

Prehospital Lung Ultrasound: Impact on Diagnosis and Management in Patients with Acute Heart Failure

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Background/Objective

In the United States, one million hospitalizations occur each year due to acute heart failure (AHF), with a one-year mortality rate of 27%. Recent literature suggests that early diagnosis and treatment is associated with improved prognosis. We investigated the diagnostic accuracy of prehospital paramedic-performed lung ultrasound (LUS) and its impact on initial treatment of patients with AHF.

Methods

Paramedics, previously trained in LUS, performed a 4-zone LUS protocol to evaluate for the presence or absence of pulmonary edema. Per protocol, presence of bilateral B-lines was diagnostic of AHF and treatment included nitroglycerin. Inclusion criteria were patients (>18 years old) with shortness of breath and at least one of the following: bilateral lower extremity edema, orthopnea, wheezing or rales on auscultation, increased work of breathing, tachypnea (RR>20) or hypoxia (oxygen saturation <92%). Patient data was collected in the hospital setting and evaluated by 2 separate physicians to determine final diagnoses of AHF. Paramedic data were analyzed for LUS image quality, accuracy of AHF diagnosis, and prehospital treatment.

Results

Prehospital LUS was performed on 27 patients meeting inclusion criteria. Diagnostic accuracy for AHF yielded a sensitivity of 66.7% (95% CI 29.9%-92.5%) and specificity of 100% (95% CI 81.5%-100%). Of the 9 patients with AHF, 3 were not correctly identified despite having bilateral B-lines on LUS and 3 (33%) received prehospital nitroglycerin. Median LUS image quality was 4 (range 3-5) on a 5-point scale.

Conclusion

Paramedic performed LUS was highly specific and moderately sensitive for the diagnosis of AHF, which is an improvement over diagnostic accuracy without the use of LUS (prior literature showing 14% sensitivity, 98% specificity). LUS slightly improved prehospital initiation of HF therapy (33% vs 28% previously reported). More training is needed to improve accuracy of LUS diagnosis and increase initiation of HF therapies in the prehospital setting.