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Bedside lung ultrasonography by emergency department residents as an aid for identifying heart failure in patients with acute dyspnea after a 2-h training course

Mohamed Amine Msolli[1,3], Adel Sekma[1,3], Maryem Ben Marzouk[1,3], Wael Chaabane[2,3], Khaoula Bel Haj Ali[1,3*], Lotfi Boukadida[2,3], Nasri Bzeouich[1,3], Imen Gannoun[3], Imen Trabelssi[3], Kamel Laaouiti[1,3], Mohamed Habib Grissa[1,3], Kaouthar Beltaief[1,3], Zohra Dridi[4], Asma Belguith[5], Mehdi Methamem[6], Wahid Bouida[1,3], Riadh Boukef[2,3], Hamdi Boubaker[1,3] and Semir Nouira[1,3] on behalf of the GREAT Network

Abstract

Background: Ultrasonographic B-lines have recently emerged as a bedside imaging tool for the differential diagnosis of acute dyspnea in the Emergency Department (ED). However, despite its simplicity, LUS has not fully penetrated emergency department. This study aimed to assess the accuracy and reproducibility of ultrasonographic B-lines performed by emergency medicine (EM) residents for the diagnosis of congestive heart failure (CHF) in patients admitted to ED for acute dyspnea.

Patients and methods: This is a cross-sectional prospective study conducted between January 2016 and October 2017 including patients aged over 18 years admitted to ED for acute dyspnea. At admission, two consecutive bedside LUS study were performed by a pair of EM residents who received a 2-h course for recognition of sonographic B-lines to determine independently B-lines score and B-profile pattern. All participating sonographers were blinded to patients' clinical data. B-lines score $\geq$ 15 or a B-profile pattern was considered as suggestive of CHF. The final leading diagnosis was assessed by two expert sonographers, who were blinded to the residents' interpretations, based on clinical findings, chest X-ray, brain natriuretic peptide, cardiac and lung ultrasound testing. Accuracy and agreement of B-lines score and B-profile pattern were calculated.

Results: We included 700 patients with a mean age of 68 $\pm$ 12.6 years and a sex ratio (M/F) of 1.43. The diagnosis of CHF was recorded in 371 patients (53%). The diagnostic performance of B-lines score at a cut-off 15 and B-profile pattern was, respectively, 88% and 82.5% for sensitivity, 75% and 84% for specificity, 80% and 85% for positive predictive value, 84% and 81% for negative predictive value. The area under receiver operating characteristic curve was 0.86 [0.83–0.89] and 0.83 [0.80–0.86], respectively, for B-lines score and B-profile pattern. There was an excellent agreement between residents for the diagnosis of CHF using both scores (kappa = 0.81 and 0.85, respectively, for ordinal scale B-lines score and B-profile pattern).

Conclusion: Lung ultrasound B-lines assessment has a good accuracy and an excellent reproducibility in the diagnosis of CHF in the hand of EM residents following a short training program.

*Correspondence: belhajalikhaoula@yahoo.fr
[1] Emergency Department, Fattouma Bourguiba University Hospital, 5000 Monastir, Tunisia
Full list of author information is available at the end of the article