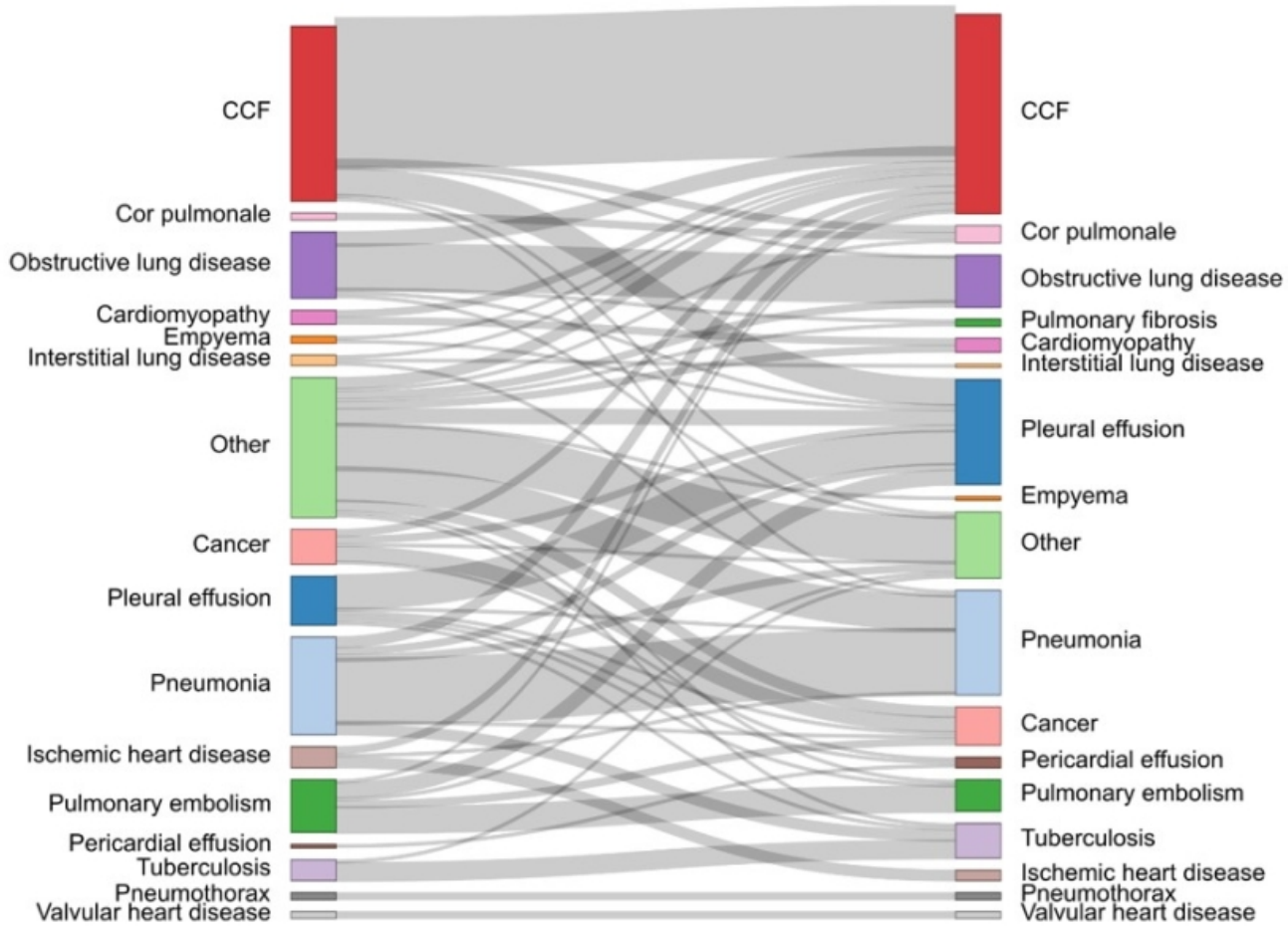
The Utility of Clinician-performed Cardiopulmonary Ultrasound Assessment of the Acutely Breathless Patient: Breathlessness Early Detection With Ultrasound (BED-US) Study

J. W. Kagima[1], H. Meme[2], I. Welters[3], B. Morton[4], J. Rylance[4], NIHR International Multidisciplinary Programme toAddress Lung Health and TB in Africa (IMPALA); [1]Internal Medicine, Kenyatta National Hospital, Nairobi, Kenya, [2]Centre for Respiratory Disease Research, Kenya Medical Research Institute, Nairobi, Kenya, [3]Critical Care, University of Liverpool, Liverpool, United Kingdom, [4]Clinical Sciences, Liverpool School of Tropical Medicine, Liverpool, United Kingdom.

Corresponding author's email: jacikagima@gmail.com

Rationale: Breathlessness is frequently a diagnostic challenge, being the primary manifestation of disparate pathological entities including cardiopulmonary, haematological and neuromuscular diseases. Clinical signs similarly variable limiting precision in treatment decisions without further investigations. A cardiopulmonary, clinician-performed point-of-care ultrasound (PoCUS) scan provides rapid imaging to support clinical decision-making. The aim of this study was to determine if information gained by PoCUS supported or changed clinical decision pathways in a busy Emergency unit in a low income country. Methods: A prospective cohort study was conducted at the accident and emergency department of the Kenyatta National Hospital (KNH), Nairobi, Kenya, between May 2019 and March 2021. Convenience sampling of 212 acutely breathless patients was conducted in parallel with purposive sampling of the attending doctors with clinical responsibility for care of the recruited patients. Patients were scanned using PoCUS, by a blinded study physician according to the modified Rapid Assessment of Dyspnoea with Ultrasound (RADiUS) protocol. The results were provided to the treating physician and patients followed up for 72 hours. Results: The patients in the study were young; median age of 48 years (IQR; 34-65), with a slight female preponderance 50.7% (107/212). The majority of patients 93.4% (198/212) had grade 3 or 4 according to the modified Medical Research Council (mMRC) dyspnoea scale. Abnormal cardiac scans were present in 78.6% (162/206) of patients and abnormal lung and doppler scans in 83% (174/211). Cardiovascular comorbidities were common, with hypertension the most common at 36.6% (78/212). Pleural effusion was the most common cardiopulmonary abnormality noted, 61% (129/211), followed by alveolar interstitial syndrome in 53.5% (113/211). Overall, PoCUS changed the leading diagnosis in 36.3% of cases. PoCUS increased pleural effusion as the primary diagnosis from 6.9% (14/204) to 14.7% (30/204) (p=0.031). Uncertainty in the primary diagnosis: “Other” was reduced from 19.6% (40/204) to. 9.3% (19/204) (p=0.002). Clinician reported confidence improved on a 10-point visual analogue scale (VAS) score by a mean(95%CI) of 1.05 (0.88,1.22) with the addition of the PoCUS information. Conclusions: The provision of PoCUS results to clinicians in an emergency department in a low income setting substantially improved the diagnostic certainty and clinician confidence. Combining a basic lung and cardiac PoCUS into a syndromic “dyspnoea” algorithm, has the potential to elucidate the primary causes of respiratory distress which are potentially rectifiable and also to improve patient outcomes by improved diagnostic certainty especially pleural disease and reducing the number of uncertain aetiologies of dyspnoea.

Figure 1: Alluvial plot of the clinician's diagnosis pre (left bars) and post PoCUS (right bars)



Abbreviations: CCF, congestive cardiac failure. Other represents other diagnoses not prespecified.

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