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A simple algorithm to improve quality while reducing resource utilization in evaluation of suspected appendicitis☆

DR. MARK NOLAN HILL (Highland Park, Illinois): I applaud you, Dr. Esparaz, and your institution for getting the surgeon involved straight away. Even though ultrasound was first used to assess appendicitis in 1981 and developed into realtime graded compression with additional secondary signs introduced by Puylaert in '86, the imaging choice gravitated to CAT scan over the years until the appreciation of the effect of ionized and radiation upon young children. This has now muted the cavalier use of this modality.

As this is a particular interest of mine, please forgive me, Joe, the number of questions your paper generated. Did you stratify the ages of the pediatric population defined in your paper as less than 17 in terms of your algorithm for evaluation, especially with regard to their ability to provide a good history and reliable examination at different ages.

I believe you used Alvarado score of white count of 10,000 as your fulcrum for determining different options. Did you consider using the absolute neutrophil or band count in addition, particularly considering the normalcy range of the white count varies in the very young versus the teenager? Ultrasound for appendicitis is, to be sure, a realtime operator dependent procedure. Did the radiologist perform the exam or the technician? And who interpreted the exam, especially in the middle of the night? And were these radiologists dedicated ultrasonographers and perhaps in pediatrics? And, as you are aware, there's a great variability in level of competence. In hospitals that NightHawk their imaging, would you suggest another type of imaging, CAT scan or MRI? When did you obviate all imaging? Ultrasound remains the predominant imaging method outside the states.

And, finally, what pearl would you provide to all the surgeons in the community non-academic hospitals with regard to your findings?

DR. ESPARAZ: So first in terms stratification, we did not look at different age groups for, like, 17-year-olds that could actually explain their symptoms more versus kids. So we did not stratify it from that standpoint. When you mentioned the Alvarado score, yes, we did use the same 10,000 cut-off. I think the Alvarado score does have a lot more components to it and it doesn't necessarily link to the ultrasound being the next step in diagnosis or skipping to just the surgeon consult. So I think that the Alvarado score is a great score also. It's just this is even a simpler algorithm that may be used from a primary care physician's standpoint.

When we looked at neutrophils, we did look at those just for the ones that fell outside the outliers, so if it was less than 10,000, we did look to see if there were any left shifts. And the ones that I did bring up for the diagnosis of acute appendicitis, two of the patients did have left shifts with normal white counts; however, the ultrasounds on those did show that you mentioned, the secondary signs of appendicitis, which were helpful in those couple patients.

For the ultrasounds being performed, so at our institution, technicians do that overnight and radiology residents are reading those. We did see also a decrease or a more non-diagnostic ultrasound over the night shift, and in certain patients that we're doing now, we potentially even reorder an ultrasound in the morning where the pediatric sonographers are on board and the pediatric radiologists are in house.

From a community hospital standpoint or out of the hospital standpoint, additional imaging, I think we still need to weigh the risks and benefits of everything. There was this recent paper that came out this year that showed that still in pediatric populations, the increased risk of radiation is showing an increase in cancer, and I think as kids are young, they are going to be exposed to multiple CT scans throughout their lives. We have to keep that in mind. So I think ultrasound still would be a better option prior to doing a CT scan.

And, finally, for your last question, from a non-academic hospital or community hospital, I think the biggest thing is just to go back to the history and physical. I think we're focusing way too much on imaging, especially in the emergency room, and I think if we go back to that original history and physical, we can diagnose most of these cases without any supplementation.

DR. ALAN P. LADD (Indianapolis, Indiana): I want you to further explain your findings around the reduction of ultrasound by applying your algorithm to your data cohort and your achievement of a 51% reduction in the use of ultrasound. Is that assuming that the surgical consultation would be a hundred percent sensitive in the diagnosis of appendicitis?

DR. ESPARAZ: If we applied this, we would have a 51% decrease in the sense that white blood count of 10,000 or less wouldn't even need an ultrasound, and at that point would not necessarily even need a surgical evaluation.

DR. ANNA M. LEDGERWOOD (Detroit, Michigan): I'm a little confused here. Your abstract says that you reviewed 327 consecutive patients for suspected appendicitis. How many actually had appendicitis?

DR. ESPARAZ: Of those, 51 patients had appendicitis.

DR. LEDGERWOOD: 51 out of the 327?

DR. WILLIAM C. CIROCCO (Columbus, Ohio): So my two cents, this is geared towards surgical intervention. Does your group have any comment on the nonoperative approach, which is trending, for acute appendicitis?

DR. ESPARAZ: So we still believe that acute appendicitis is a surgical operation. I know there are several institutions looking at using antibiotics, but at our institution, we're still doing surgery.

☆ (Presentation given by Joseph Esparaz, M.D.)

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