Emergency Department Ultrasound in the Early Diagnosis of Acute Decompensated Heart Failure: A Systematic Review and Meta Analysis

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Introduction

- Dyspnea is a common presenting problem that frequently creates a diagnostic challenge for physicians in the emergency department (ED). While the differential diagnosis is vast, acute decompensated heart failure (ADHF) represents a common cause that requires prompt diagnosis and management. A rapid and accurate diagnosis can be difficult to achieve. Recent studies on dyspneic patients have suggested a potential role for bedside lung ultrasound. The objective of this systematic review was to assess the sensitivity and specificity of early bedside lung US in patients presenting to the ED with dyspnea.

Methods

- With the assistance of a medical librarian, a systematic search of EMBASE, PubMed, the Cochrane Library, bibliographies of previous systematic reviews, and abstracts from major emergency medicine conferences was completed. We included prospective studies that assessed the diagnostic accuracy of B-lines from bedside lung ultrasound using a clinical diagnosis of ADHF at hospital discharge as the gold standard. Two reviewers independently screened all titles and abstracts for possible inclusion. Two separate content experts full text-reviewed selected studies and performed quality analysis using a modified Critical Appraisal Skills Program (CASP) questionnaire. Extracted data was then assessed with summary receiver operator characteristics curve (SROC) analysis for pooled sensitivity and specificity.

Results

- The initial electronic search yielded 3674 articles.
- Of those, seven met the inclusion criteria and fulfilled CASP requirements for methodologic quality. The total number of patients in these studies was 1861. Summary statistics from the Meta-analysis showed that as a diagnostic test for ADHF, bedside lung ultrasound had a pooled sensitivity of 82.5% (95% confidence interval [CI]= 66.4% to 91.8%) and a pooled specificity of 83.6% (95% CI = 72.4% to 90.8%).
- The positive likelihood ratio was 4.84 (95% CI = 2.57 to 9.09), and negative likelihood ratio was 0.19 (95% CI = 0.09 to 0.39)

Conclusion

- This study suggests that in patients presenting to the ED with undifferentiated dyspnea, early bedside lung US may be used to accurately diagnose ADHF. This may lead to more appropriate and timely initial management, and ultimately improved patient outcomes.