

Internal Medicine Point-of-Care Ultrasound: Anterior Lung

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Disclosure

- I have no financial disclosure or conflicts of interest with the presented material in this presentation.

PEARLS



P - Parasternal

E - Epigastric

A - Anterior lung; apical (cardiac)

R - RUQ

L - LUQ

S - Suprapubic

Lecture Outline

- Discuss beginner and advanced goals with POCUS
- Probe Orientation
- Normal Ultrasound Anatomy
- Pathology and Applications for the internist

Anterior Lung View

- Beginner
 - Visualize lung sliding and detect pneumothorax if present.
 - Fan probe to be perpendicular to lung surface to visualize A-lines and B-lines in at least 6 quadrants.
- Advanced
 - Identification of shred sign, plankton sign, loculations, static vs. dynamic bronchograms and clinical importance.

Probe Orientation in Lung fields

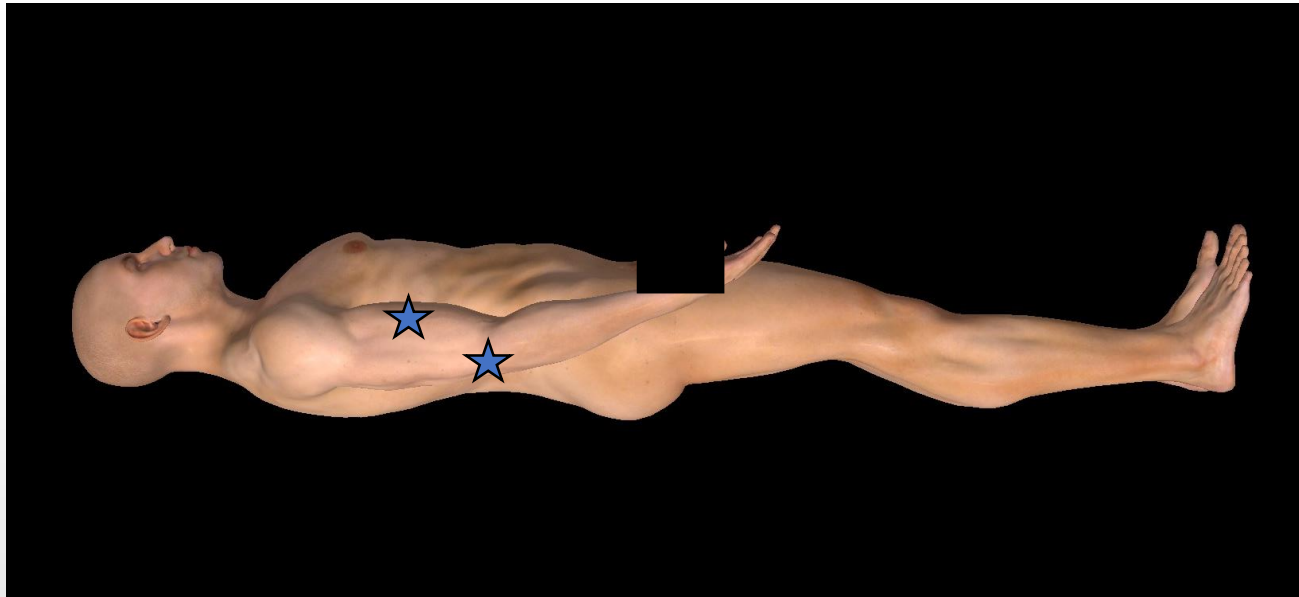
Probe: Curvilinear (phased array) for deeper structures, linear for lung sliding

Preset: Lung (maximizes artifacts)/ Abdominal

Probe marker: Cephalad

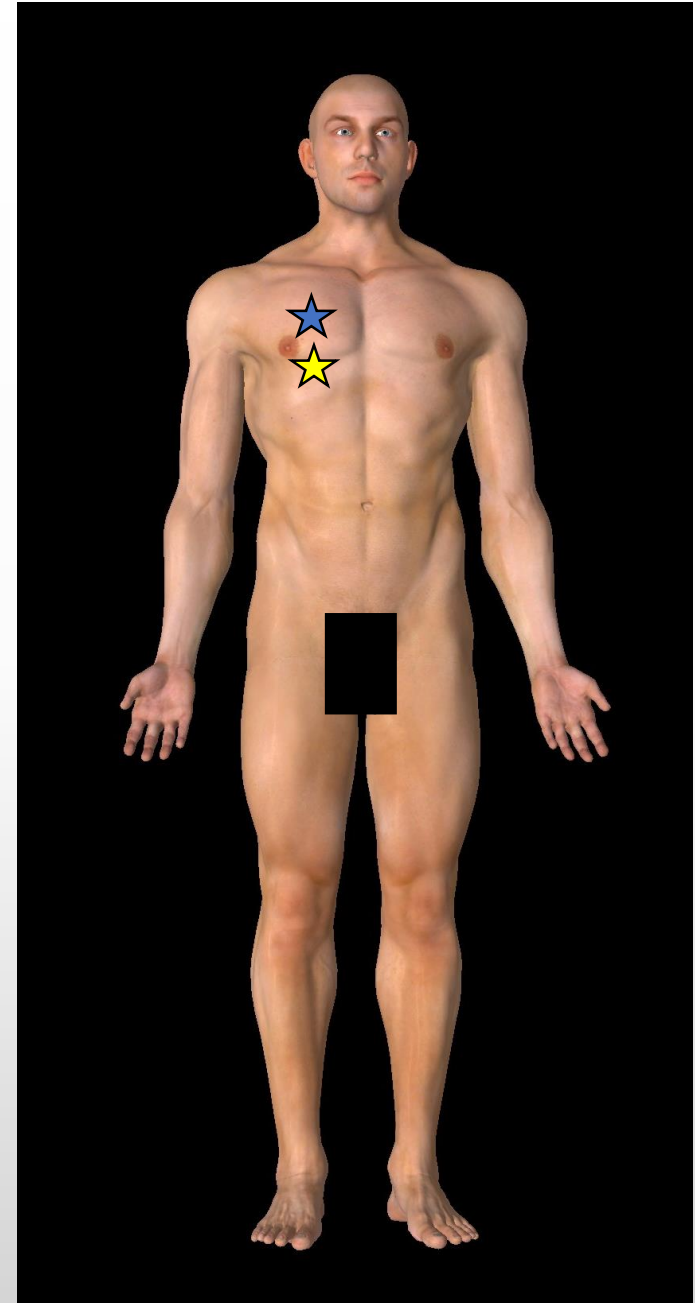
Probe location: Depending on view you are attempting. More to come.

6 Point Lung Exam

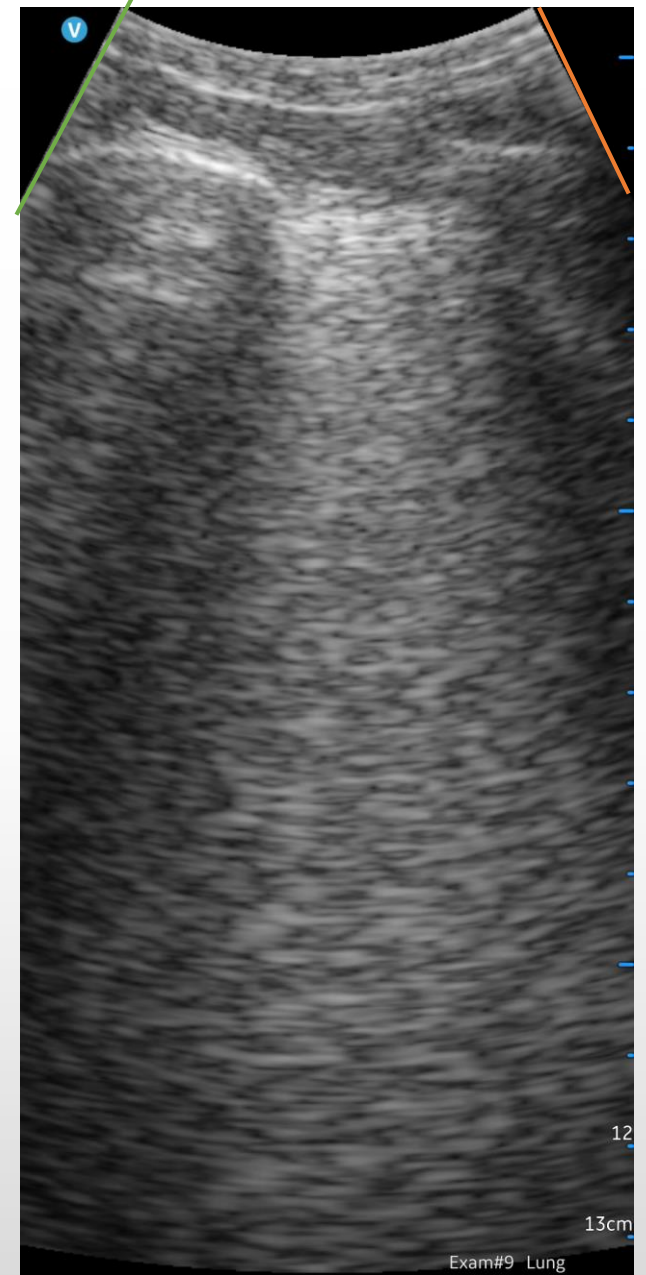
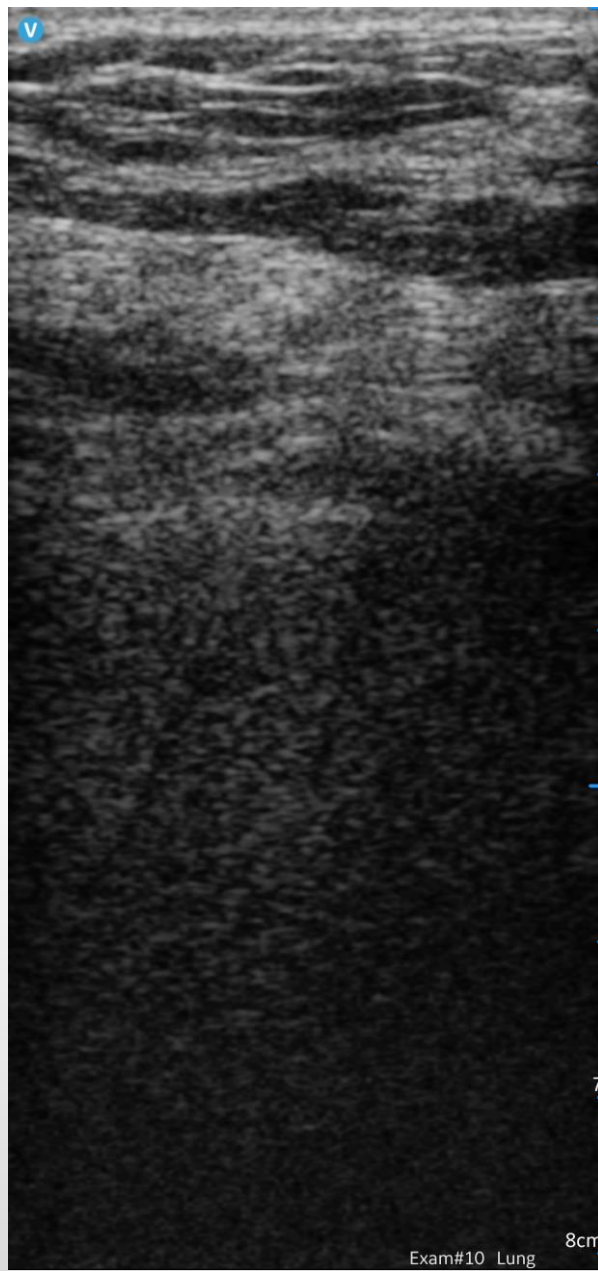
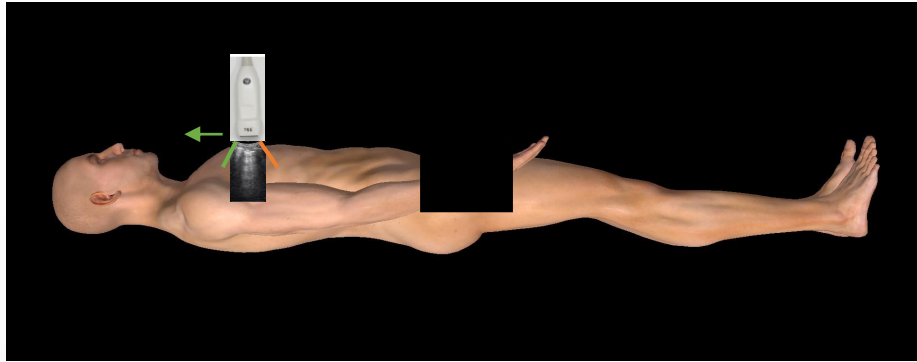


You will need to scan 3 points on each side to obtain a sufficient lung exam. Anterior, lateral and posterior. These are at the midclavicular, mid-axillary, and posterior axillary lines respectively.

Yellow star – I usually scan a fourth on either side, including this second anterior lung field.



Anterior/ mid axillary Lung Field



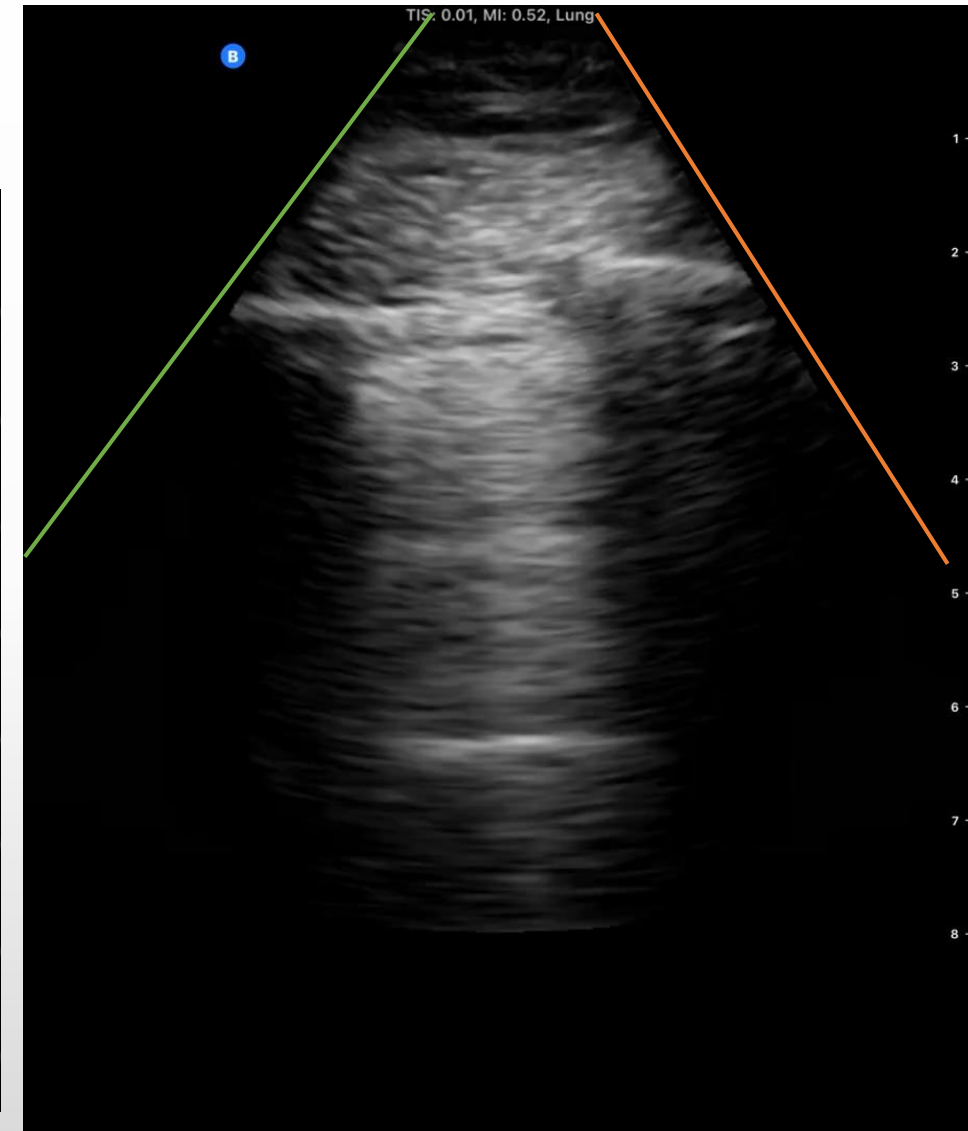
Anterior/ mid axillary Lung Field

Most helpful for
assessing for
pneumothorax and
interstitial edema.

Identify:

- Landmarks
- Lung Sliding
- A lines vs. B lines

Can also evaluate for
lung sliding and a
pneumothorax using M
mode. This will be
discussed in more detail
at a later date.



Posterior lung field

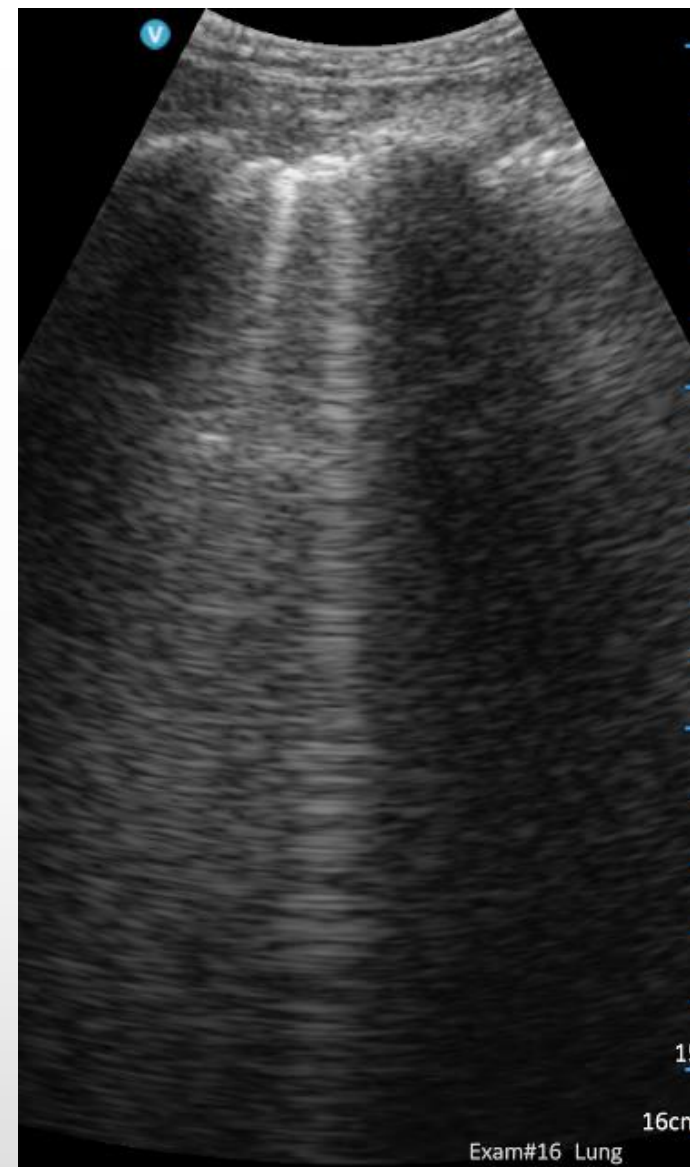
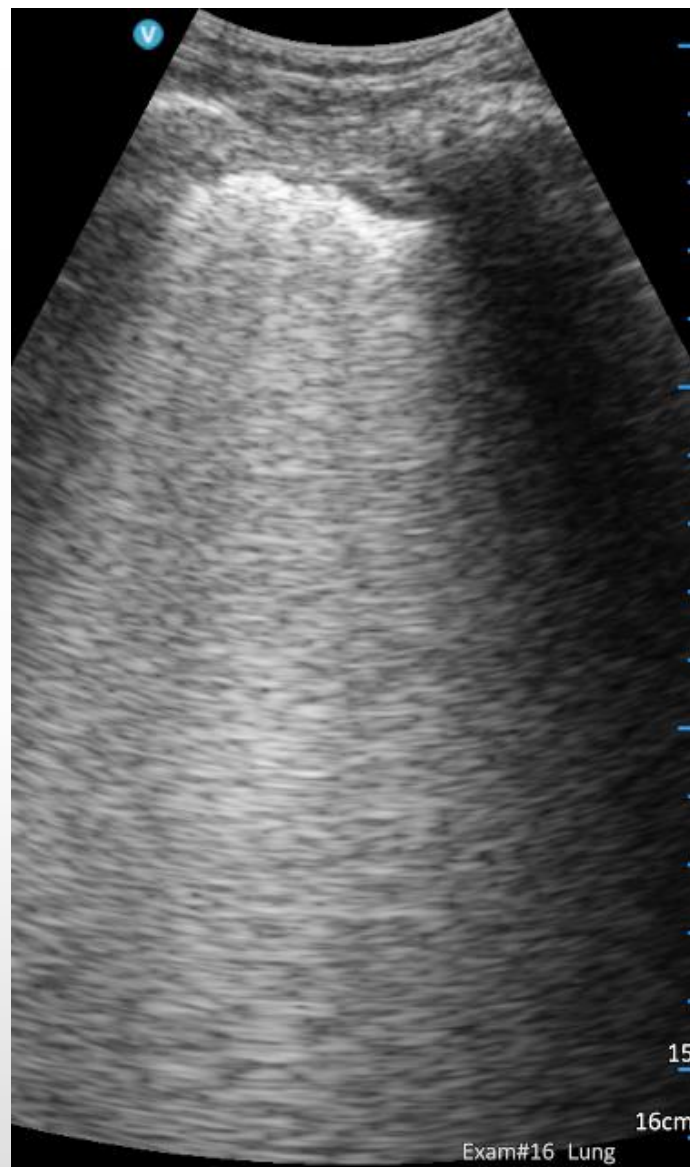
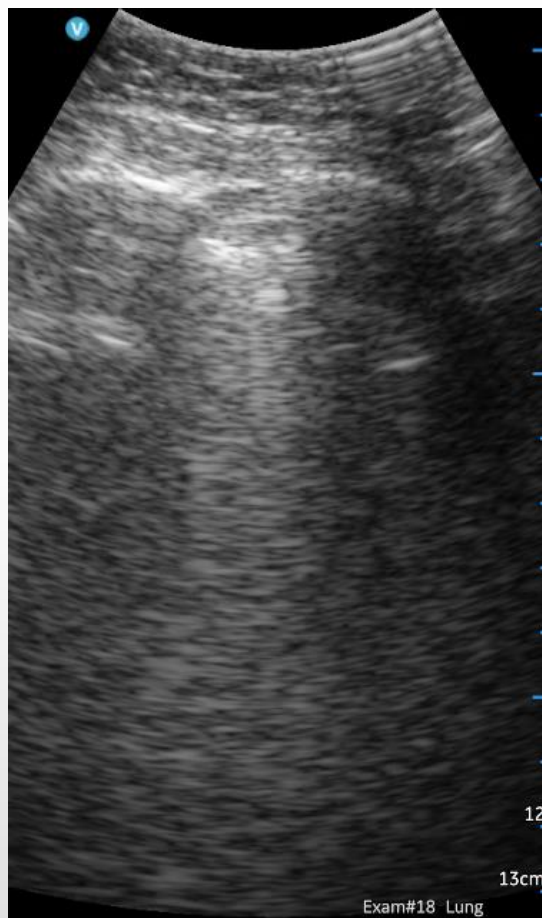
- RUQ and LUQ home screens discussed further in their respective lectures.
- Also known as the PLAPS point (posterior and/or lateral alveolar and/or pleural syndrome)
- Most helpful for identifying pleural effusions and consolidations.
- Note pleural effusion, jellyfish sign, and spine sign in these images.



Curtain Sign



B lines



B-Lines Diagnostic Criteria

- Represent thickened lung tissue, or fluid filled alveoli
- Begin at the pleural line
- Move with lung sliding
- Extend to the periphery of the screen, obtain depth of 8-10 cm
- Can be associated with a thickened pleural membrane
- Lung fissures and thickened interlobular septa can also result in B-lines

B-Lines

- Bilateral
 - Pulmonary edema
 - Diffuse interstitial pneumonitis/infection
 - ARDS
 - Interstitial lung disease
- Unilateral
 - Focal pneumonia
 - Atelectasis
 - Lung contusion
 - Pulmonary infarct
 - Malignancy

Shred sign

- Fluid filled/ collapsed lung tissue meets aerated lung.
- From superior to inferior: chest wall -> pleural effusion -> consolidated lung -> aerated lung.



Lung consolidation with air bronchograms

- Can resemble lung echotexture and be termed hepatization of the lung
- Quick note on air bronchograms
 - Dynamic – move with inhalation and exhalation and occur more frequently in pneumonia.
 - Static – occur when air bubbles are trapped behind an obstruction such as atelectasis



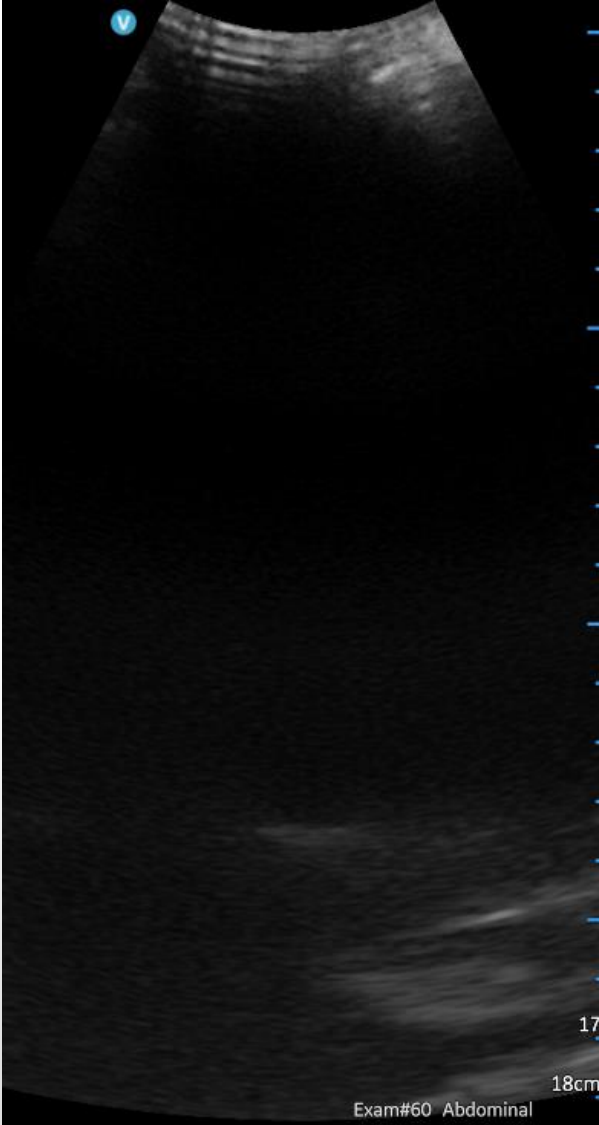
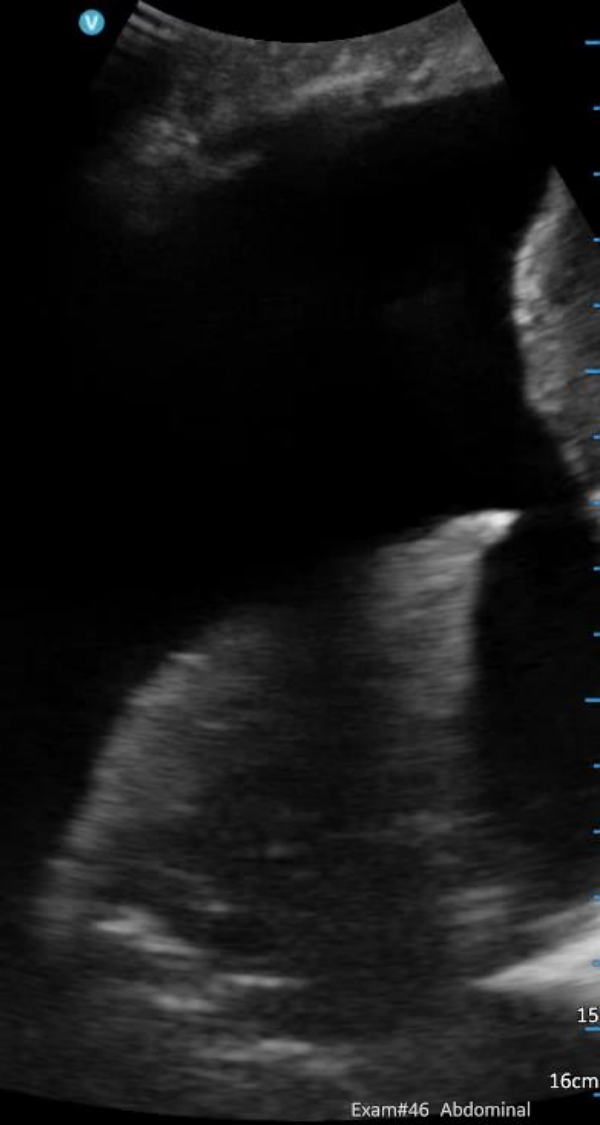
Pleural Effusions

- Spine Sign
- Jellyfish sign
- Sinusoid Sign (with M-Mode)
- Quad Sign
- Plankton Sign = exudative effusion
- Hematocrit Sign = exudative effusion or hemothorax

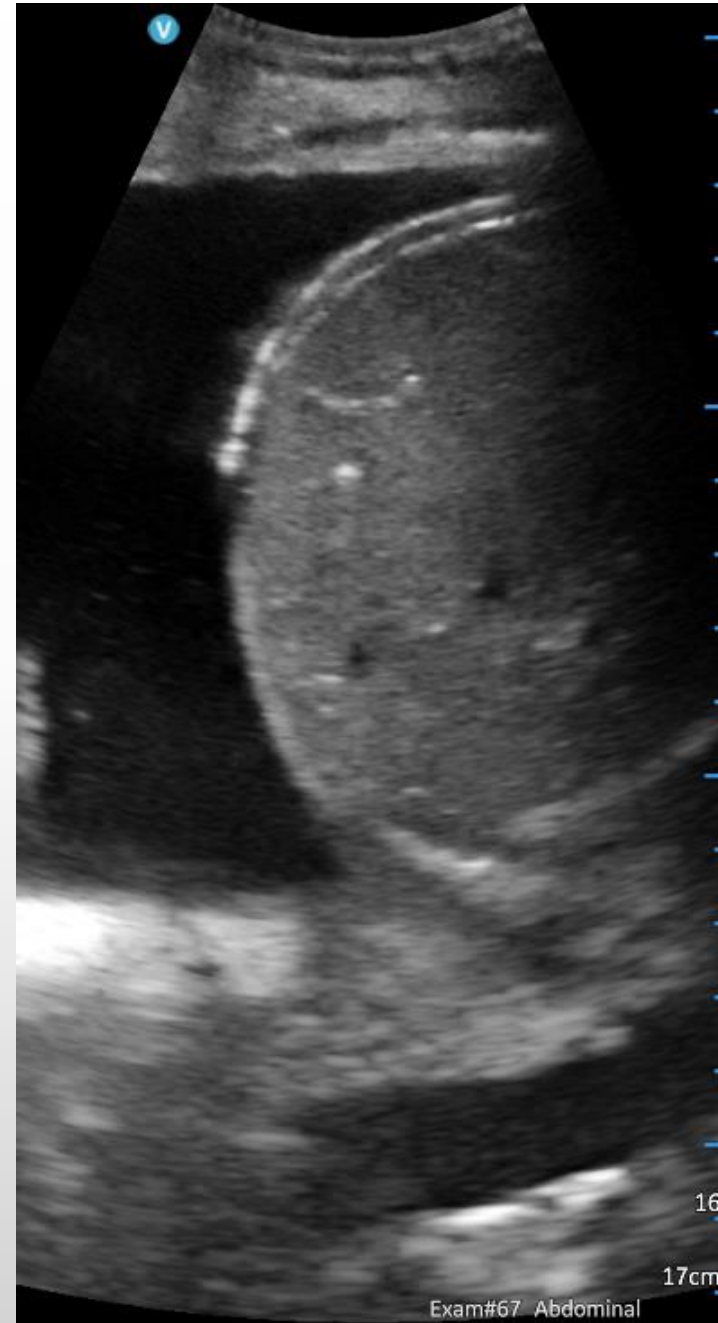
Spine sign



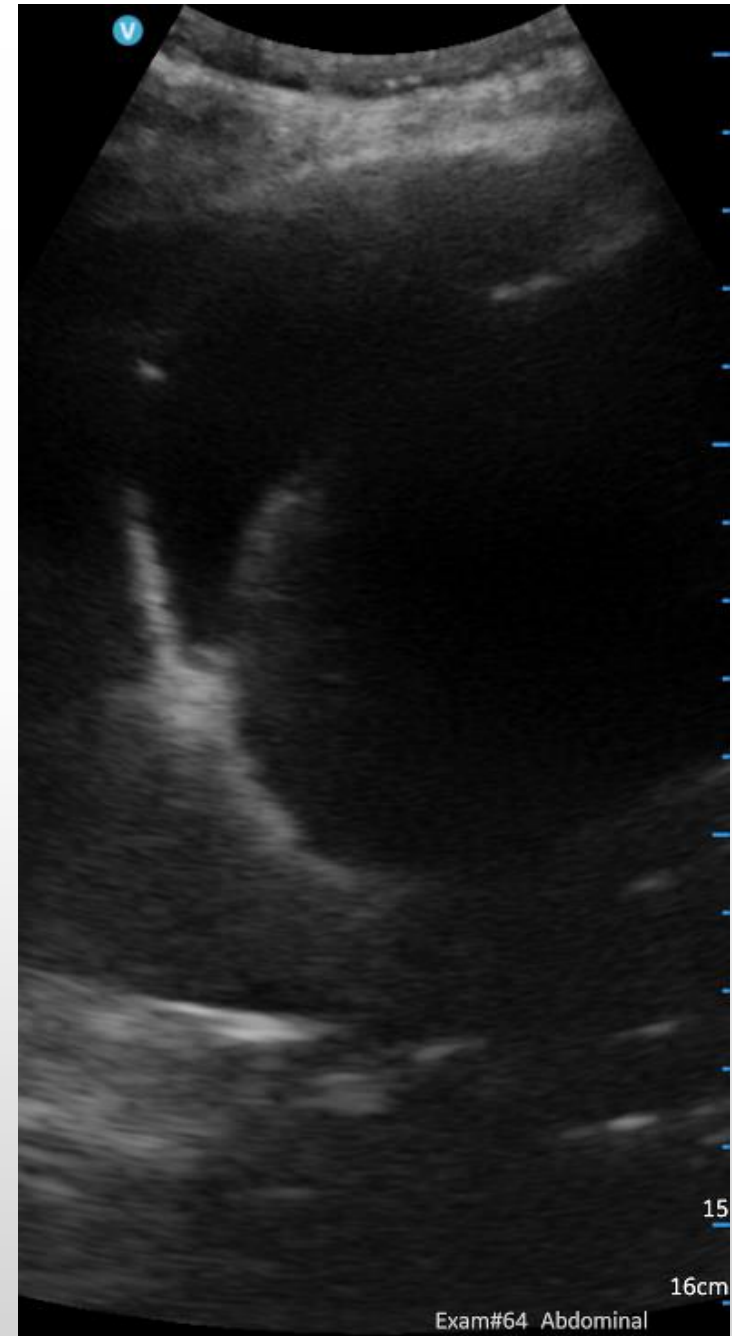
Jellyfish Sign



Plankton sign

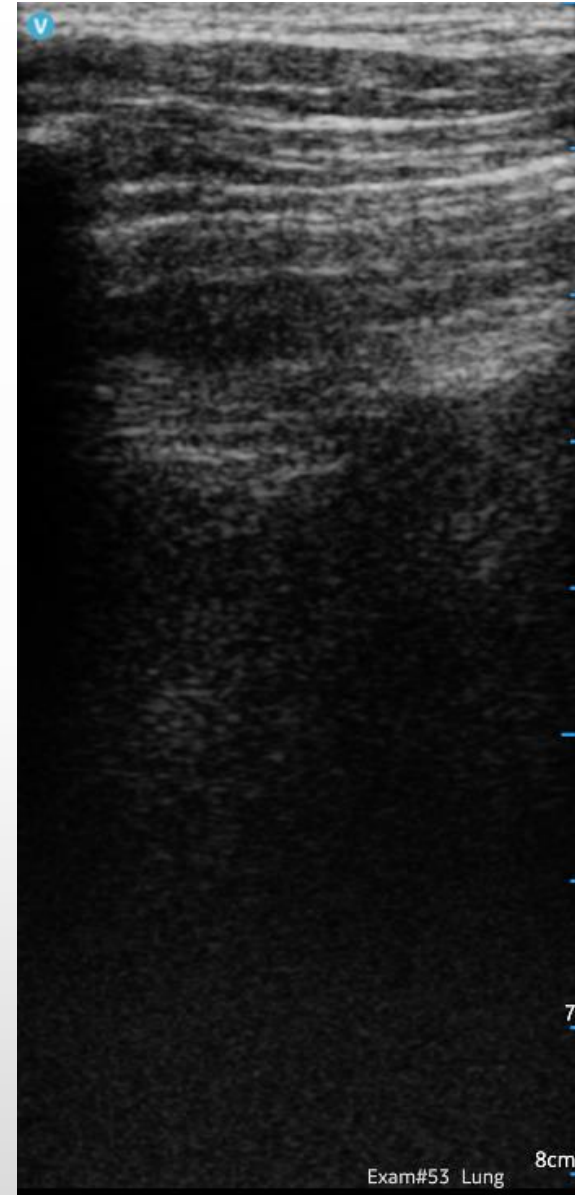


Pleural effusion with ascites



Pneumothorax

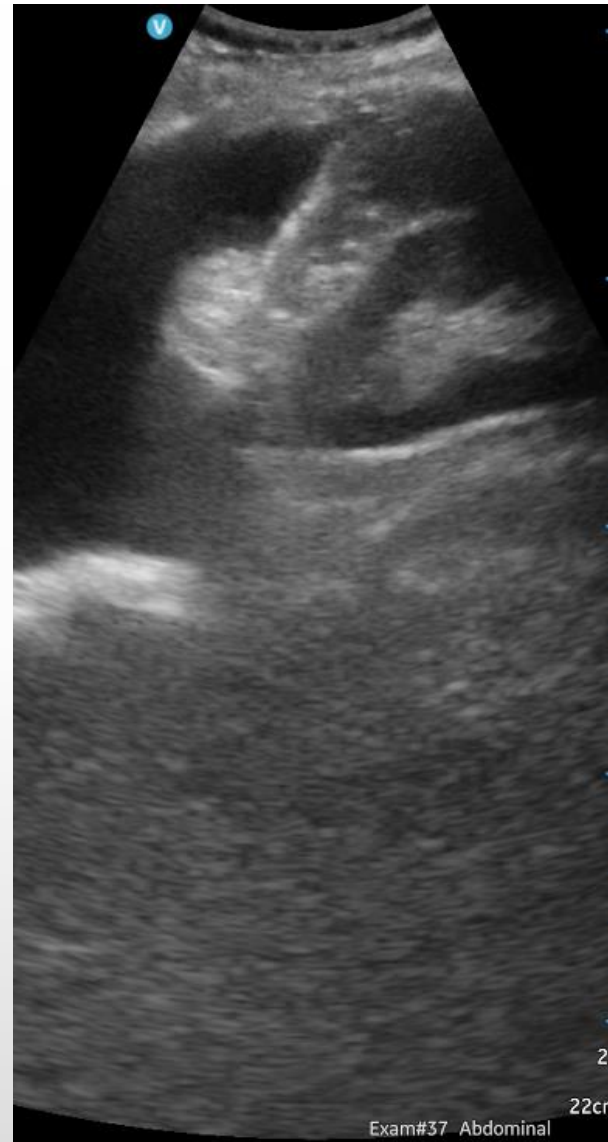
- Presence of lung sliding **100% sensitive** for absence of pneumo and presence of lung point **100% specific** for presence of pneumothorax.
- Absence of lung sliding without lung point could be pneumothorax but must consider alternatives such as severe consolidation, chemical pleurodesis, acute infectious or inflammatory states, fibrotic lung diseases, acute respiratory distress syndrome, or mainstem intubation.



More Evidence Based Medicine

- In a systematic review, lung ultrasound was 93% sensitive for diagnosing pneumonia compared to 54% sensitivity for CXR
- Pleural ultrasound was found to be superior in diagnostic accuracy (93%) compared to CXR (47%) and auscultation (61%)

Interesting path



Condition	Ultrasound Findings
Cardiogenic Pulmonary Edema	<ul style="list-style-type: none"> • Diffuse bilateral B-Lines • Normal lung sliding • +/- Pleural effusion
Pneumonia	<ul style="list-style-type: none"> • Early: Focal unilateral B-Lines, normal lung sliding • Advanced: Consolidation bounded by B-Lines, dynamic air bronchograms, reduced or absent lung sliding • +/- Pleural effusion
COPD/Asthma	<ul style="list-style-type: none"> • Bilateral A-lines with normal lung sliding • Reduced or absent lung sliding without lung point in severe disease
Pulmonary Embolism	<ul style="list-style-type: none"> • Bilateral A-Lines • DVT • Heart strain
Pneumothorax	<ul style="list-style-type: none"> • Absent lung sliding with lung point • Absent anterior B-lines

Pearls and Pitfalls

- Patients with normal US and dyspnea should be evaluated for COPD/Asthma, PE or non pulmonary cause
- For B-Lines to be pathologic, 3 or more must appear in a single rib space at depth of 8-10 cm
- Blunting of the costophrenic recess and obliteration of the hemidiaphragm on a PA CXR is seen after accumulation of 200mL and 500mL of pleural fluid respectively, but US can pick up 100mL of pleural fluid

Pearls and Pitfalls

- Obese patients may make finding the pleural line difficult. Therefore, providers should identify a rib and search for the pleural line 0.5cm deep to the rib
- A pleural effusion with an interpleural distance of $> 10\text{cm}$ or involving more than 3 intercostal spaces indicate pleural effusion volume greater than 1L

References

- Soni NJ, Arntfield R, Kory P. *Point-of-Care Ultrasound*. Elsevier; 2020.
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