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Case Report

Point-of-Care Ultrasound (POCUS) for Rapid Detection of Postoperative Pulmonary Embolism

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Abstract: Dyspnoea remains a common cause of emergency admissions in sub-Saharan Africa, where diagnostic delays are compounded by limited access to advanced imaging modalities. Point-of-care ultrasound (POCUS) is increasingly recognised as an essential tool for the rapid bedside evaluation of cardio-pulmonary disorders. We report the case of a 71-year-old man admitted to the Essos Hospital Centre emergency department with acute dyspnoea, fever, and hypoxaemia. Cardiac POCUS revealed right ventricular dilatation with paradoxical interventricular septal motion, while lung ultrasound demonstrated bilateral pleural effusions and a B-profile, immediately suggesting a dual pathology: acute pulmonary embolism and bilateral pleuro-pneumonia. Thoracic CT angiography confirmed a segmental embolus in the left lower lobe associated with a pleuro-pneumonia. Early initiation of anticoagulation and targeted antibiotic therapy, guided by POCUS findings, resulted in rapid clinical improvement. This case highlights the major diagnostic value of integrating cardiac and lung POCUS into emergency assessment, particularly in resource-limited African settings where imaging delays may compromise outcomes.

Keywords: Point-Of-Care Ultrasound, Pulmonary Embolism, Acute Respiratory Failure, Lung Ultrasound, Right Ventricular Dysfunction.

INTRODUCTION

Acute respiratory failure is a leading cause of emergency admissions worldwide, with particularly high morbidity and mortality in resource-limited regions such as sub-Saharan Africa. In these settings, diagnostic uncertainty is often exacerbated by delayed presentation, limited access to advanced imaging, and a high prevalence of infectious diseases. Pulmonary embolism (PE) remains largely underdiagnosed, despite its increasing incidence in African populations and its strong association with malignancy, prolonged immobilisation, and postoperative status [1–3]. Point-of-care ultrasound (POCUS) has emerged as an essential modality for the rapid assessment of critically ill patients. When applied systematically, cardiac and lung ultrasound can identify within minutes signs of acute right ventricular (RV) overload, pleural effusions, subpleural consolidations, and abnormalities of lung aeration, long before confirmatory imaging becomes available [4–6]. Several studies have demonstrated that RV dilatation, paradoxical septal motion, and inferior vena cava (IVC) enlargement have high specificity for PE in an appropriate clinical context [7–9]. Similarly, lung ultrasound outperforms chest radiography in detecting pneumonia, pleural effusions, and interstitial syndromes, particularly where radiological expertise is limited [10, 11]. Despite its proven utility, integration of POCUS into emergency care pathways remains inconsistent in Africa, due to disparities in equipment availability, training, and institutional support [12]. Yet, in contexts where thoracic CT angiography may be delayed for several hours, or even unavailable, the combined use of cardiac and lung ultrasound represents a critical step toward diagnostic equity.

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We present a case in which POCUS enabled the rapid identification of a dual pathology, acute pulmonary embolism and bilateral pleuro-pneumonia, in an elderly patient presenting with acute respiratory distress to the emergency department. This case highlights the indispensable role of POCUS in early, life-saving management and underscores its potential to reduce diagnostic delays in resource-constrained environments.

CASE PRESENTATION

A 71-year-old man, weighing 90 kg, with a history of low rectosigmoid cancer managed by diverting colostomy, was admitted to the emergency department of Essos Hospital Centre (Cameroon) for dyspnoea. He had been discharged four days earlier after an uncomplicated hospitalisation and had experienced progressive dyspnoea over the preceding 48 hours, accompanied by fever, productive cough, and marked fatigue. He had no prior cardiovascular or pulmonary disease, was a non-smoker, and was not on anticoagulation. On presentation, the patient was tachypnoeic at 32 breaths/min, with an oxygen saturation of 94 % on 6 L/min via nasal cannula, tachycardic at 105 bpm, blood pressure 132/78 mmHg, and a temperature of 38.5 °C. Lung auscultation revealed diffuse bilateral crackles without wheezing. There were no clinical signs of deep vein thrombosis. Arterial blood gases on supplemental oxygen showed a pH of 7.46, $PaCO_2$ 31 mmHg, PaO_2 72 mmHg, bicarbonate 21 mmol/L, and lactate 1.8 mmol/L. Laboratory tests demonstrated elevated C-reactive protein (148 mg/L) and leukocytosis (14.2 G/L), with normal renal function, liver function tests, and electrolytes. The initial assessment included a modified Wells score, indicating an intermediate-to-high clinical probability of pulmonary embolism, prompting urgent POCUS evaluation.

Bedside cardiac POCUS was performed by an anaesthetist. Transthoracic imaging revealed right ventricular (RV) dilatation with an RV/left ventricular (LV) ratio >1, paradoxical interventricular septal motion producing a “D-shaped” LV (figure 1), and a dilated inferior vena cava (>2.5 cm) with <20 % respiratory variation (figure 2 and 3), consistent with acute RV pressure overload. Left ventricular systolic function was preserved (visually estimated ejection fraction 55–60 %). No intracardiac thrombus was visualised. Cardiac valves were normal, and visual estimation of cardiac output suggested preserved left-sided flow. These findings were interpreted as acute cor pulmonale secondary to pulmonary embolism.

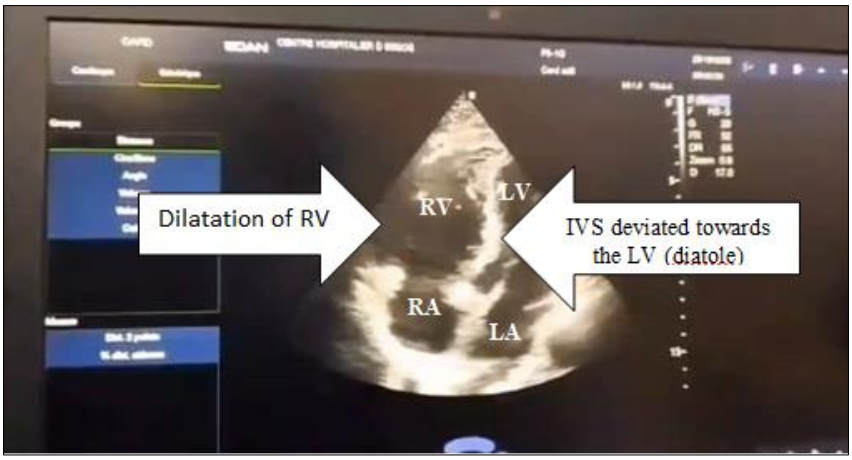

Figure 1: Cardiac POCUS showing RV dilatation, Interventricular septum (IVS) deviated towards the LV during diastole

Figure 2: Cardiac POCUS showing plethoric IVC

Lung POCUS demonstrated bilateral pleural effusions, more pronounced on the right, an irregular pleural line with subpleural consolidations, and focal B-lines, suggesting bilateral inflammatory involvement without pneumothorax or significant atelectasis (figure 3).

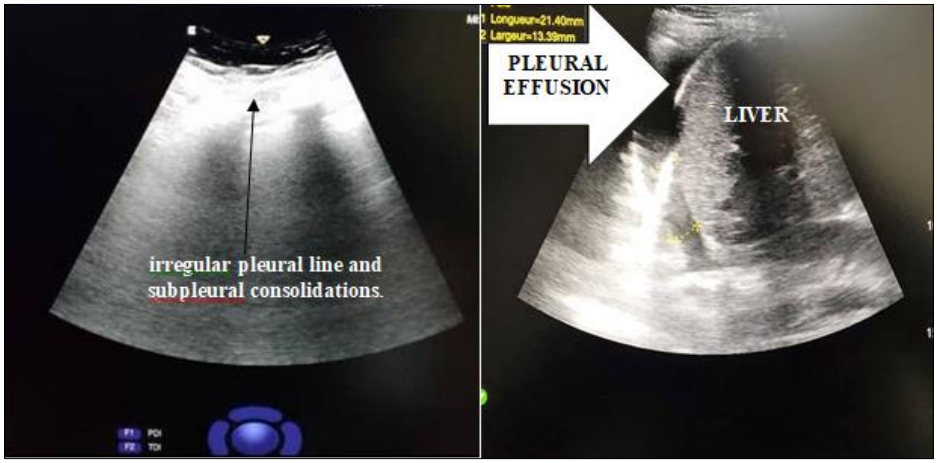

Figure 3: Lung ultrasound demonstrating pleural effusions, irregular pleural line, and subpleural consolidations

The combination of acute RV overload and pulmonary inflammatory changes suggested dual pathology: segmental pulmonary embolism and bilateral pneumonia. Peripheral vascular POCUS did not reveal deep vein thrombosis in the lower limbs. Contrast-enhanced thoracic CT angiography, performed despite local limitations, confirmed a segmental embolus in the left lower lobe and bilateral pleuropneumonia with moderate effusions, without intracardiac thrombus. The Pulmonary Embolism Severity Index (PESI) score indicated intermediate risk of haemodynamic complications.

Initial management included subcutaneous low-molecular-weight heparin at 100 IU/kg every 12 hours and empiric broad-spectrum antibiotic therapy with intravenous piperacillin-tazobactam 4.5 g every 8 hours, replacing prior amoxicillin-clavulanate. High-flow oxygen therapy (FiO_2 0.40–0.50) was administered to maintain SpO_2 ≥94 %. Haemodynamic monitoring continued in the intensive care unit, with daily POCUS assessments guiding fluid management, monitoring RV dilatation, early detection of haemodynamic instability, and adjustment of ventilatory support. Inflammatory biomarkers and arterial blood gases were monitored daily to evaluate treatment response.

After five days in the intensive care unit, the patient demonstrated progressive improvement in oxygenation, with SpO_2 of 97 % on 3 L/min via nasal cannula and a stabilized respiratory rate of 20–22 breaths/min. Clinical examination confirmed haemodynamic stability (BP 125/75 mmHg, HR 88 bpm) and a reduction of bilateral crackles on auscultation. Daily cardiac POCUS monitoring revealed progressive normalization of the right ventricle: the RV/LV ratio decreased to <1, paradoxical septal motion resolved, and inferior vena cava diameter reduced with respiratory variation >40 %, consistent with resolution of acute RV pressure overload. Lung ultrasound showed regression of B-lines and subpleural consolidations, with partial resolution of bilateral pleural effusions, in keeping with improvement of the bilateral pneumonia. No intracardiac thrombus or new embolic events were detected. The patient was subsequently transferred to the general medical ward for conventional follow-up and discharged on day 12 with recommendations for close oncological follow-up and a structured respiratory and functional rehabilitation programme, including early mobilisation, respiratory physiotherapy, and optimisation of overall physical condition.

DISCUSSION

Pulmonary Embolism in Sub-Saharan Africa: An Under-Recognised Problem

Pulmonary embolism (PE) remains a major diagnostic challenge in resource-limited settings, particularly across sub-Saharan Africa, for several reasons: its clinical features (dyspnoea, fever, cough) are often non-specific and easily confounded with respiratory infections; access to advanced imaging modalities such as CT pulmonary angiography is frequently limited; and late presentation is common. Our case illustrates these difficulties, especially in an elderly patient with malignancy, a population known to be at high risk of venous thromboembolism according to recent African literature [1-13]. A recent systematic review (up to 2024) examining risk factors and outcomes of PE in Africa identified several predominant determinants: immobilisation, recent surgery, malignancy, and other comorbidities such as obesity and cardiovascular disease [1]. These data suggest that, despite growing awareness, PE remains substantially under-diagnosed; the absence or delayed availability of imaging contributes considerably to this gap. Earlier studies have also documented the presence of PE in sub-Saharan Africa, particularly in centres equipped with CT scanning. For example, experience from a hospital in

Yaoundé, Cameroon, showed that when multidetector CT was available for clinically suspected cases, PE proved to be far more frequent than previously assumed, likely having been under-recognised due to limited imaging access in earlier years [14].

The Role of POCUS as a Diagnostic Lever in Constrained Settings

Within this context, point-of-care ultrasound (POCUS) has emerged as a transformative tool. A multimodal protocol (cardiac, pulmonary, venous) markedly enhances diagnostic yield without immediate reliance on CT. A recent meta-analysis among critically ill patients demonstrated strong diagnostic accuracy for multi-organ POCUS in suspected PE, with sensitivity and specificity levels sufficient to support clinical decision-making, particularly where CT is difficult to obtain or contraindicated [15]. More specifically, a 2024 meta-analysis of transthoracic lung ultrasound (LUS) reported a sensitivity of 0.80 (95% CI, 0.71–0.86) and a specificity of 0.87 (95% CI, 0.81–0.92) for diagnosing PE, reinforcing the view that LUS may serve as a reasonable surrogate when CT pulmonary angiography is unavailable [16]. Similarly, a 2024 cohort study in critical care settings found that thoracic ultrasound significantly contributed to PE diagnosis, especially when combined with other POCUS modalities such as focused cardiac ultrasound [17].

Safety and Efficacy: the POCUS-Guided Protocol

Our case demonstrates not only the diagnostic utility but also the therapeutic impact of POCUS: its findings enabled early anticoagulation and targeted antibiotic therapy, while serial POCUS examinations informed dynamic management of fluids and oxygenation. Prospective evidence supports this approach; for instance, the PRIME study (2021–2023) showed that a structured POCUS protocol (cardiac, pulmonary and venous) significantly reduced the need for conventional imaging (such as CT) while maintaining an acceptable rate of false-negative diagnoses when accompanied by careful clinical assessment and follow-up [18].

Towards Diagnostic Equity: Training, Equipment, and Sustainability

The implementation of POCUS in resource-limited settings requires well-designed strategies. Training remains a cornerstone: studies from sub-Saharan Africa have demonstrated that short training programmes, supplemented by online assessment tools, can effectively develop competence in lung ultrasound [19]. Moreover, findings from the "Use of a handheld ultrasonographic device" study in Tanzania indicate that frontline clinicians trained to use handheld devices can achieve substantial agreement with expert sonographers in complex cardiopulmonary diagnoses, supporting broader deployment of POCUS in rural or under-resourced settings [20].

These observations suggest that a sustainable POCUS implementation strategy should simultaneously rely on the acquisition of portable, handheld ultrasound devices, the provision of initial and ongoing training for clinicians, including both medical and non-specialist personnel, the integration of standardised POCUS protocols into the workflow of emergency and critical care services, and the establishment of a structured quality-assurance system incorporating routine image review, performance audits, and longitudinal competency monitoring. Despite its advantages, notable challenges persist. Operator dependency remains critical: without adequate supervision, mentorship, and structured curricula, inter-observer variability may compromise diagnostic accuracy. While LUS shows promising sensitivity and specificity, the 2024 meta-analysis highlights substantial heterogeneity, suggesting results may not be universally generalizable, particularly in settings where training, disease prevalence, and resources differ [16].

Another concern is the risk posed by delayed confirmatory imaging: although POCUS-guided treatment initiation is reasonable, it must be accompanied by meticulous clinical reassessment, as was done in our case, and confirmatory imaging whenever feasible. The PRIME study also reported a non-negligible "failure rate", reminding clinicians that POCUS cannot fully replace CT pulmonary angiography, although it may safely reduce its utilisation when employed judiciously [18]. Large-scale implementation will require investment (equipment, infrastructure) and institutional support. Nevertheless, the potential gains, earlier diagnosis, reduced morbidity and mortality from PE, and lower imaging-related costs, strongly argue in favour of its adoption.

CONCLUSION

This case underscores with particular clarity the pivotal role that POCUS can assume when embedded within a structured clinical framework for the evaluation of acute respiratory compromise in resource-constrained environments. By facilitating the prompt identification of acute right-ventricular pressure overload, refining the diagnostic suspicion of pulmonary embolism, and enabling the initiation of targeted therapy prior to confirmatory imaging, POCUS materially shortens critical decision-making intervals that directly influence morbidity and mortality. The accumulating body of evidence suggests that its systematic integration into emergency and critical care pathways has the potential to substantially narrow the diagnostic deficit that characterises many low-resource settings and to meaningfully improve patient outcomes. Within the broader agenda of health-system strengthening in sub-Saharan Africa, the disciplined and widespread adoption of POCUS thus represents a strategically important lever for advancing the early recognition and effective management of life-threatening conditions such as pulmonary embolism.

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