Advanced Practice in Critical Care Outreach: Point of Care Ultrasound

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POCUS development

- First ultrasound images of the heart recorded in 1953
- Focused scanning, ECHO training and portable machines have increased the feasibility and use of POCUS in critical care over the last 10 years.
- Focused cardiac ultrasound used for rapid differentiation of shock
- FUSIC Heart (ics.ac.uk)
- Lung ultrasound used for acute respiratory failure
- FAMUS - Focused Acute Medicine Ultrasound - Society for Acute Medicine

Case study

A 74-year-old man with a National Early Warning Score (NEWS) of 12 . He had a respiratory rate of 30 bpm, a heart rate of 130 bpm, was confusion, and an oxygen requirement.

Multimorbid gentleman who had been admitted to hospital six days previously from the elderly care rapid access clinic with worsening confusion and shortness of breath.

He had a chronic right sided pleural effusion of unknown aetiology that had been drained twice previously and was negative for any cytology. Not for resuscitation or escalation to ICU.

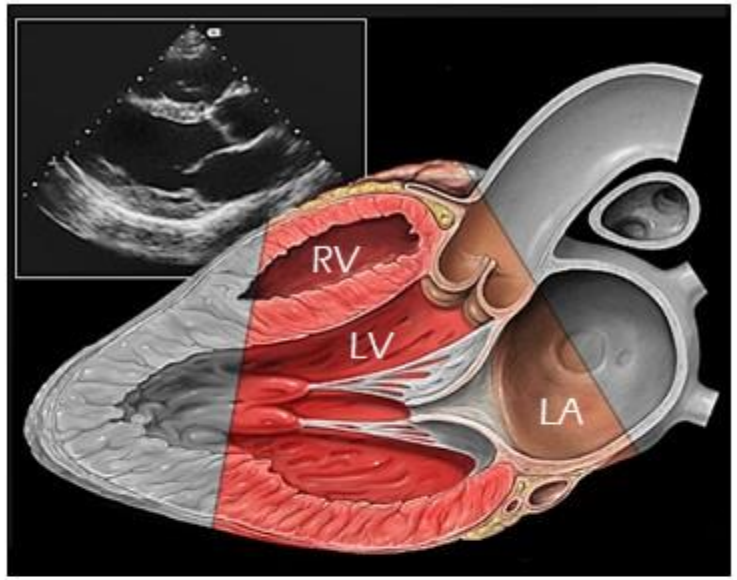
SpO2 of 96% on 4 L/min of oxygen delivered via nasal cannula. His heart rate was 130 bpm and regular. He was cold peripherally, clammy with mottled legs. IV access was obtained, and a blood gas was taken which showed a worsening metabolic acidosis and a lactate of 11.

Profoundly shocked, too sick to take to scan.

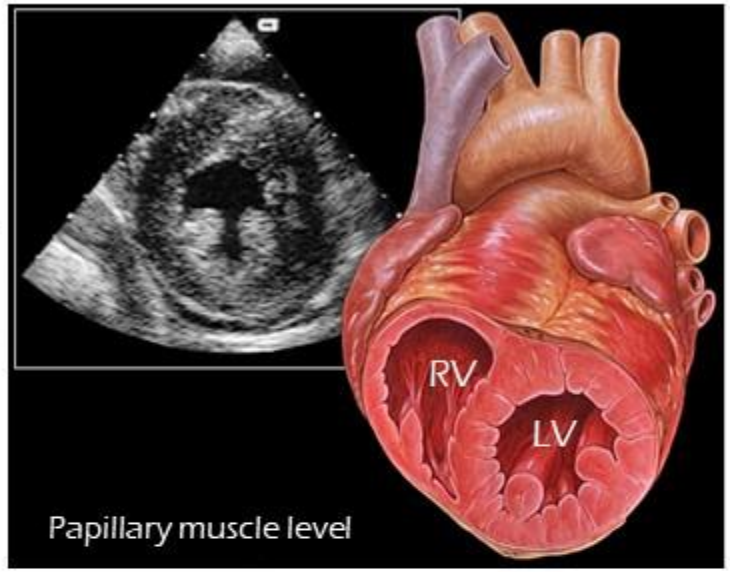
Focused cardiac ultrasound performed

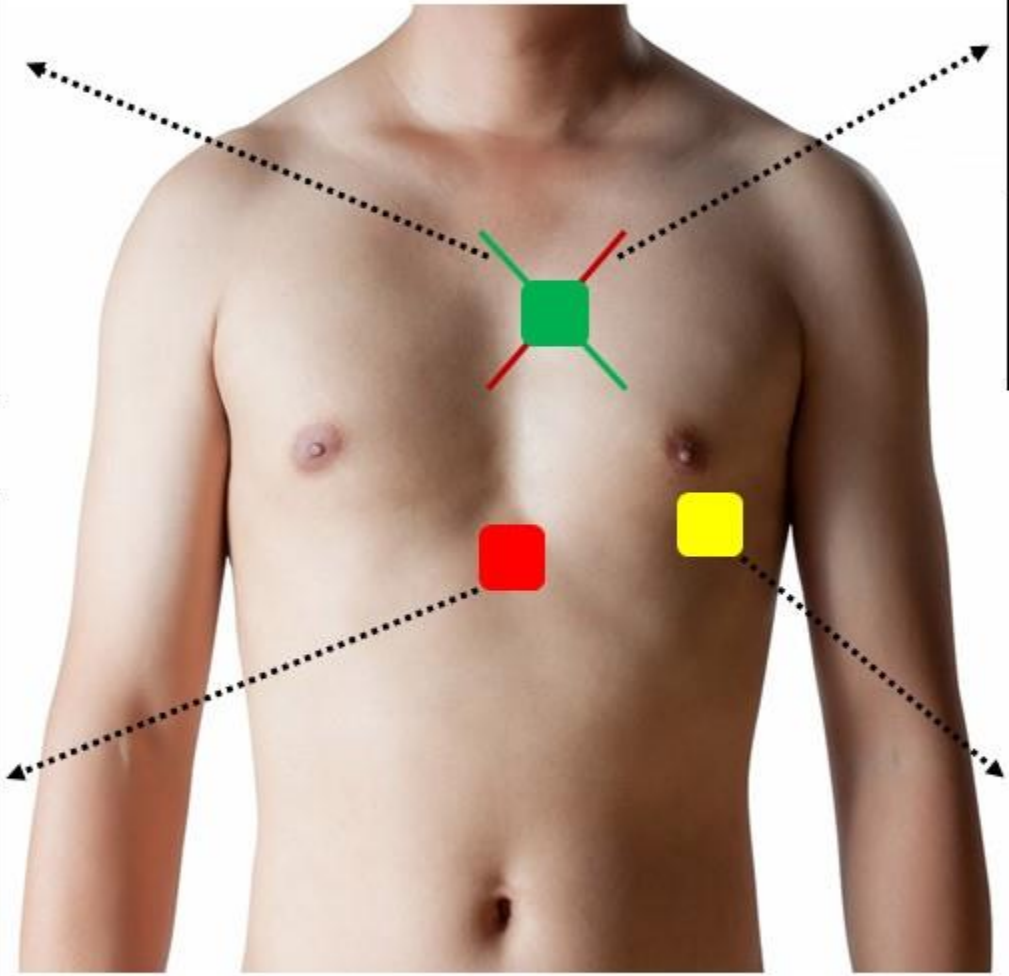
THE BASIC VIEWS OF FoCUS

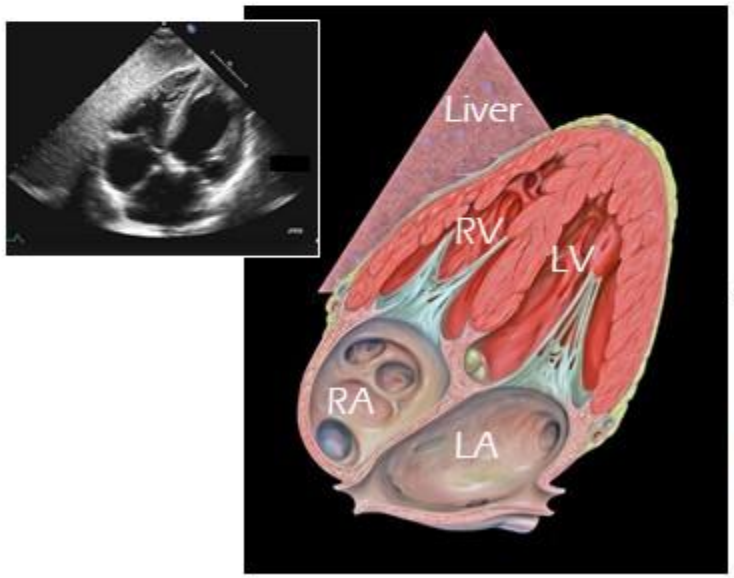
Parasternal Long Axis (PLAX)



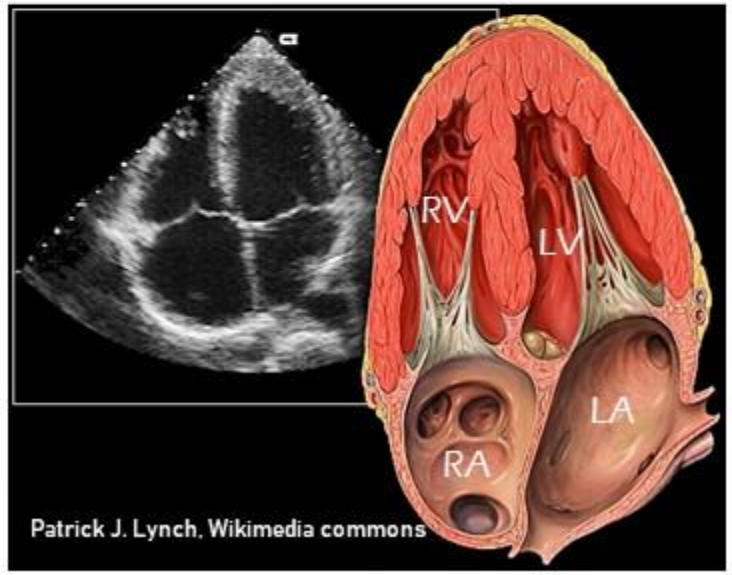
Parasternal Short Axis (PLAX)







Subxiphoid 4-chamber



Apical 4-chamber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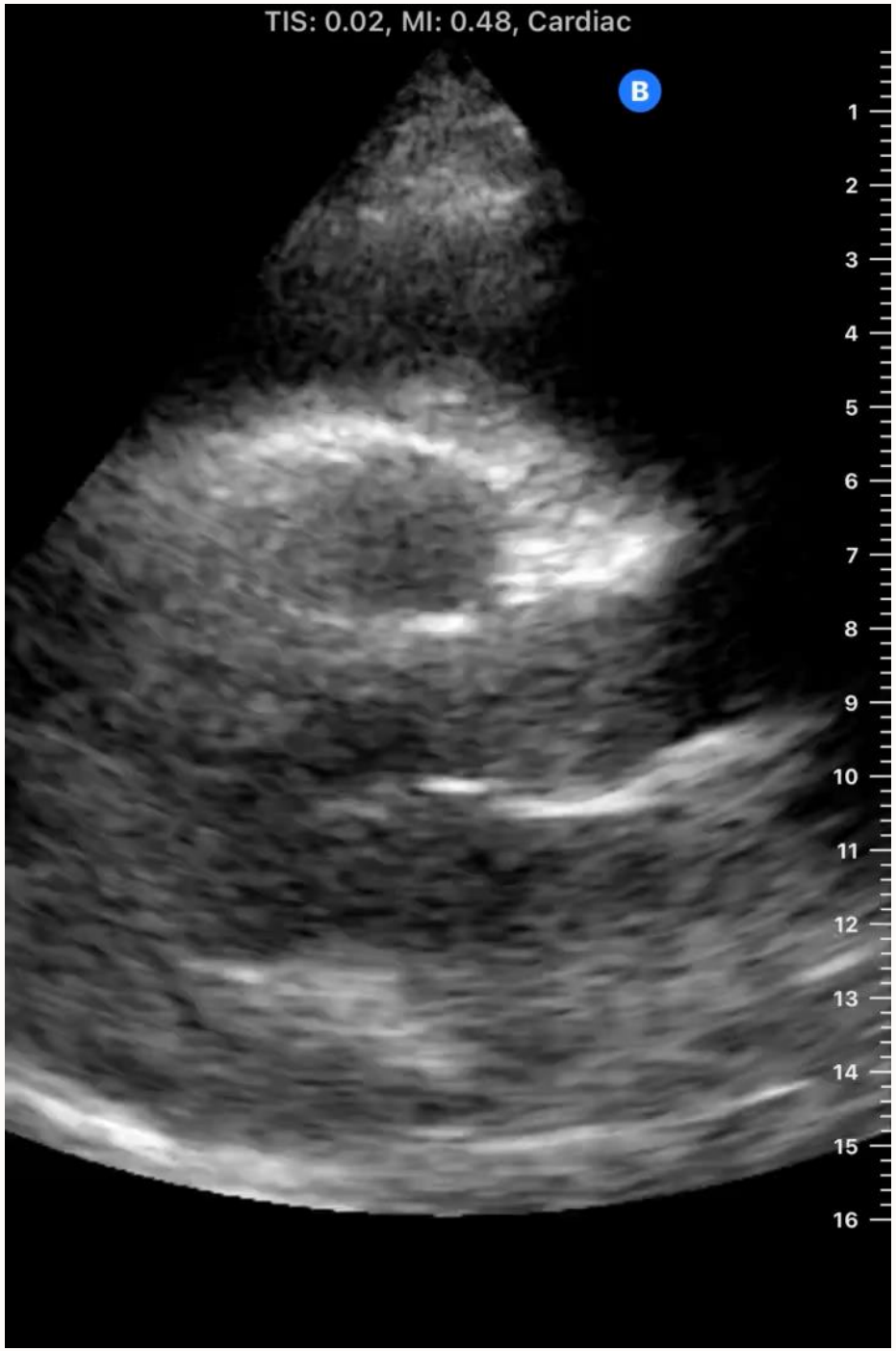
TIS: 0.02, MI: 0.48, Cardiac
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Focused echo and shock

- FoCUS is useful to narrow the differential diagnosis in patients with undifferentiated shock
- FoCUS is more accurate than the physical examination for assessing LV systolic function

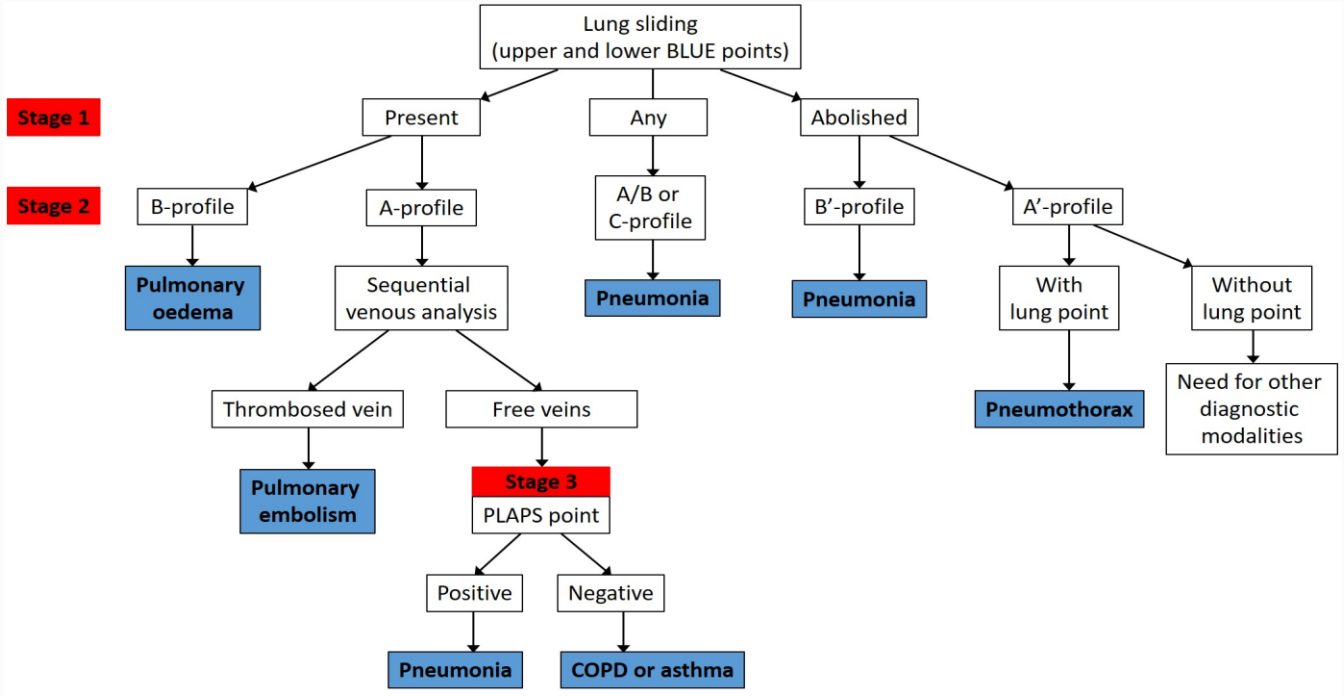
Lung US for acute respiratory failure

Diagnostic accuracies of the BLUE protocol in respiratory failure

	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
Cardiogenic pulmonary oedema	97	95	87	99
COPD/asthma	89	97	93	95
Pulmonary embolism	81	99	94	98
Pneumothorax	88	100	100	99
Pneumonia	89	94	88	95
Overall diagnostic accuracy of the BLUE protocol in these five conditions				**90.5%**

Open in a separate window

Adapted from Lichtenstein and Mezière[11]



Intensive Care Med (2012) 38:577–591
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CONFERENCE REPORTS AND EXPERT PANEL

International evidence-based recommendations for point-of-care lung ultrasound

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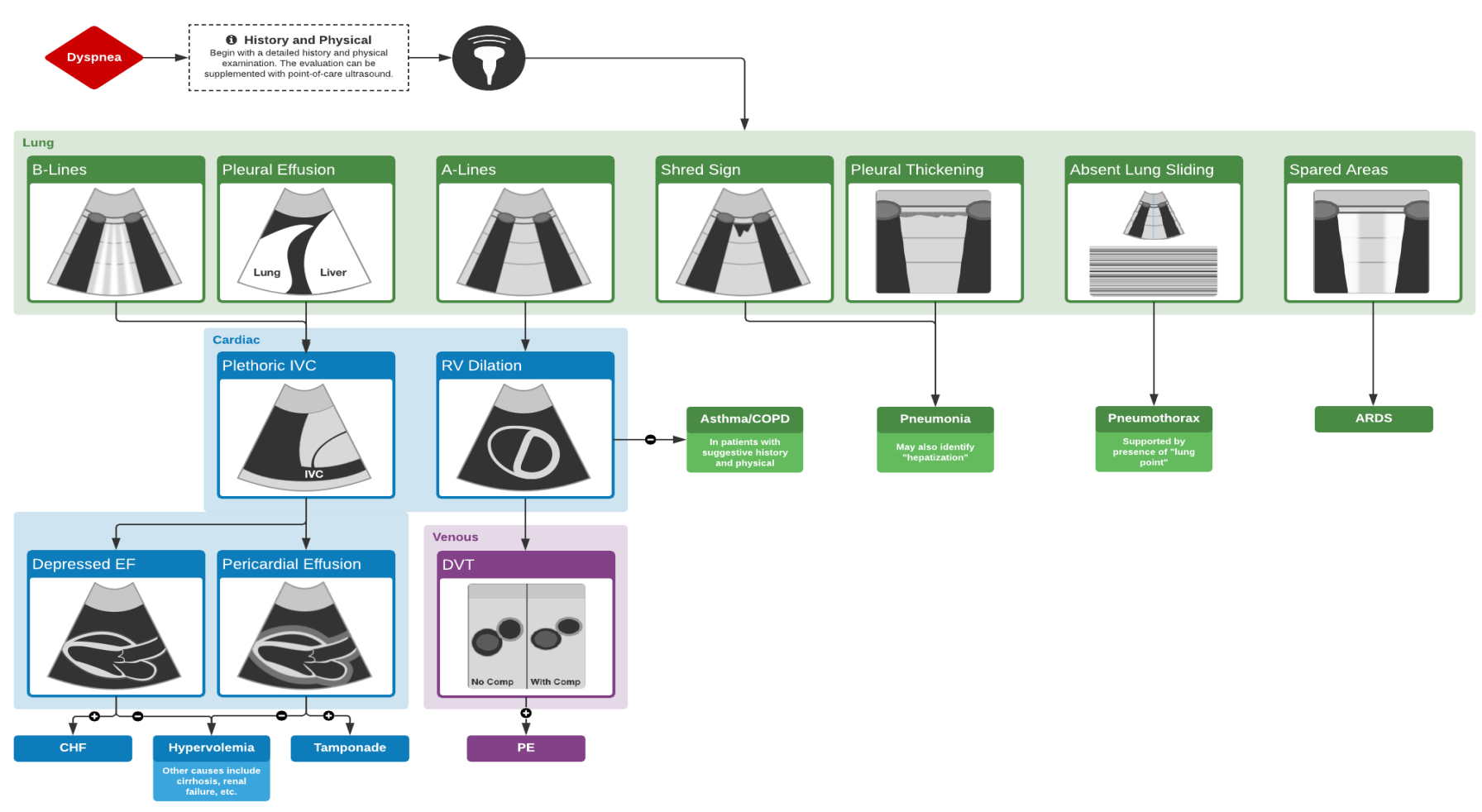
Algorithm for LUS in Evaluation of Dyspnoea



Lung US- An Algorithm https://ddxof.com/ultrasound-in-dyspnea/?sf_action=get_data&sf_data=all&_sf_s=lung

In cardiac arrest

- Presence of sonographic activity predicts ROSC (51%), and improved survival to hospital discharge (3.6% vs 0.6%)
- an absence of sonographic activity predicts low chance of ROSC (14%)
- In tamponade subgroup, survival to discharge increased to 15.4%

Observational Study > Resuscitation. 2016 Dec;109:33-39.
doi: 10.1016/j.resuscitation.2016.09.018. Epub 2016 Sep 28.

Emergency department point-of-care ultrasound in out-of-hospital and in-ED cardiac arrest

Romolo Gaspari [1], Anthony Weekes [2], Srikar Adhikari [3], Vicki E Noble [4], Jason T Nomura [5], Daniel Theodoro [6], Michael Woo [7], Paul Atkinson [8], David Blehar [9], Samuel M Brown [10], Terrell Caffery [11], Emily Douglass [4], Jacqueline Fraser [8], Christine Haines [12], Samuel Lam [13], Michael Lanspa [10], Margaret Lewis [2], Otto Liebmann [14], Alexander Limkakeng [15], Fernando Lopez [15], Elke Platz [16], Michelle Mendoza [9], Hal Minnigan [17], Christopher Moore [18], Joseph Novik [19], Louise Rang [20], Will Scruggs [21], Christopher Raio [12]

Affiliations + expand

PMID: 27693280 DOI: 10.1016/j.resuscitation.2016.09.018

Applications in CCOT

- Managing the shocked/hypotensive patient
- HAP vs pulmonary oedema
- Diagnosing PE
- Cardiac arrest prognostication
- Marking effusions/ tapping effusions
- Accurate bladder scans
- US guided access

Challenges

- Access to training
- Finding supervisors
- Access to equipment
- Time to accumulate scans
- Confidence

Conclusion

POCUS is a rapid and feasible for CCO practitioners to use in their assessment of patients

POCUS improves diagnostic accuracy in breathlessness

Provides unique information in shock +/-cardiac arrest

Assess to training, equipment and mentors remain barriers

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