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Clinical Conundrum:
Lung Ultrasound for the Diagnosis of Pneumonia in Adult ED Patients

Background:
Current recommendations do not support lung ultrasound as an acceptable alternative to chest x-ray (CXR) or computed tomography (CT) scan for the diagnosis of pneumonia. However, CT scans are expensive and involve potentially harmful doses of radiation, while CXR lacks in sensitivity and specificity for diagnosing most pulmonary processes. While physicians' clinical assessments alone have a 97% negative predictive value (NPV) in ruling out pneumonia in febrile adults with respiratory tract infections, the positive predictive value (PPV) of their assessments is limited (27%) and bedside ultrasound is readily available in most emergency departments. This paper will explore the utility of bedside ultrasound as a diagnostic adjunct for emergency physicians suspecting pneumonia.

Findings:

1.) A systematic search and meta-analysis of 2,726 published studies comparing the diagnostic accuracy of beside lung ultrasound to CXR, CT, and clinical assessment showed a pooled sensitivity and specificity for the diagnosis of pneumonia using beside lung ultrasound of **94%** (95% CI, 92%-96%) and 96% (94%-97%), respectively; pooled positive and negative likelihood ratios of 16.8 (7.7-37.0) and 0.07 (0.05-0.10), respectively; and, the area-under-the-ROC curve was 0.99 (0.98-0.99).

2.) In a prospective cohort study of 120 patients admitted to the emergency department for suspected pneumonia, bedside lung ultrasound was found to have a diagnostic sensitivity of **98%** (95% CI of 93.3 – 99.9) and specificity of 95% (82.7-99.4), while CXR exhibited a diagnostic sensitivity of 67% (56.4-76.9) and specificity of 85% (73.3-95.9).

3.) In the study above, bedside ultrasound was available and feasible in 100% of patient cases, and each study was performed in less than 5 minutes.

Conclusions:
Bedside lung ultrasound is **more sensitive and specific than CXR** for diagnosing pneumonia in the emergency department. It is **less expensive than a CT scan, delivers minimal radiation to the patient, and is a readily available, time-efficient** modality in most emergency departments. With that said, the sensitivity and specificity of bedside ultrasound is dependent on a high level of training and proficiency of the provider performing the exam. Physicians credentialed in the use of bedside ultrasound should consider using it as a safe, cost-effective, efficient, and highly accurate alternative to CXR and CT in diagnosing pneumonia in the emergency department.

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