Introduction: There is inherent difficulty in the diagnosis of appendicitis in children presenting to the emergency department with abdominal pain. The concern is that missing the diagnosis can result in perforation, morbidity, and death, while the ability to definitively diagnose appendicitis, if present, would result in unnecessary radiation exposure, unwarranted surgery, and potential postsurgical complications. The Pediatric Appendicitis Score was created by Samuel from England based on a cohort of children ages 4-15 years old to determine common symptoms, physical exam findings, and lab results most consistent with the proper diagnosis of acute appendicitis.

Purpose:

Research Question: The aim of the study was to prospectively validate the Pediatric Appendicitis Score in a large group of pediatric patients presenting with abdominal pain to the emergency department.

Hypothesis: Application of the Pediatric Appendicitis Score (which includes symptoms, physical exam findings, and lab results) will successfully aid in stratifying those pediatric patients with appendicitis from those without in pediatric patients presenting to the emergency department with complaint of abdominal pain.

Design:

Study Design: Prospective observational

Dependent variable: Proper diagnosis of appendicitis or lack thereof

Independent variable: Application of the PAS

Setting/Subjects:
Research Setting: Tertiary urban pediatric emergency department in Ontario, Canada, with 50,000 child visits per year with 24-hour coverage provided by a pediatric emergency medicine staff and an in-hospital pediatric surgery fellow. Time frame was September 1, 2003-March 31, 2005.

Subjects: Study population: Children ages 1-17 who presented with a chief complaint of abdominal pain present for 7 days or less

Exclusion Criteria: Children with a known diagnosis of appendicitis by ultrasound or CT on arrival to the ED, children with a history of previous appendectomy, children with abdominal pain of greater than 7 days duration

Study Group: those with appendicitis, n=123

Control Group: those without appendicitis, n=726

Demographics: all children ages 1-17; unknown specific ages, sex breakdown, races

No attrition within the study

Methods:

Interventions: Calculation of the PAS?

Study Groups: Study group is those with appendicitis, control group is those without appendicitis

Instruments/Data Collection:

The PAS was utilized, which includes a scoring system that ranges from 0-10. Components include: migration of pain (1), anorexia (1), nausea or vomiting (1), fever >38 (1), cough/percussion/hopping tenderness in the RLQ (2), right iliac fossa tenderness (2), leukocytosis >10k (1), PMNs >7500 (1).

- Staff physicians filled out a structured form that included the HPI, chronic illness, and findings on physical examination

- One research nurse collected information on laboratory test results and disposition

- One modification was made: not all patients had blood tests performed; if this was the case, a score was calculated on the basis of the history and physical examination alone

- For those patients admitted to the hospital, a research nurse reviewed the in-hospital chart, the surgical report after a surgery, and the pathology report if an appendectomy was performed. After 5-7 days, the research nurse conducted a follow-up call with the family to document final diagnosis after discharge from the ED or the hospital and to determine whether the family obtained further medical consultation.
Any children who still had abdominal pain at the time of the follow-up call were enrolled to the control group with the assumption that appendicitis would be expected to be diagnosed within 5-7 days of the onset of pain.

All data collected is summarized in Table 1

The only noted area of inconsistency with regard to data collection is that there were presumably various staff physicians who filled out the form with regard to HPI, chronic illness, and physical exam findings. Otherwise, one research nurse gathered the rest of the data.

Data Analysis:

Level of Data: Categorical (presence or lack of appendicitis)

Statistics Used: Pearson’s chi-squared test was used for comparison of frequencies and t tests or analysis of variance for comparisons of continuous variables. A receiver operating characteristic curve was used to assess sensitivity and specificity and optimal cut points for the PAS to diagnose appendicitis (Figure 1)

-Figure 2 represents the percentage of study and control groups as a function of the PAS.

Results:

The authors concluded that the mean score for those with appendicitis was 7 (median, SD, range was 7, 2.2, 2-10), and 1.9 (1, 1.9, 0-9). If the threshold for making the diagnosis of a lack of appendicitis had been a PAS < or = to 2, only 3 patients (2.4%) with appendicitis would’ve been sent home from the ED. If the threshold for making a diagnosis of appendicitis had been a PAS of > or = to 7, only 29 (4%) of patients without appendicitis would have undergone surgery.

-Table II reveals the sensitivity and specificity for PAS given various cutoff points

-a PAS >7 is valid for the diagnosis of appendicitis

-a PAS <2 is valid for the exclusion of appendicitis

-a PAS between 3-6 cannot accurately determine the diagnosis, and this group needs further imaging studies to determine the likely presence or absence of appendicitis

-This data does answers the original research question quite well

-Their data does seem valid based upon the data reported

Additional Findings: none

Other Possible Explanations For Findings: none
Limitations:

- There is significant subjectivity with regard to the staff physicians who fill out the structured form. People report abdominal tenderness differently even with the same physical exam. Furthermore, cough/percussion/hopping tenderness is also quite subjective.

- Children are not excellent at providing a great history (with regard to migration) nor physical exam (tenderness over the right iliac fossa, cough/percussion/hopping tenderness

- Fever >38 was not specified in terms of whether it had to be in-hospital or self-reported at home. What if the patient had been provided with antipyretics prior to arrival in the ED?

- Not every eligible patient was enrolled into the study

- Not all patients had blood testing done; if not, a PAS was calculated on the basis of history and physical examination alone, although it is unclear which scale was used (was it still out of 10 or did they lower it somehow)

Implications for Practice: Totally generalizable. The study is highly applicable to a broad range of pediatric patients.

Feasible: Completely free to do; all that is needed is knowledge of how to calculate the PAS. It does assess risks, although is not helpful with determining whether or not to image those was PAS between 3-6. There is no true cost associated with calculation of the PAS.

Clinically Relevant: HIGHLY!

Level of Evidence: Ready for use, IIB