Articles

Rachel Williams:
Kharbanda et al - Validation and Refinement of a Prediction Rule to Identify Children at Low Risk for Acute Appendicitis, Arch Pediatric Adolescent Medicine August 2012; Volume 166; Number 8

Casey Roeder:
Mittal et al - Performance of Ultrasound in the Diagnosis of Appendicitis in Children in a Multicenter Cohort

Ashleigh Kennedy:
Goldman et al - Prospective Validation of the Pediatric Appendicitis Score

All:
Saucier et al - Prospective Evaluation of a Clinical Pathway for Suspected Appendicitis, Pediatrics 2014; 133; e88

We discussed 4 articles dealing collectively with the diagnosis of acute appendicitis in children. This patient population is difficult due to the problems associated with history and physical examination in pre-verbal patients and the lifetime risk of ionizing radiation in this patient population.

The Kharbanda article involved a refinement of a previously described clinical decision rule (Low-Risk Appendicitis Rule) that was published previously. The original rule stated that if a pediatric patient had an absolute neutrophil count of less than 6750, did not have nausea, did not have maximal tenderness on exam in the RLQ, then appendicitis was unlikely and further imaging may not be necessary. Validation of this previously derived set of variables was conducted in this study to maximize sensitivity without affecting specificity. The goal was to create a rule for which the risk of appendicitis in the low-risk group approximated the false negative rate on CT (6-7.5%). For the validation study, a patient was low risk for appendicitis if:

1. They had an ANC of <6750 and no maximal tenderness in the RLQ or
2. They had an ANC of <6750 WITH maximal tenderness in the RLQ but no abdominal pain with walking/jumping or coughing

This rule refinement resulted in a sensitivity of 98.1% and a specificity of 23.7% and a negative predictive value of 95.3% in a patient population where 38.8% of patients had appendicitis.

Take Home: It may be possible to use clinical criteria/labs without imaging to identify a subset of pediatric patients in whom imaging is not warranted and expeditious outpatient follow up is preferred.

The Goldman article was a prospective validation of the previously described Pediatric Appendicitis Score (PAS). This score includes:
The study revealed that in a cohort of 849 children, of whom 14.5% had appendicitis, that the following cutoffs were useful:

PAS $\leq 2$, child unlikely (2.4%) to have appendicitis

PAS $>7$, child is likely to have appendicitis (found in 61% of children with appendicitis)

Take Home: This study suggests that using a PAS of $\leq 2$ to discharge without imaging, PAS 3-6 to image, and PAS $>7$ to bypass imaging and go straight to OR. The keys here are that to calculate a PAS, you need to have a WBC before putting in for imaging but may provide a framework for the workup of pediatric abdominal pain.

The Mittal study described the sensitivity and specificity of US for the diagnosis of appendicitis in children at multiple sites. The overall sensitivity of US for appendicitis in children was 72.5% (95% CI of 58.8-86.3%) and specificity was 97% (95% CI of 96.2-97.9%). The more a site used US, the better the test characteristics were and the study was highly accurate WHEN THE APPENDIX COULD BE VISUALIZED. The visualization rate in this study, across 10 centers was 469 of 965 (48.6%).

Take Home: US is useful as a diagnostic test but it’s test characteristics are dependent on operator skill. The more studies are done, the better centers performed. US was non-diagnostic (no appendix visualized in over 50% of cases which would then require CT imaging or admission for serial examinations.

The Saucier study described a clinical pathway for the diagnosis of appendicitis in children. Using the PAS score, 196 patients were risk stratified into one of 3 buckets: PAS 1-3 low risk (no imaging, home with 24 hour phone follow up), PAS 4-7 intermediate risk (US ordered as first diagnostic test), PAS 8-10, high risk (immediate pediatric surgical consultation). Of the 196 patients enrolled, 65 had appendicitis. Of the patients with a LR score 0 of 44 had an appy. Of the patients with an intermediate score, 37 of 119 had an appy and in the high risk group 28 of 33 had appendicitis. CT rate was 6.6%.

Take Home: Engaging our consultants to develop a clinical practice guideline that utilizes clinical data, laboratory data and judicious use of imaging seems safe and effective.

Take Home of the Take Home: Pediatric appendicitis is a tough disease. If it were easy, we’d have figured it out before. We have an obligation to not miss appendicitis in kids due to the morbidity and even mortality associated with delayed diagnosis. We also have an obligation to be stewards of the limited healthcare resources of the hospital and not expose children unnecessarily to ionizing radiation.