**Appendix**

This appendix was part of the submitted manuscript and has been peer reviewed. It is posted as supplied by the authors.

- **Figure S1:** The four quadrant approach – lung ultrasound at the bedside.

* The anterolateral hemithorax is divided into four areas by longitudinal parasternal, anterior axillary and posterior axillary lines, and a transverse line at the 5th–6th intercostal space. † 2D ultrasound is complemented by M-mode, only if pleural integrity cannot be confirmed on 2D images. In each examined area, the presence or absence of pleural sliding, lung artefacts, consolidation and effusion needs to be established.
Figure S2: The Bat Sign. The echogenic anterior periostia of the ribs on each side of the lung window form the wings of the bat, while the hyper-echoic parietal pleura resembles the bat's body, below which lung artefacts will be visible, flanked by rib ultrasound shadows bilaterally.
- Figure S3: To ensure anatomical orientation, the diaphragm should be identified as a bright line, several millimetres thick, overlying the solid abdominal organs and moving with respiration.
Figure S4: A-lines are a result of reverberation artefact and are usually generated in the hyper inflated lung. They can be recognised as evenly spaced, parallel lines of gradually decreasing echogenicity.
Figure S5: B-lines commonly represent an increase in interstitial fluid content. They arise exclusively from the pleural line, move in concert with the pleura during respiration, are laser-beam like, do not fade out and obliterate the A-lines.
- Figure S6: Sonographic Hepatisation - collapsed or consolidated lung becomes non-aerated and echogenic with ultrasound appearances resembling solid organs.
Figure S7: Pathognomic of consolidation, Air Bronchograms are bright branching tree-like structures shifting with the respiratory and cardiac cycle.
- Figure S8: Effusions are defined as a relatively echo-free space within clear anatomical boundaries (chest wall, diaphragm and consolidated lung).
- Figure S9: Complicated effusions and empyema present as mixed echogenicity collections often with strands and septations.
- Figure S10: Complicated effusions and empyema present as mixed echogenicity collections often with strands and septations.


Appendix
- Figure S11: The Seashore Sign is the appearance of normal lung in M-mode ultrasound. Above the pleural line tissues of the chest wall do not move in relation to the ultrasound beam therefore the pattern will be static over time, yielding a series of horizontal lines. Below the pleural interface the speckled pattern changes with lung movement during the respiratory cycle resulting in a sand-like pattern.
- Figure S12: The Stratosphere Sign (or Barcode Sign) can be observed when there is no movement along the entire beam, which occurs with separation of the parietal and visceral pleura, commonly in the case of pneumothorax. Of note, subcutaneous emphysema can also produce a similar pattern.
Figure S13: The Lung Pulse sign results if the pleural interface is intact but there is no lung sliding — e.g., in the event of significant consolidation or contralateral endobronchial intubation. The Stratosphere pattern is disrupted by transmitted vibrations from cardiac pulsation resulting in short bursts of Seashore pattern, in synchrony with the cardiac cycle (note ECG trace). The presence of a Lung Pulse excludes pneumothorax.
Figure S14: The Lung Point, a definite confirmation of pneumothorax can also be demonstrated in M-mode. This separation point of parietal and visceral pleura moves with the respiratory cycle. If it crosses the M-mode ultrasound beam, Seashore and Stratosphere patterns will alternate, coinciding with respiration. Importantly this pattern will not be in synchrony with the cardiac cycle (note ECG trace).
Pleural effusion size measurement

Figure S15: Small versus large pleural collection. In clinical practice semi-quantitative evaluation of pleural effusions as small, moderate or large is usually adequate to determine if they are likely to be a mechanical factor contributing to respiratory failure and if drainage is required.
Pleural effusion size measurement

Figure S16: Small versus large pleural collection. In clinical practice semi-quantitative evaluation of pleural effusions as small, moderate or large is usually adequate to determine if they are likely to be a mechanical factor contributing to respiratory failure and if drainage is required.
Figure S17: The proximity of the diaphragm and solid abdominal organs make drainage of small basal effusions complicated and technically difficult. If ascites is present, an inadvertent sub-diaphragmatic puncture may not be promptly recognised. If no acoustic window is available where the diaphragm, the pericardium and the lung are all well away from the site of planned needle insertion, procedural risk of complications will be significantly increased. Due to the dynamic movement of these organs with the respiratory cycle, blind and “x-marks the spot” techniques are not recommended.