

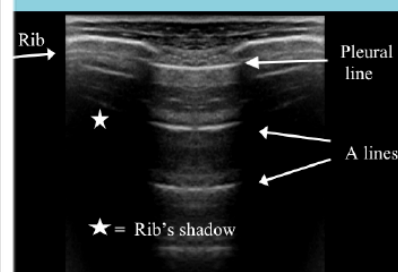
# POCUS Club

## Lung Ultrasound

### Normal lung appearances

- **Pleural sliding** - shimmering or "ants marching" under pleura.
- Predominance of **A-lines** - reverberation artefact of pleural line.
- Comet tail artefact - short vertical echogenic lines, attenuate rapidly.

Figure 2a. Normal LUS image with the bat sign and A-lines



### Evidence

#### Pneumothorax - Alrajhi et al. 2012

- Systematic review of 8 prospective studies (**n=1048**).
- Also evaluated test characteristics of supine CXR (Sn only 50%).

#### Pulmonary oedema - Al Deeb et al. 2014

- Systematic review of 7 prospective studies (**n=1074**). Included pts with acute SOB in ED/ICU/ward.
- Various lung protocols used with heterogenous gold standard.

B-Lines for Acute Cardiogenic Pulmonary Edema	
≥ 3 B-lines in two bilateral lung zones*	
Sensitivity	94.1
Specificity	92.4
Positive LR	12.38
Negative LR	0.06

#### Pleural effusion - Yousefifard et al. 2016

- Meta-analysis of 12 prospective and retrospective studies (**n=1554**), adults and paed.

Pneumothorax	
No Lung Sliding and Lack of Comet Tails	
Sensitivity	90.9
Specificity	98.2
Positive LR	50.5
Negative LR	0.09

Pleural Effusion	
Anechoic Fluid Above Diaphragm	
Sensitivity	94
Specificity	98
Positive LR	47
Negative LR	0.06

#### Pneumonia - Alzahrani et al. 2017

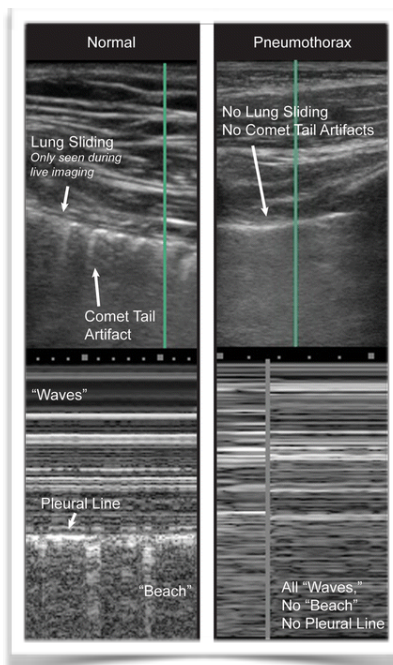
- Systematic review of 20 prospective studies (**n=2513**), adults and paed in ED/ICU/ward (from ambulatory to critically ill).
- Large degree of heterogeneity, operators varying in expertise.

Pneumonia (Adults and Peds)	
Hepatization, Shred Sign, Air Bronchograms	
Sensitivity	85
Specificity	93
Positive LR	12.14
Negative LR	0.16

### Pneumothorax

#### Technique

- **Linear probe** for best resolution (curvilinear works too), lung preset.
- Sagittal orientation, **minimise depth** to optimise resolution of pleura.
- Can use **M-mode** through pleura.



#### What to look for?

- **Absent lung sliding** or **lung point** (area of normal lung sliding beside absent sliding, 100% specific for PTX). **"Barcode" sign** with M-mode.

### LUS key questions

1. Is **pleural sliding** present or absent?
2. Are there **B-lines** (focal or diffuse)?
3. Is there a **pleural effusion**?
4. Are there signs of **consolidation** (eg. air/fluid bronchograms)?

- Lung point can be found more easily if probe rotated into horizontal orientation and slide laterally along each rib space.

## Pulmonary oedema

### Technique

- **Curvilinear** (or phased array) probe with **lung preset** (turn off artefact-suppressing software such as THI/multi-beam).
- Sagittal orientation across rib space, set **depth to 8-15cm**.
- Scan at least 2 lung zones (BLUE protocol or Volpicelli zones).

### What to look for?

- **B-lines** = artefactual hyperechoic lines extending from pleura to bottom of screen. Indicate **increased lung density** from interstitial fluid (but also lung fibrosis, contusions and interstitial pneumonias).
- **≥3 B-lines in ≥2 lung zones bilaterally** consistent with alveolar-Interstitial oedema.

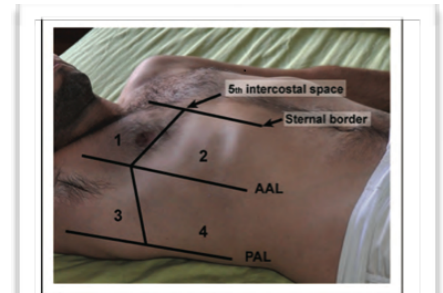
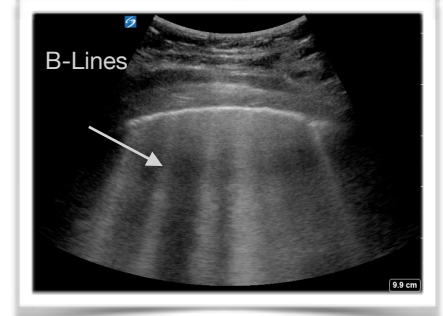


FIGURE 3. The four Volpicelli's zones. AAL, anterior axillary line; PAL, posterior axillary line.



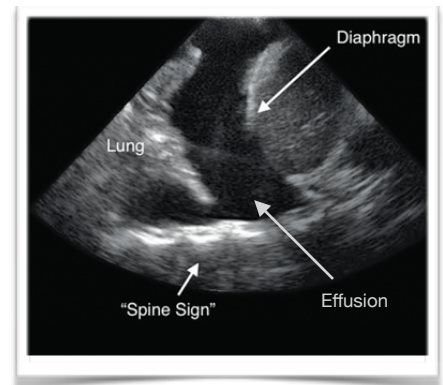
## Pleural effusion

### Technique

- Curvilinear (or phased-array) probe. Abdominal preset works fine. Slide up from FAST RUQ/LUQ views.

### What to look for?

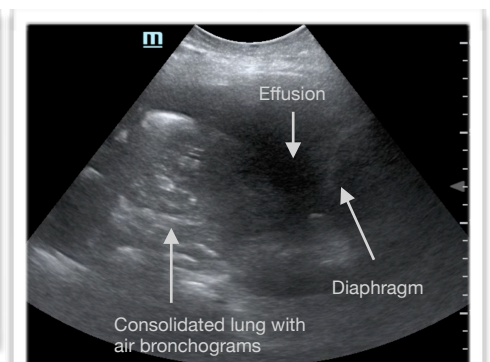
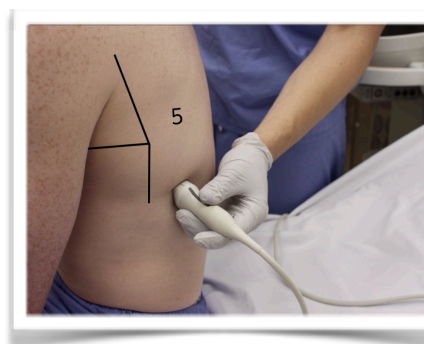
- **Anechoic region** above diaphragm with "floating" lung (fish tail).
- **"Spine" sign** (continuation of spine) and loss of mirror image artefact.



## Pneumonia

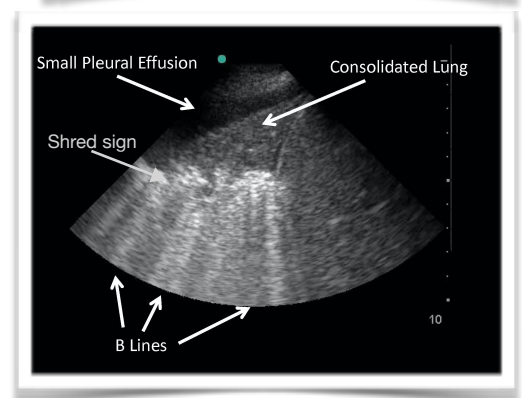
### Technique

- **Phased-array probe** fits easily between ribs (alternatively curvilinear). Lung preset ideally but can use abdominal.
- Scan **lateral/posterior** lung zone.



### What to look for?

- **Air/fluid bronchograms** - static or dynamic, appearance similar to liver echotexture ("hepatization").
- Irregular pleural line (and **"shred" sign**) - commonly surrounded by **focal B-lines**.
- Effusions - may be parapneumonic (echogenic or septations).



## RESOURCES

5 Min Sono: <http://5minsono.com/pna/>  
 POCUS Atlas: <http://www.thepocusatlas.com/ea-pulm>  
 Western Sono: <https://westernsono.ca/screencasts/lung-ultrasound/>