CRITICAL REVIEW FORM FOR THERAPY

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Citation:_ Kaiser et al. "Suspected Appendicitis in Children: US and CT- a prospective randomized study." ***Radiology***:_June 2002 223: 633-638

Guide	**Comments**	
I. Are the results of the study valid? **Did the experimental and control groups begin the study with a similar prognosis?**		
Primary Guides: 1. Were the patients randomized	Yes. From December 1999 to September 2000, 600 consecutive children, clinically suspected of having appendicitis, were randomly assigned to US only (283) or US plus CT (317) **after** being evaluated by a pediatric surgeon or a surgical resident.	
2. Was randomization concealed? (blinded)	No. After evaluation by surgery, these 600 children were randomly assigned to US only or US plus CT. The CT was always done after the US and one of 12 pediatric radiologists or 1 of nine senior residents interpreted results. The radiologists had the results of the US prior to reading the CTs. No description of randomization scheme.	
3. Were patients analyzed in the groups to which they were randomized?	• 4 pts in US only group had false negative findings. Additional CT was performed though which were positive for appendicitis- this was not included in the study. • 6 patients underwent appendectomy despite neg imaging results secondary to clinical presentation	
4.Were patients in the treatment and control groups similar with respect to known prognostic factors?	Prognostic factors between the two groups were not compared but the surgeons estimated the likelihood of each child having appendicitis on a scale from 0 to 100%. Additionally, they decided which tx would have been chose if no imaging studies were done.	
II. ***Did experimental and control groups retain a similar prognosis after the study started (answer the questions posed below)?***		
1. Were patients aware of group allocation?	Yes	
2. Were clinicians aware of group	Yes and results of u/s were known when CT was performed	

allocation?		
3. Were patients aware of group allocation?	Yes	
4. Was follow-up complete?	94% (327 of 328) of those treated nonsurgically completed questionnaire 6 months after ED visit. Ie. Outcomes, treatments at other facilities	
II. What are the results?		
1. How large was the treatment effect? a. What was the prevalence of appendicitis in the study population (pre-test prob.) b. Describe subject diagnostic test group assignments c. Sensitivity and Specificity of ultrasound? d. Sensitivity and Specificity of CT? e. Sensitivity and Specificity US + CT f. What are the likelihood ratios for each of the diagnostic interventions g. What are the post-test probabilities for positive and negative US and CT	a. Prevalence: 40.7% (244 of 600) b. 600 children enrolled. 283/600 assigned to us only, 317/600 assigned to us with ct. 244 had appendicitis (prevalence = 244/600= 40.7%) 252 subjects underwent laparotomy and 348 did not. 244 underwent appendectomy, 8 cases of appendicitis were treated with antibiotics alone for appendiceal abscess c. US: sens:80%; (CI 77-83) specif 94% (CI 92-96) d. CT: sens 97% (CI 94-99) specif 93% (CI 91-95) e. CT + US: sens 99% (CI 95-100); specif 89% (CI 87-90) f. Sensitivity or Positive LR for positive study US: Positive LR 13(CI 8.80, 20) CT: Positive LR : 14 (CI 8.22-23) CT plus US: Positive LR: 9.0 (CI 5.99-14) Specificity or Neg LR's for negative study US: Negative LR 0.21 (CI 0.17-0.27) CT: Negative LR= 0.03 (CI 0.01-0.09) CT plus US: Neg LR 0.01 (0.00-0.06) g. **Pretest Prob Posttest Prob** 40.7% (+ US with LR+ 13) → 90% 40.7% (+CT with LR+ 14) → 91% 40.7% (-US with LR- 0.21) → 13% 40.7% (-CT with LR- 0.03) → 2% h. Among the 317 who underwent both US and CT the	

h. Among subjects that underwent CT and US what was the discordance rate? Among the discordant cases what number did CT vs US diagnose correctly? i. What percentage of subjects had perforation? j. How accurate was the surgeons estimated pre-test probability for positive and negative appendicitis?	results were discordant in 50 (16%). Among these discordant findings CT was correct in 39 and US in 11. i. 52 OF 244 patients had perforation (21.3% of all appendicitis, 8.7% of all subjects) j. The surgeons predicted >75% likelihood of having appendicitis in 173 patients (28.8 % of all pts) but only 119 of these 173 (68.8%) had appendicitis. In 78/173(45.1%) physical signs were convincing enough that surgeons would have gone to OR if imaging were unavailable and 20/78 (25.6%) would have been a negative laparotomy. Surgeons predicted <50% likelihood of having appendicitis in 130 patients but 25 of these patients actually had appendicitis (19.2%)	
2. How precise was the treatment effect? (confidence intervals)? See above link which will calculate CI's for you	CT: positive test CI (8.29,24), (85%,- 94%) US:CI (8.88, 21), (86% -94%)	
III. How can I apply the results to patient care?		
1. Were the study patients similar to my patients?	The population itself was similar but in our institutions, we do not usually get a surgical evaluation prior to imaging results and we do not have experienced pediatric CT and u/s radiologists to read our studies. U/S may not even be available.	
2. Were all clinically important outcomes considered?	The investigators did look into alternative diagnose for these patients and had questionnaire followup for those discharge. ie. 1 pt with neg us/ and ct finding was diagnosed with appendiceal abscess 2 weeks later. this was considered as a false negative. another pt with neg u/s and ct was found to have acute appendicitis 3 months later. after statistical analysis, this was determined to be a true negative. Potential issues: - time delay between u/s and ct - radiation risk - 6/9 pts who underwent appendectomy had negative appendicitis despite neg imaging.	

1. Are the likely benefits worth the potential harms and costs? Clinical bottom line	U/S may be an appropriate initial choice study to diagnose appendicitis in children when combined with a surgical consultant as examiner and radiologist with expertise in interpreting appy by US. Ultrasound cannot reliably rule out the diagnosis of appendicitis in this data set.	

Clinical Bottom Line:
CT has significantly higher specificity as a study to 'rule out' acute appendicitis. Sensitivity appears to be sufficiently powered to consider US as an initial diagnostic test. If "negative" and with high clinical PTP for acute appendicitis, only CT has the specificity to "rule out" the disease.