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Reply to Letter: “Progress in the Diagnosis of Appendicitis”

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Reply

We thank Dr Rao for his letter regarding “Progress in the Diagnosis of Appendicitis: A Report From Washington State’s Surgical Care and Outcomes Assessment Program” (SCOAP),¹ in which he raised 3 main criticisms.

The first was that our results were skewed by excluding patients younger than 15 years. In fact, Luckmann’s classic epidemiologic paper shows a spike in incidence that begins in the 10- to 19-year-old age range and that only slowly decreases until the age of 30 to 40 years, when incidence drops substantially.² Our cohort included patients 15 years or older and should capture most cases of appendicitis. A second reason for choosing the age of 15 years as our starting point was an assumption that most patients 15 years or older would be managed without transfer to one of the state’s pediatric centers (which are not represented in the specific database utilized for this study). Although Bachur et al³ did show that negative appendectomy (NA) was similar among boys 5 years or older who received imaging compared with those who did not, that study’s hospital-level data are perhaps more instructive (and echo the findings of our 2008 SCOAP study⁴) in that hospitals where advanced imaging was more frequently utilized saw a decrease in NA among boys 5 years or older compared with those hospitals where imaging is used less frequently. This suggests that quality of imaging also plays an important role in reducing NA.

Dr Rao questions why advanced imaging was not associated with a decrease in perforated appendicitis. However, numerous publications now support the hypothesis that perforation is more often a prehospital event (before imaging would be expected to alter outcomes).^{5–7}

He also notes that different imaging protocols and indications were employed throughout the centers included in this study. We view this as a strength of our study, because clinicians sometimes view with skepticism results obtained within tertiary centers or rigorously protocolized clinical trials. In this diverse group of SCOAP hospitals, we found that NA was reduced for those patients who underwent preoperative imaging compared with those who did not. Perhaps more convincingly, this was a trend that was also evident over time (not just as a static comparison), which suggests that SCOAP’s focus on improving the quality of radiographic studies and interpretations drove a sustained diminution in NA.¹

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It is worth noting that 2 randomized controlled trials of mandatory imaging versus selective imaging in patients with suspected appendicitis demonstrated substantial reductions in NA.^{8,9} A model of routine imaging may not be appropriate for every setting, but a preponderance of experimental and observational data certainly suggest that routine imaging reduces unnecessary operations. Computed tomographic (CT) scan is highly accurate but does carry some risks. Malignancy risks related to radiation exposure are heavily dependent on age. Estimates based on epidemiologic studies of Japanese nuclear bomb survivors suggest that for children, one excess cancer will arise for approximately every 1000 abdominal CT scans, and for young adults (age 25–30 years), there is one excess cancer for every 2000 scans. The risk then decreases rapidly such that for patients 35 years or older, there is less than 1 excess malignancy for every 5000 scans.¹⁰ For every 1000 CT scans performed in the evaluation of suspected appendicitis, 100 or more patients may avoid unnecessary intra-abdominal surgery. Appendectomy is a relatively safe operation, but no surgical procedure is 100% complication-free. Costs versus benefits must be appropriately weighed, and as low-dose CT protocols become more prevalent and as high-quality ultrasound is employed more frequently (especially in younger patients), we predict that benefits will accrue more and more into the imaging column and that costs will decrease.

Dr Rao echoes a familiar lament that clinical skill and surgical expertise are being replaced by a reliance on “sophisticated imaging.” In most series, reliance on clinical findings alone results in approximately 15% of those with suspected appendicitis undergoing unnecessary operations; this number can be reduced below 5% when high-quality imaging is included in preoperative evaluations. Viewed this way, when we utilize these *tools*, we heighten rather than diminish our ability to make appropriate clinical decisions.

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