Yang WC, Wu KH, Chen CY, Fu YC. Diagnosing appendicitis at different time points in children with right lower quadrant pain: comparison between pediatric appendicitis score and the alvarado score. World J Surg 2012; 36(1): 216–221.
31. Pogorelić Z, Rak S, Mrklić I, Jurić I. Prospective validation of Alvarado score and pediatric appendicitis score for the diagnosis of acute appendicitis in children. Pediatr Emerg Care 2015; 31(3): 164–168.

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