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Case based simulation in MRI for suspected appendicitis in children☆

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ABSTRACT

Purpose: To establish the effect on diagnostic confidence of a simulation setting, in which radiologists re-interpret anonymized pediatric MRI cases.
Materials: In this IRB-approved study, participants completed surveys rating confidence before and after interpreting 10 MRI cases for suspected appendicitis in children.
Results: 18 radiologists (4 faculty, 5 fellows, and 9 residents) correctly identified an average of 7.44 cases (range 5–9). Self-described confidence regarding technique and interpretation increased from 2.0 (SD 0.77) and 2.33 (SD 0.69) to 2.83 (SD 0.71) and 2.94 (SD 0.73), respectively.
Conclusion: Simulated interpretation of pediatric MRI in suspected appendicitis results in increased self-describe confidence without requiring additional capital/equipment expenses.

1. Introduction

Magnetic resonance imaging (MRI) is an established imaging modality for the detection and evaluation of diseases with an increasing demand in the pediatric emergency setting [1,2].

MRI offers a safer alternative to CT, and is central to strategies that try to limit the exposure of children to ionizing radiation. In acute appendicitis, the most common condition for urgent abdominal surgery in children, ultrasound is the preferred initial imaging modality followed by CT for inconclusive cases [3]. In the last few years, alternative imaging algorithms that incorporate magnetic resonance imaging (MRI) have been proposed [4–6]. MRI has been reported to be accurate for acute appendicitis in children and does not change time to antibiotic administration, time to appendectomy, negative appendectomy rate, perforation rate, or length of stay compared to CT [4,7–9]. However, plans to adopt MRI for suspected appendicitis in clinical practice might be hindered by unfamiliarity with the technology by the interpreting radiologist or by the residents and fellows, who operate independently after hours.

We developed a workstation simulation format for radiologists and radiologists-in-training, in which they re-interpret anonymized MRI studies in children with suspected appendicitis as if it were firsthand. The interpretation was followed by a “read out” session for trainees and key-image responses for faculty to replicate on-the-job learning. We sought to establish the effect on perceived diagnostic confidence of a simulation-based curriculum

2. Method and materials

This HIPAA compliant study was approved by our institution review board. We evaluated diagnostic performance and self-reported competence level on interpreting MRI for suspected appendicitis of radiologists and radiologists-in-training at a single stand-alone pediatric training hospital.

All participants were distributed a video lecture of MR for suspected appendicitis and completed pre-test surveys rating competence on their technical and interpretative skills regarding MRI for appendicitis using the following five-point scale: 1. Novice, 2. Advanced Beginner, 3. Competent, 4. Proficient, and 5. Expert. The categories were adapted from Benner's stages of clinical competence [10], as follows: Novice: No previous experience, lacks confidence and requires continual cues from supervisor. Advanced Beginner: marginally acceptable performance because of prior experience but requires occasional support. Competent: competence and efficiency is demonstrated. The reader is coordinated and has confidence in his/her actions. Reports are completed within a suitable time frame without supporting cues. Proficient: can now recognize abnormalities, fit them into a category and develop a plan without supervision. Expert: deep understanding of the situation.

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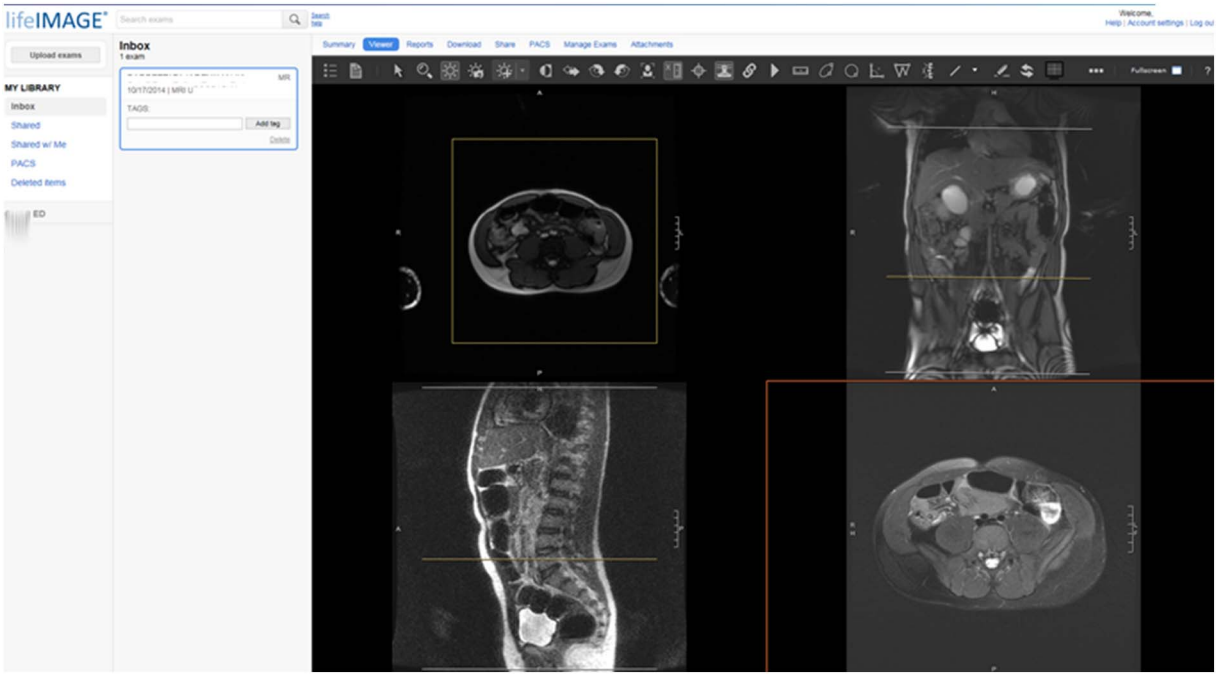

Fig. 1. Standard PACS viewer tool use during the simulation.

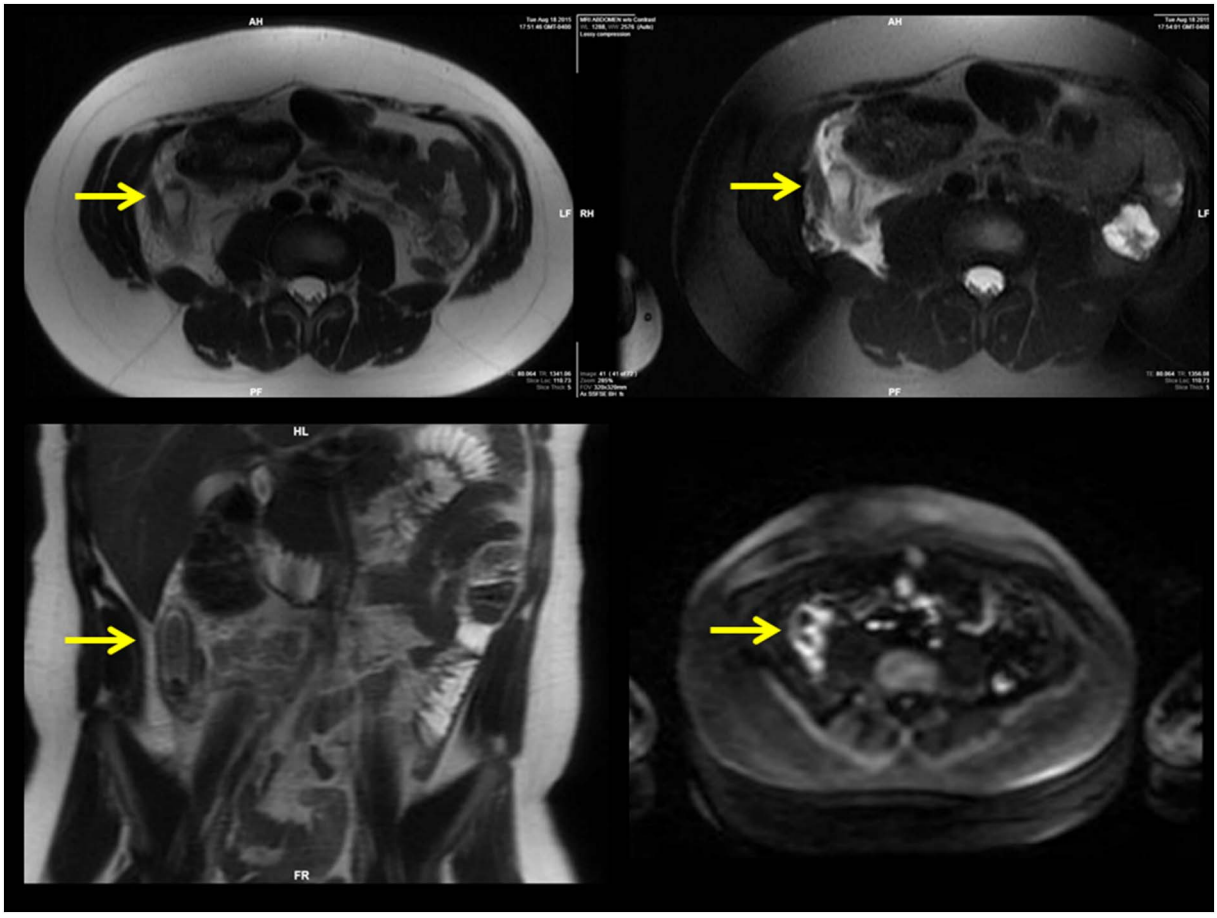

Fig. 2. Key images from anonymized study showing uncomplicated appendicitis (arrow) in a 12-year old boy, including axial T2-weighted images with and without fat saturation, coronal T2-weighted image without fat-saturation, and axial Diffusion Weighted Imaging.