Comparison of RIPASA and Alvarado scores for the diagnosis of acute appendicitis

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ABSTRACT

Introduction: The accuracy of the Alvarado score in diagnosing acute appendicitis in an Asian population has been disappointingly low. We prospectively compared the RIPASA score with the Alvarado score for the diagnosis of acute appendicitis.

Methods: 200 consecutive patients who presented to the Accident and Emergency Department with right iliac fossa pain were recruited in the study. Both the RIPASA and Alvarado scores were derived, but decisions for appendicectomy were based on clinical judgement. Receiver operating curve (ROC), sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for both scoring systems were calculated.

Results: Only 192 out of the 200 patients who satisfied the inclusion and exclusion criteria were included in the analysis. At the optimal cut-off threshold score of 7.5 derived from the ROC, the sensitivity, specificity, PPV, NPV and diagnostic accuracy of the RIPASA score were 98.0 percent, 81.3 percent, 85.3 percent, 97.4 percent and 91.8 percent, respectively. At the cut-off threshold score of 7.0 for the Alvarado score, the sensitivity, specificity, PPV, NPV and diagnostic accuracy were 68.3 percent, 87.9 percent, 86.3 percent, 71.4 percent and 86.5 percent, respectively. The RIPASA score correctly classified 98 percent of all patients confirmed with histological acute appendicitis to the high-probability group (RIPASA score greater than 7.5) compared with 68.3 percent with the Alvarado score (Alvarado score greater than 7.0; p-value less than 0.0001).

Conclusion: The RIPASA score at a cut-off threshold total score of 7.5 is a better diagnostic scoring system than the Alvarado score for the diagnosis of acute appendicitis in our local setting.

Keywords: acute appendicitis, appendicectomy, diagnostic technique, surgical, symptoms

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INTRODUCTION

The Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score is a new diagnostic scoring system developed for the diagnosis of acute appendicitis and has been shown to have significantly higher sensitivity, specificity and diagnostic accuracy than that reported for the Alvarado or Modified Alvarado scores, particularly when the latter two scores were applied in an Asian or oriental population.[1,2] Although the RIPASA score is more extensive than the Alvarado score, it is simple to apply and has several parameters that are absent in the Alvarado score, such as age, gender and duration of symptoms prior to presentation. These parameters have been shown to affect the sensitivity and specificity of the Alvarado and Modified Alvarado scores.[3] The RIPASA score consists of 14 fixed generalised parameters, with an additional parameter that is specific to our local population. We prospectively compared the RIPASA score with the Alvarado score by applying both scores to patients who presented to our Accident and Emergency (A&E) Department with right iliac fossa (RIF) pain and who were suspected of acute appendicitis.

METHODS

200 consecutive patients who presented to the A&E Department of Raja Isteri Pengiran Anak Saleha (RIPAS) Hospital for a period of eight months from November 2008 to June 2009 with RIF pain and who were suspected of acute appendicitis were recruited into the study. The inclusion criteria were patients of all age groups presenting with RIF pain and with suspicion of acute appendicitis. Patients who presented with non-RIF pain and those who had been admitted previously for other complaints, but who subsequently developed RIF pain during their admission episodes were excluded from the study. Ethical approval to conduct the study was granted by the Medical and Health Review Ethics Committee at RIPAS Hospital.

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RIPAS APPENDICITIS (RIPASA) SCORE

PATIENT'S NAME:_____ AGE: _____

IC NO:_____ MRN NO:_____

Date of Assessment							
Time of Assessment							
	Score	Score	Score	Score	Score	Score	Score
Patient's Demographic							
Female	*0.5*						
Male	*1.0*						
Age < 39.9 yrs	*1.0*						
Age > 40 yrs	*0.5*						
Symptoms							
RIF pain	*0.5*						
Pain migration to RIF	*0.5*						
Anorexia	*1.0*						
Nausea & Vomiting	*1.0*						
Duration of symptoms < 48 hrs	*1.0*						
Duration of symptoms > 48 hrs	*0.5*						
Signs							
RIF tenderness	*1.0*						
Guarding	*2.0*						
Rebound tenderness	*1.0*						
Rovsing's Sign	*2.0*						
Fever >37ºC, <39ºC	*1.0*						
Investigations							
Raised WCC	*1.0*						
Negative urinalysis	*1.0*						
Additional Scores							
Foreign NRIC	*1.0*						
Total							

Total score is achieved by adding all the score for each category together. Additonal score is added for patient with foriegn NRIC.

Guidelines for management according to total score:

- *< 5 = Probability of acute appendicitis is unlikely; observe patient in A&E Dayward and repeat scoring after 1–2 hrs. If reducing score, discharge. If increasing score, treat according to score level.*
- *5–7.0 = Low probability of acute appendicitis; observe in A&E Dayward and repeat scoring after 1–2 hrs or perform abdominal ultrasound investigations to rule out acute appendicitis. Patients may need admission for observations, discussed with surgeon on-call.*
- *7.5–11.0 = Probability of acute appendicitis is high; refer patient to on-call surgeon for admission and repeat score in 1–2 hrs time. If remains high, prepare patient for appendicectomy procedure. In female patients, suggest perform abdominal ultrasound investigations to rule out gynaecological causes of RIF pain.*
- *> 12 = Definite acute appendicitis; refer to surgeon on-call for admission and appendicectomy.*

Date of Appendicectomy: …… Histology: ……

Signature of surgeon confirming diagnosis: …… Name: ……..

PLEASE SCORE BY TICKING OFF PARAMETERS THAT ARE PRESENT. ONCE COMPLETED, PLEASE ATTACHED THIS FORM TO PATIENT'S NOTES. ON DISCHARGE, PLEASE REMOVE FROM PATIENT'S NOTES AND FILED IT INTO THE RIPASA SCORE STUDY FOLDER FOR COLLECTION BY STUDY COORDINATOR. THANK YOU. PROPERTY OF DEPARTMENT OF SURGERY.

Fig. 1 RIPASA score sheet. Actual scores for each parameter and the guidelines (in italics) were removed from the RIPASA evaluation score sheet used in this study.

ALVARADO APPENDICITIS SCORING SYSTEM

PATIENT'S NAME:_____

IC NO:_____ MRN NO:_____

Date of Assessment							
Time of Assessment							
	Score	Score	Score	Score	Score	Score	Score
Symptoms							
Pain migration to RIF	*1*						
Anorexia	*1*						
Nausea & Vomiting	*1*						
Signs							
RIF tenderness	*2*						
Rebound tenderness	*1*						
Fever	*1*						
Investigations							
Raised WCC	*2*						
Shift of WCC to left	*1*						
Total Score							

Total score is achieved by adding all the score for each category together.

Date of Admission:…….. Date of Discharge:……

Diagnosis:……

Date of Appendicectomy: …… Histology: ……

Signature of surgeon confirming diagnosis: …… Name: ……..

PLEASE SCORE BY TICKING OFF PARAMETERS THAT ARE PRESENT. ONCE COMPLETED, PLEASE ATTACHED THIS FORM TO PATIENT'S NOTES. ON DISCHARGE, PLEASE REMOVE FROM PATIENT'S NOTES AND FILED IT INTO THE RIPASA SCORE STUDY FOLDER FOR COLLECTION BY STUDY COORDINATOR. THANK YOU. PROPERTY OF DEPARTMENT OF SURGERY.

Fig. 2 Alvarado score sheet. Actual scores for each parameter (in italics) were removed from the Alvarado evaluation score sheet used in this study.

Upon admission, both the RIPASA and Alvarado scores were performed by completion of the score sheets as shown in Figs. 1 and 2, respectively. The RIPASA score sheet consisted of 14 fixed parameters as previously evaluated, with an additional parameter for patients who held foreign national record of identity card (NRIC) (Fig. 1).[1] The Alvarado score sheet contained the standard eight parameters (Fig. 2). Neither of the evaluation score sheets used during the study contained the actual scores and guidelines as shown in Figs. 1 and 2 (in italics), so that the total scores would not bias the judgement of the admitting surgeon with respect to appendicectomy, which was still solely based on the surgeon's own clinical judgement for this prospective comparison study.

In cases of patients observed in the A&E day ward, the initial and subsequent scorings were performed by an A&E Senior Medical Officer. After admission to the general surgical ward, scoring was carried out by the admitting surgeon. Only scores derived by a surgeon of the grade of Senior Medical Officer and above were considered. Scoring was performed at every review (which was at the discretion of the attending doctor) or at the next morning round if the patient was admitted in the early hours of the morning, until a decision was made for either appendicectomy or continued conservative observation/treatment. At discharge, all completed forms were removed from the patients' notes by the ward clerk and kept in a RIPASA study folder, which were later collected by the study coordinator at regular intervals. Data regarding patients' admission and discharge dates, date of appendicectomy, if performed, name and signature of the confirming surgeon, postoperative complications and radiological investigations used, if any, were recorded in the score sheet. All histological confirmations of appendicular specimens obtained the from the emergency appendicectomy were reviewed by a single senior pathologist at RIPAS hospital.

Patients who were treated conservatively and subsequently discharged were reviewed once in the surgical outpatient clinic a week after discharge, while those who were discharged from A&E were reviewed at the A&E clinic. All patients with true negative RIPASA and true Alvarado score status were contacted via telephone within a month to confirm their true negative status as well as to verify that they had not been re-admitted and undergone emergency appendicectomy at RIPAS or another hospital. All pathological specimens were sent to the Department of Histopathology at RIPAS hospital, and confirmation of true negatives was further corroborated by cross checking the patient's name to the specimens.

Receiver operating curves (ROCs) at the optimal cut-off threshold score of 7.5 for the RIPASA score and 7.0 for the Alvarado score were derived using

Table I. Patients' demographics (n = 192).

Demographic	No. (%)
Gender	
Male	92 (47.9)
Female	100 (52.1)
Mean age ± SD (yrs)	25.1 ± 12.7
Ultrasonography investigations	46 (24.0)
Male	12 (26.1)
Female	34 (73.9)
Total emergency appendicectomy	131 (68.2)
Confirmed histology for acute appendicitis	101 (77.1)
Negative histology for acute appendicitis	30 (22.9)
Mean hospital stay ± SD; range (days)	4.3 ± 2.0; 1–18
Perforated appendicitis	8 (6.1)
Postoperative complication	10 (7.6)
Superficial wound infection	5 (50.0)
Intra-abdominal sepsis/bowel obstruction	4 (40.0)
Haematuria secondary to urinary catheter trauma	1 (10.0)
Patients discharged alive	192 (100)

SD: standard deviation

StatsDirect statistical software version 2.7.2 (StatsDirect Ltd, Cheshire, UK). Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy at the optimal cut-off threshold scores were derived from the ROCs for both the RIPASA and Alvarado scores. Predicted negative appendicectomy rates for both scores were calculated and compared using Chi-square test for statistical analysis. All continuous variables were analysed using unpaired student's *t*-test so as to compare the differences between the groups.

RESULTS

Of the 200 patients recruited, only 192 patients satisfied the study inclusion and exclusion criteria. The demographics of these 192 patients are shown in Table I. The mean age of the patients (92 male, 100 female) was 25.1 ± 12.7 years. Ultrasonography was performed in only 46 out of the 192 patients (24%), with 73.9% of the procedures conducted in female patients (Table I). The majority of the ultrasonography procedures were performed in patients with RIPASA score < 7.5 (58.3%) or Alvarado score < 7.0 (75%) (Table II). 131 patients underwent emergency appendicectomy based on the surgeons' clinical judgement. Out of these, only 101 cases were confirmed histologically for acute appendicitis, and eight (6.1%) cases had perforated appendicitis (Table I). 30 cases were negative for acute appendicitis, and histology specimens showed normal appendix in 23 patients and periappendicitis (a condition characterised by inflammation localised to the serosa only) in seven patients, indicating a negative appendicectomy rate of 22.9%. The mean duration of hospital stay was 4.3 ± 2.0 (range 1–18) days.

Ten out of 131 (7.6%) patients who underwent emergency appendicectomy developed postoperative complications (Table I). All 192 patients were discharged alive. Table II shows the distribution of the 192 patients in four groups according to the RIPASA score at a cut-off threshold score of 7.5 and the Alvarado score at a cut-off threshold of 7.0. The RIPASA score correctly classified 99 (98.0%) patients confirmed with histological acute appendicitis to the high-probability group (RIPASA score > 7.5) compared with 69 (68.3%) patients with Alvarado score > 7.0 (Table II, $p < 0.0001$). The 32 patients who were missed by the Alvarado score were classified wrongly into the false negative group with Alvarado score < 7.0. This number was significantly higher than those wrongly classified as false negative by the RIPASA score (Table II, $p < 0.0001$).

Both the RIPASA and Alvarado scores correctly classified 74 (81.3%) and 80 (87.9%) patients without acute appendicitis into the true negative group with scores < 7.5 and < 7.0, respectively. There was no statistical significance between the true negative groups and no difference in the mean age among all four groups ($p = 0.6$). The mean total RIPASA scores for each group are shown in Table II. True positive cases achieved mean total RIPASA scores of 10.2 ± 1.8 (range 7.5–15), while true negative cases had mean scores of 5.8 ± 0.9 (range 3.5–7.0). The eight patients with perforated appendicitis had a mean RIPASA score of 10.2 ± 2.3 (range 8–14.5). Hospital stay was significantly longer in both the true positive and false positive groups compared to the true negative group (Table II, $p < 0.0001$), which corresponded with the longer postoperative period observed in the former, following emergency appendicectomy.

At the optimal cut-off threshold score of 7.5 for the RIPASA score, the calculated sensitivity and specificity were 98.02% (95% confidence interval [CI] 93.03%–99.76%) and 81.32% (95% CI 71.78%–88.72%), respectively compared with 68.32% (95% CI 58.31%–77.22%) and 87.91% (95% CI 79.40%–93.81%), respectively for Alvarado score at an optimal cut-off threshold of 7.0 (Table III). The PPV and NPV for the RIPASA score were 85.34% and 97.37%, respectively compared with 86.25% and 71.43%, respectively for the Alvarado score (Table III). The NPV was significantly higher for the RIPASA score compared to that for the Alvarado score ($p < 0.0001$).

The diagnostic accuracy was 91.83% (95% CI 87.63%–96.04%) for the RIPASA score and 86.51% (95% CI 81.41%–91.62%) for the Alvarado score, showing a

Table II. Distribution of patients according to RIPASA and Alvarado scores.

	True positive		False positive		True negative		False negative	
	RIPASA > 7.5	Alvarado > 7.0	RIPASA > 7.5	Alvarado > 7.0	RIPASA < 7.5	Alvarado < 7.0	RIPASA < 7.5	Alvarado < 7.0
Sample size	99	69	17	11	74	80	2	32
Male:female	64:35	39:30	5:12	4:7	23:51	24:56	0:2	25:7
Mean age ± SD (yrs)	26.1 ± 14.0	26.1 ± 14.9	23.4 ± 10.6	20.5 ± 9.7	24.5 ± 11.4	24.7 ± 11.1	20 ± 4.2	25.8 ± 11.7
Total score ± SD; range	10.2 ± 1.8; 7.5–15	8.0 ± 0.9; 7.0–10	9.4 ± 1.3; 7.5–11.5	7.6 ± 0.9; 7.0–10.0	5.8 ± 0.9; 3.5–7.0	4.2 ± 1.3; 2.0–6.0	5.5 ± 0.7; 5–6	5.4 ± 0.9; 2.0–6.0
Mean hospital stay ± SD; range (days)	5.1 ± 2.2;* 2–18	5.3 ± 2.6;* 2–18	4.5 ± 1.2;# 3–8	4.3 ± 1.8; 1–8	3.2 ± 1.0;*# 1–8	3.3 ± 1.1; 17	4.0 ± 1.4; 3–5	4.5 ± 0.9; 3–6

* Comparison of hospital stay between true positive and true negative groups ($p < 0.0001$). # Comparison of hospital stay between false positive and true negative groups ($p < 0.001$).
RIPASA: Raja Isteri Pengiran Anak Saleha Appendicitis; SD: standard deviation

Table III. Comparison between the RIPASA and Alvarado scoring systems with respect to different variables.

Variable	Score in % (95% CI)		p-value
	RIPASA > 7.5	Alvarado > 7.0	
Sensitivity	98.02 (93.03–99.76)	68.32 (58.31–77.22)	< 0.0001
Specificity	81.32 (71.78–88.72)	87.91 (79.40–93.81)	
Positive predictive value	85.34	86.25	
Negative predictive value	97.37	71.43	< 0.0001
Diagnostic accuracy	91.83 (87.63–96.04)	86.51 (81.41–91.62)	< 0.0001
Negative appendicectomy rate	14.7	13.8	0.8

RIPASA: Raja Isteri Pengiran Anak Saleha Appendicitis; CI: confidence interval

difference of 5.32% (Fig. 3 shaded area, $p < 0.0001$), which was statistically significant. This difference of 5.32% equates to a total of 30 (15.6%) patients with confirmed histological acute appendicitis who were missed from being diagnosed by Alvarado score (Fig. 3). The predicted negative appendicectomy rates for both the RIPASA and Alvarado scores were 14.7% and 13.8% respectively, which was not statistically significant (Table III, $p = 0.8$). For the RIPASA score, an 8.2% reduction was achieved from the raw data of 22.9% (Table I); however, this was also not statistically significant ($p = 0.3$).

DISCUSSION

Acute appendicitis is one of the most common surgical emergencies encountered by junior surgeons on-call, with emergency appendicectomy making up one in ten of all emergency abdominal surgeries.[4,5] A quick and correct diagnosis of acute appendicitis leading to early appendicectomy and avoidance of complications arising from perforation can be difficult at times. Radiological modalities such as computed tomography (CT) imaging further aid in making a definite diagnosis and have been reported to have high sensitivity (94%) and specificity (95%) for diagnosing acute appendicitis.[6] Thus, in most large hospitals, it is routine to request for CT imaging in all patients suspected of acute appendicitis.[7] However, such routine practice will inflate the cost of healthcare substantially. Furthermore, the process of arranging for CT imaging may cause further delay for emergency appendicectomy. A recent study has suggested that such indiscriminate use of CT imaging may lead to the detection of early low-grade appendicitis and unnecessary appendicectomies in a condition that would otherwise have resolved spontaneously with antibiotics therapy.[8]

The Alvarado score, which was developed in 1986, was a simple additive scoring system to help with the diagnosis of acute appendicitis.[9] Although it showed very good sensitivity and specificity when applied in a Western population, several subsequent studies have shown its limitations when applied in an Asian or Oriental population.[10-12] As a result, we developed a new scoring system called the RIPASA score, which is a more extensive yet simple additive scoring system consisting of 14 fixed parameters and an additional parameter (NRIC) that is unique to our population setting. All these 15 parameters are easily obtainable from a good clinical history, examination and investigations. In a retrospective study, the RIPASA score has been shown to achieve better sensitivity (88%) and specificity (67%) than the Alvarado score (sensitivity 59%, specificity

Table IV. Guidelines for decision-making in the management of patients suspected of acute appendicitis according to the RIPASA scoring system.

Total RIPASA score	Decision-making guidelines
< 5.0	Probability of acute appendicitis is unlikely; observe patient in A&E day ward and repeat score after 1–2 hrs; if reducing score, discharge. If increasing score, treat according to score level.
5.0–7.0	Low probability of acute appendicitis; observe in A&E day ward and repeat scoring after 1–2 hrs or perform abdominal ultrasonography investigations to rule out acute appendicitis. Patients may need admission for observations; discuss with on-call surgeon.
7.5–11.5	Probability of acute appendicitis is high; refer patient to on-call surgeon for admission and repeat score in 1–2 hrs. If still high, prepare patients for appendicectomy procedure. In female patients, suggest abdominal ultrasonography investigations to rule out gynaecological causes of RIF pain.
≥12	Definite acute appendicitis; refer to on-call surgeon for admission and appendicectomy.

RIPASA: Raja Isteri Pengiran Anak Saleha Appendicitis; RIF: right illac fossa; A & E: Accident & Emergency

23%) in an Asian population.[1] This study compared the RIPASA and Alvarado scores in our patient population who presented with RIF pain and who were suspected of acute appendicitis. The RIPASA score considerably better than the Alvarado score in terms of correctly diagnosing patients with acute appendicitis (sensitivity and diagnostic accuracy) as well was found to be as those who were negative for acute appendicitis (NPV).

Using the RIPASA score, 98.0% of patients who actually had acute appendicitis were correctly diagnosed and placed in the high-probability group (RIPASA score > 7.5) and managed appropriately, compared to only 68.3% when using the Alvarado score on the same population sample. Thus, the Alvarado score failed to diagnose 15.6% of patients (n = 30) with acute appendicitis and wrongly classified them in the low-probability group (Alvarado score < 7.0). The difference in diagnostic accuracy of 5.32% between the RIPASA score and Alvarado score was statistically significant (Fig. 3, $p < 0.0001$), indicating that the RIPASA score is a much better diagnostic tool for the diagnosis of acute appendicitis in our patient population, which is representative of a Southeast Asian population group. Similarly, for patients who were classified in the low-probability group, i.e. true negative group with RIPASA score < 7.5 and Alvarado score < 7.0, the RIPASA score again outperformed the Alvarado score by correctly diagnosing 97.4% of patients who did not have acute appendicitis, compared with the Alvarado score, which only managed to correctly diagnose 71.4% ($p < 0.0001$).

The RIPASA score is a useful, rapid diagnostic tool for acute appendicitis, especially in the settings of the A&E, as it requires only the patient's demographics (age, gender and nationality, which are all available on registration), a good clinical history (RIF pain, migration to RIF, anorexia, nausea and vomiting), clinical examination (RIF tenderness, localised guarding, rebound tenderness, Rovsing's sign and fever) and

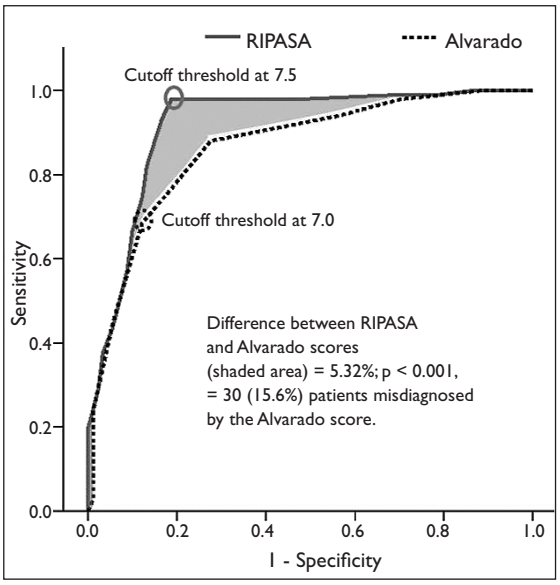

Fig. 3 ROC plots for the RIPASA score and Alvarado score. Area under the curve (diagnostic accuracy) for the RIPASA score is 0.9183 (91.83%), which is greater than that for the Alvarado score, which is 0.8651 (86.51%). The difference in the area (shaded) under the curve of 0.0532 (5.32%) is significant between the two scoring systems ($p < 0.0001$), which equates to 30 (15.6%) patients with acute appendicitis who were misdiagnosed using the Alvarado score compared to the RIPASA score.

two simple investigations (raised white cell count and negative urinalysis performed at triage, which is defined as an absence of red and white blood cells, bacteria and nitrates). 84% of patients could be placed correctly into either a high-probability or low-probability of acute appendicitis upon completion of clerking, examination and urinalysis without having to wait for the results of the white cell count. In fact, for this study, only 7% of patients had to wait for a raised white cell count before being classified into a high-probability group.

Thus, in an A&E setting, the casualty officer can make a quick decision upon seeing patients with RIF pain, by referring those with a RIPASA score > 7.5 to the on-call surgical team for admission, while patients with a RIPASA score < 7.0 can either be observed in the

unit's day ward or discharged with an early clinic review appointment, as suggested by the guidelines in Table IV. The use of a numerical score also improves the working relationships between the casualty officer and the on-call surgeon, since any patient with a RIPASA score ≥ 7.5 needs to be admitted. Based on the findings of this study, our hospital admission of patients with RIF pain during this eight-month period could be reduced by up to 40% if patients with a RIPASA score < 7.0 were managed mainly in the A&E day ward and subsequently discharged if their score remained low, resulting in substantial healthcare cost savings. With its high sensitivity (98%) and NPV (97.4%), the RIPASA score can also help to reduce unnecessary and expensive radiological investigations such as routine CT imaging, thus further helping to reduce annual healthcare expenditure.

Another new scoring system, the appendicitis inflammatory response score (AIRS) was reported in 2008 by Andersson and Andersson.[7] The AIRS system was more complicated, with 37%–96% sensitivity and 73%–99% specificity, depending on whether the cut-off threshold was set at > 4 or > 8.[7] Using the AIRS, 73% of the non-appendicitis patients (true negative and false positive) were classified to the low-probability group, while 67% of patients with advanced appendicitis (true positive and false negative) were classified to the high-probability group with high accuracy, in comparison with 98% and 81%, respectively for the RIPASA score. In AIRS, rebound tenderness and guarding were grouped together and varied from none to mild, moderate or severe. Such an arbitrary category may be open to inter-observer variation, as what is mild to one observer may be moderate to another.[7] However, a prospective comparison would need to be carried out in order to conclude whether the RIPASA score is superior to the AIRS scoring system.

In conclusion, the RIPASA score is currently a much better diagnostic scoring system for acute appendicitis compared to the Alvarado score, with the former achieving significantly higher sensitivity, NPV and diagnostic accuracy, particularly in our population setting, which is typical of a Southeast Asian population. The 14 fixed parameters can be easily and rapidly obtained in any population setting by taking a complete history, and conducting a clinical examination and two simple investigations. In 93% of the patients, a quick decision can be made with regard to a referral to an on-call surgical team, discharge or further observations. The option of having additional parameters makes the RIPASA score more flexible and adaptable to different geographical regions. In terms of healthcare cost savings, the use of RIPASA score may help to reduce unnecessary inpatient admissions and expensive radiological investigations.

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