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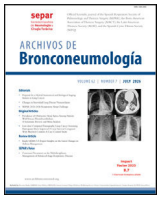

Editorial

If the Only Tool you Have is Ultrasound – Current and Future Challenges of Cardiopulmonary Point-of-care Ultrasound

Ultrasound – the hammer of the emergency physician

The Brooklyn-born psychologist Abraham Maslow once famously stated that "it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail." [1].

In the rapidly evolving field of emergency medicine, ultrasound risks becoming that hammer. Point-of-care ultrasound (POCUS), a focused examination intended to answer predefined clinical questions at the bedside, complementing rather than replacing comprehensive imaging, is becoming increasingly available – and as modern ultrasound machines provide almost immediate answers to a myriad of diagnostic questions, the temptation to apply them early and often is undeniable. Over the past decades, this enthusiasm has laid the foundation for an expanding body of literature on cardiopulmonary POCUS, including focused protocols endorsed by influential societies such as the European Respiratory Society and the European Association of Cardiovascular Imaging [2,3].

As someone who considers himself an unapologetic ultrasound aficionado, applying it whenever the opportunity arises, writing an editorial on the topic offers a welcome and perhaps necessary reality check. Because while the diagnostic capabilities of POCUS have repeatedly been demonstrated, diagnostic excellence may not necessarily translate into improved patient outcomes.

In this regard, the recent POCUS PATHWAY study by Ovesen and colleagues is particularly valuable, precisely because it addresses that uncomfortable question [4].

When I first heard about the project, I considered the answer almost self-evident. Surely, more efficient diagnostics should translate into faster treatment, shorter admissions, and ultimately more patients discharged within 24 h.

However, the trial told a different story.

The addition of focused lung and cardiac ultrasound did not increase 24-h discharge rates, shorten overall hospital stay, or improve revisit-free survival. While the intervention group underwent fewer chest radiographs, POCUS failed to influence the outcomes that clinicians and patients are likely to care most about. Importantly, these neutral findings become difficult to dismiss as a consequence of inadequate expertise, as the study involved experienced operators across multiple emergency departments [4].

Is POCUS entering a post-accuracy era?

The findings by Ovesen and colleagues raise an important possibility: perhaps cardiopulmonary POCUS has entered its post-accuracy era.

For years, ultrasound research has understandably focused on feasibility and diagnostic accuracy. Numerous studies have demonstrated impressive diagnostic performance of focused lung and cardiac in conditions such as pulmonary edema, pleural effusion and pneumothorax [5,6]. In some cardiopulmonary conditions, such as pulmonary embolism, research is still ongoing, but suggests that focused deep venous, cardiac, and lung ultrasound may contribute useful information when integrated into a broader diagnostic strategy [7,8]. Importantly, ultrasound findings are rarely diagnoses in isolation. Diffuse B-lines, for instance, may reflect pulmonary oedema but are not disease-specific and must be interpreted in the context of the clinical presentation and pre-test probability. In many ways, the diagnostic battle has therefore been partly won, but the battle for appropriate interpretation is not over.

The unresolved question is whether identifying pathology earlier meaningfully changes outcomes in healthcare systems already saturated with diagnostics.

Modern emergency departments are rarely limited by image acquisition alone. Length of stay is influenced by bed availability, timing of downstream investigations, therapeutic decisions, and specialist consultations. In that context, diagnostic uncertainty may no longer represent the primary bottleneck in patient flow. A patient with acute heart failure does not necessarily leave the hospital earlier simply because B-lines were identified 30 min sooner.

Importantly, this does not diminish the value of POCUS as a diagnostic modality. Rather, it reflects the increasing maturity of the field. As studies move beyond image acquisition and diagnostic accuracy toward patient-centered outcomes, the questions inevitably become more difficult, and the answers more nuanced. In that regard, neutral trials such as the POCUS PATHWAY study may ultimately prove more valuable than yet another study confirming that experienced clinicians can acquire diagnostically useful ultrasound images [4].

The success of POCUS may paradoxically represent one of its future challenges. Ultrasound machines have become smaller,

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cheaper, faster, and increasingly integrated into everyday clinical practice. In some clinical environments, not performing ultrasound increasingly requires more justification than performing it.

As enthusiasts, many of us have occasionally behaved as though every dyspneic patient is merely an undiscovered ultrasound finding waiting to happen. However, highly accessible diagnostics inevitably risk expanding beyond their evidence base. More imaging does not automatically translate into better care and may, in some cases, contribute to overdiagnosis, incidental findings, and unnecessary downstream testing.

This challenge is not unique to ultrasound. Modern medicine has repeatedly demonstrated that diagnostic capability and clinical utility are not interchangeable concepts. The history of pulmonary embolism imaging alone illustrates how technological advances may profoundly alter diagnostic pathways long before their impact on patient outcomes is fully understood [9].

Importantly, none of this should be interpreted as an argument against ultrasound. Rather, it is a reminder that even highly promising diagnostic tools require continual reassessment once they move from expert centers into widespread clinical use.

Future challenges of POCUS

The future challenges of cardiopulmonary POCUS are therefore unlikely to concern image acquisition itself, but rather appropriate integration into clinical reasoning and healthcare systems.

First, future studies should perhaps focus less on whether ultrasound can identify pathology and more on when ultrasound meaningfully changes management. This may include reducing unnecessary computed tomography, guiding hemodynamic assessment, or identifying patients suitable for early discharge [7,10].

Second, the field may need to reconsider which outcomes matter most. Length of stay and mortality remain important, but they may be relatively insensitive markers of diagnostic utility in modern emergency departments. Reduced radiation exposure and imaging costs as well as more efficient allocation of healthcare resources may also represent clinically meaningful benefits.

Finally, competency and standardization remain major challenges. Much of the existing POCUS literature originates from highly motivated centers with substantial ultrasound expertise. As ultrasound increasingly becomes democratized across specialties and training levels, maintaining competency and avoiding overinterpretation may become more difficult. Standardized acquisition and reporting, appropriate training and credentialing, and integration of POCUS findings into the medical record are therefore essential if bedside ultrasound is to become a reliable component of clinical care rather than an undocumented extension of the physical examination. A highly accessible diagnostic modality inevitably risks diagnostic expansion beyond its evidence base.

Ultrasound has fundamentally transformed acute respiratory and cardiovascular medicine. The challenge ahead is therefore not proving that clinicians can acquire more images, but determining when those images meaningfully improve decisions, outcomes, and resource utilization. Otherwise, we risk becoming exceptionally skilled at finding nails for an increasingly sophisticated hammer.

Conflicts of interest

Casper Falster has received honoraria by GE Healthcare for a presentation on thoracic ultrasound at the European Emergency Medicine Congress and is part of the thoracic ultrasound faculty at the European Respiratory Society.

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Casper Falster [a,b]
[a] *Department of Respiratory Medicine, Odense University Hospital, Denmark*
[b] *Odense Respiratory Research Unit (ODIN), Institute of Clinical Research, University of Southern Denmark, Denmark*
E-mail address: Casper.Falster@rsyd.dk