Amy Kule, MD (akule@lumc.edu)
Student Version

Cardiac and Pulmonary Ultrasound

Workshop:

Location: SSOM, L71

Watch:

- **Subxiphoid Cardiac View Ultrasound Scanning Protocol: (1:15)**
  https://youtu.be/zcFFTKteaUQ

- **Pulmonary Ultrasound Scanning Protocol: (7:22)**
  https://www.youtube.com/watch?v=WOlz8-km6hE

LEARNING OBJECTIVES

- Correlate anatomic structures identified during live-dissection with findings on ultrasound
- Demonstrate the ability to describe normal ultrasound anatomy in the heart and lung
- Select the appropriate transducer and optimizing image capture by adjusting function keys
- Describe artifacts encountered during the pulmonary ultrasound examination

HANDS-ON OBJECTIVES

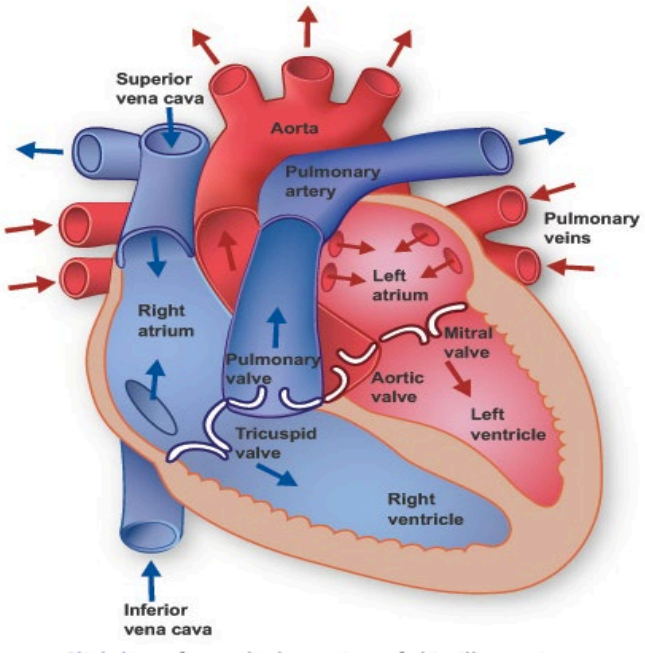
- Identify cardiac structures (Subxiphoid View)
  - Liver
  - Right atrium
  - Right ventricle
  - Left atrium
  - Left ventricle
  - Mitral valve
  - Tricuspid valve
  - Pericardium

- Identify pulmonary structures
  - Rib
  - Rib shadow
  - Pleural line
  - Lung slide
  - Sea-shore sign (in M-mode)

CARDIAC ULTRASOUND

Amy Kule, MD (akule@lumc.edu)
Student Version

Gross Anatomy



Credit: www.texasheart.org

Ultrasound Anatomy

Cardiac Ultrasound Scanning Protocol:

- In EM/general convention the probe indicator is to patient's right with the screen indicator dot to the **Left**
- In Cardiology convention the probe indicator is to patient's left with the screen dot to the **Right**.
- Subxiphoid view: https://youtu.be/zcFFTKteaUQ
  - ***Please note that the video describes how to orient the probe marker in cardiology convention, as the screen marker is on the right***

Probe Selection:

- Phased array (cardiac probe)
- Curvilinear

Patient Positioning and Preparation:

- Supine
- Tip: Having the patient bend his/her knees may assist with image acquisition

1. Technique for subxiphoid view:
   - Place probe beneath and slightly right of the xiphoid process.

Amy Kule, MD (akule@lumc.edu)
Student Version

- The probe indicator is to be directed to the patient's right side (if the screen marker is on the left in general/EM convention).
- Hold the transducer like a computer mouse with your index/middle fingers on top. Aim the probe towards the patient's head or left shoulder with the probe nearly flattened and parallel to the abdominal surface.
- Tips:
    - Use the liver as an acoustic window to avoid poor image quality due to air in the stomach and bowel gas.
    - Also, the heart sometimes can be visualized better by having the patient take a deep breath in and holding it, which brings the heart downward closer to the probe.

Image Credit: http://www.sonoguide.com/cardiac

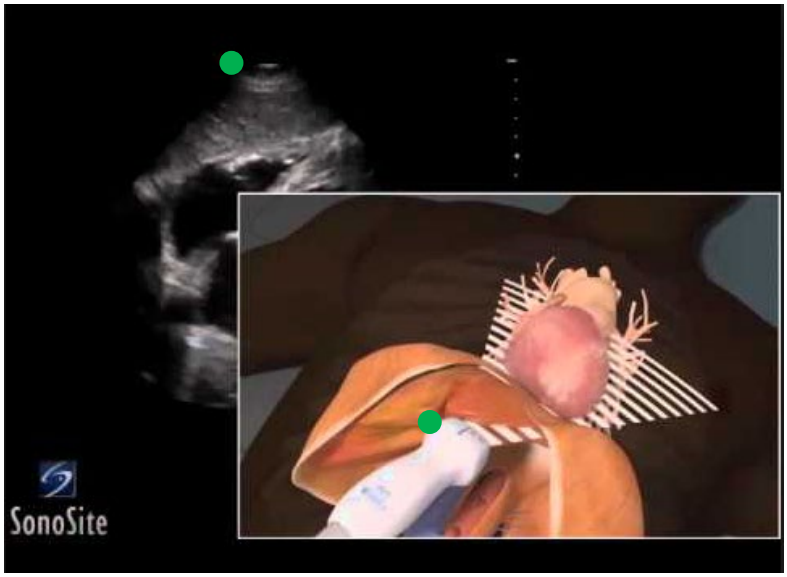
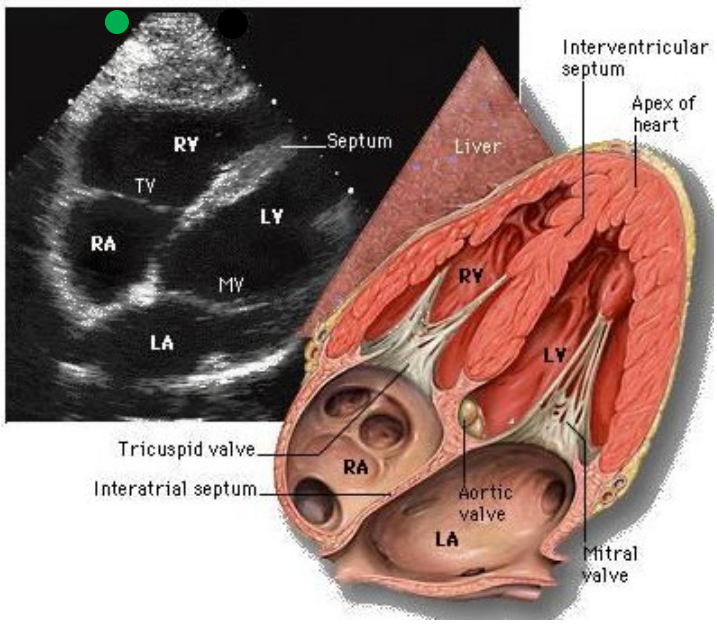


Image Credit: https://www.youtube.com/watch?v=BEofsBzfOOw

Amy Kule, MD (akule@lumc.edu)
Student Version



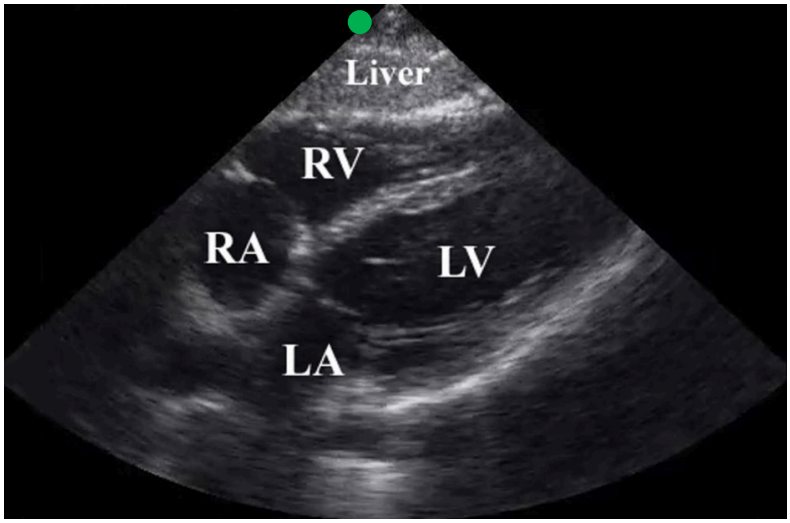


Image Credit: https://www.emergencyultrasoundteaching.com

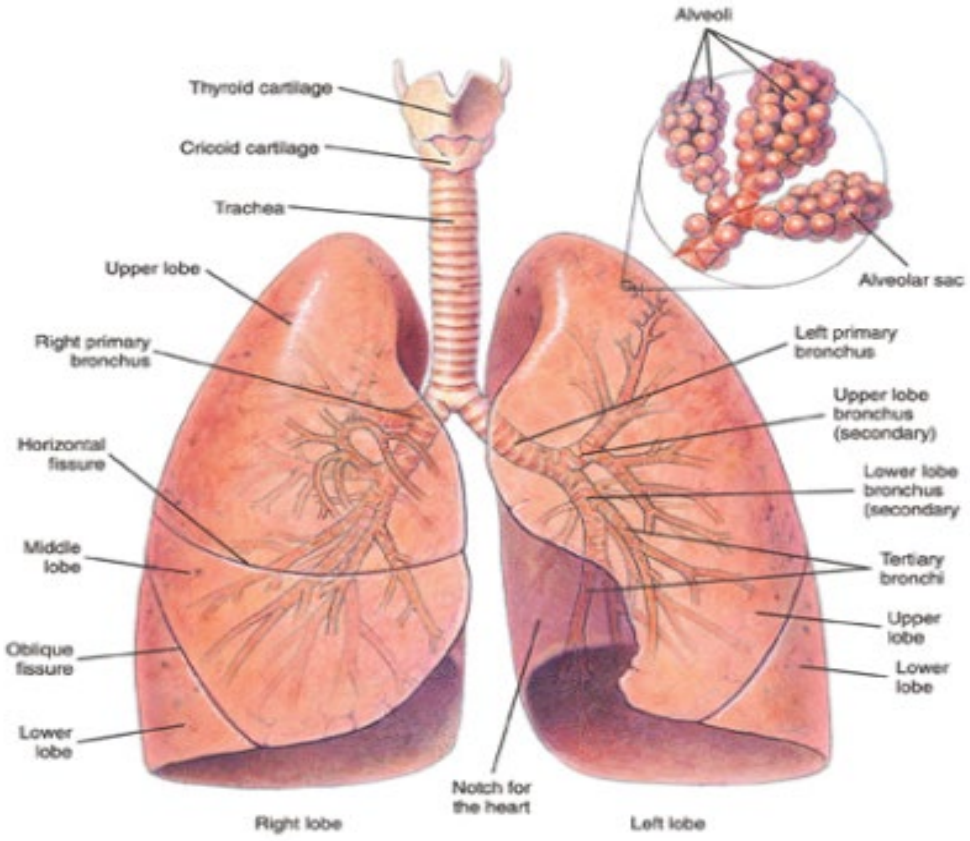
Structures to Identify:

- Liver
- Right atrium
- Right ventricle
- Left atrium
- Left ventricle
- Mitral valve
- Tricuspid valve
- Pericardium

PULMONARY ULTRASOUND

Amy Kule, MD (akule@lumc.edu)
Student Version

Gross Anatomy



Ultrasound Anatomy

- Pulmonary Ultrasound Scanning Protocol: www.youtube.com/watch?v=dQTTVQ60WsI

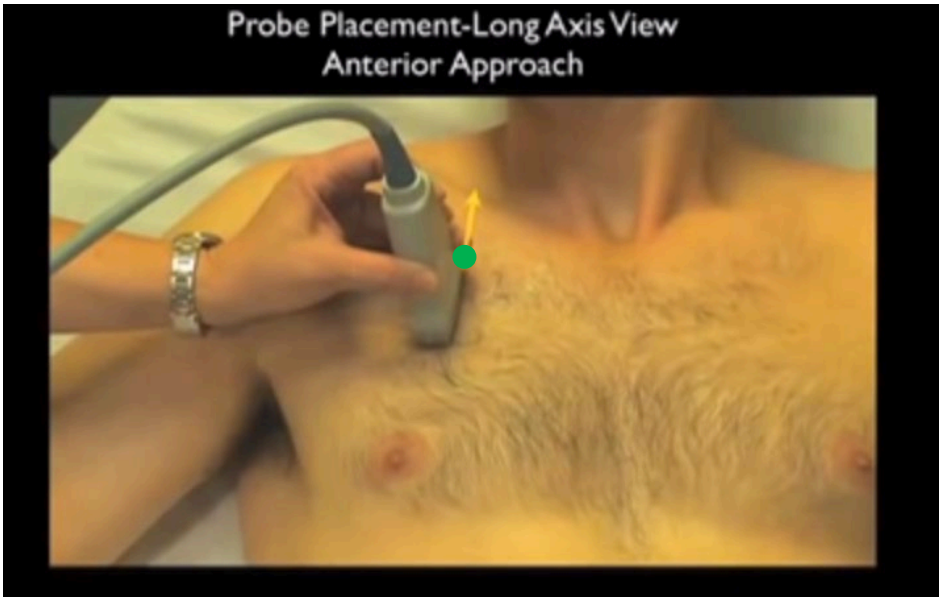
Probe Selection: Variety of probes used
- Linear
- Phased array
- Curvilinear

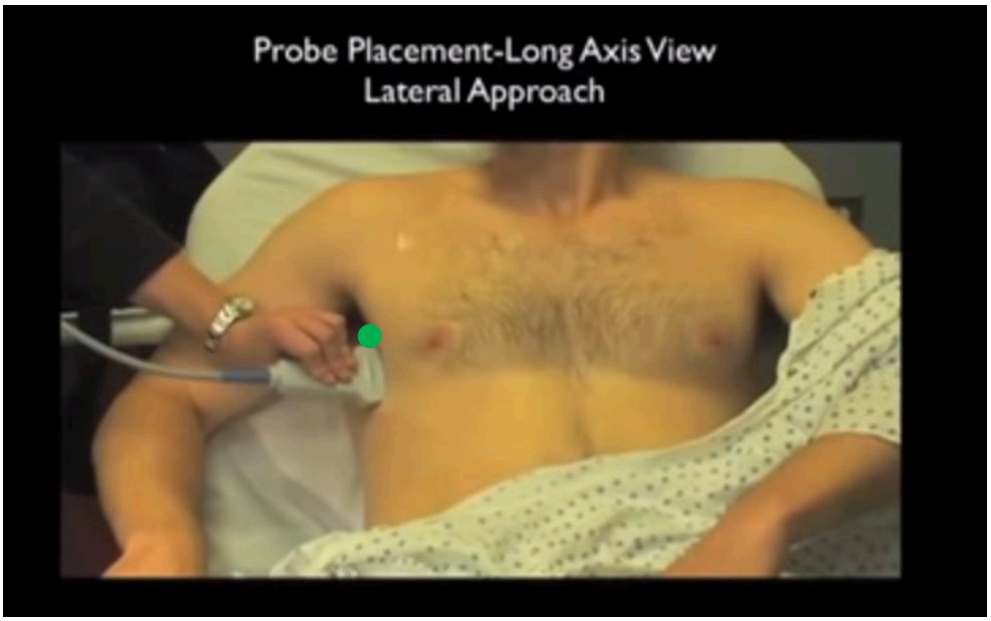
Patient Positioning and Preparation:
- Supine

1. Technique:

Amy Kule, MD (akule@lumc.edu)
Student Version

- Place probe oriented longitudinally (with indicator towards patient's head) in 2nd to 3rd intercostal space, mid-clavicular line.
- Additional views can be obtained in other intercostal spaces and anterior axillary line.

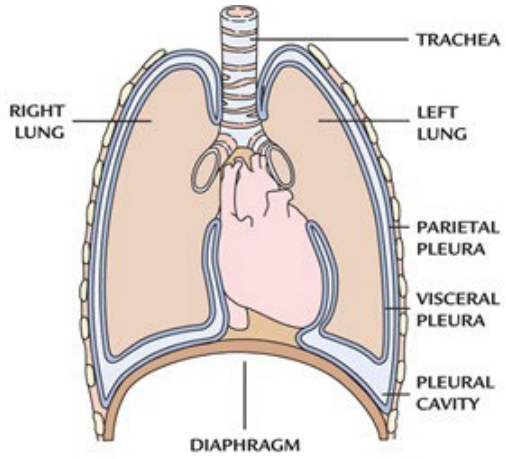




Source: https://www.youtube.com/watch?v=Xxdedx1HtHo

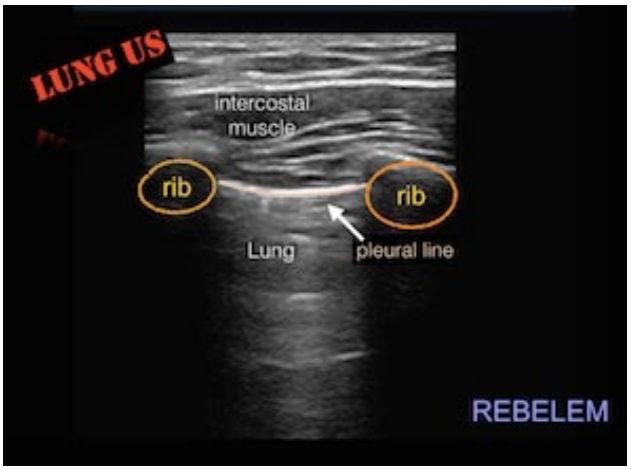
- Normal lung function on ultrasound will reveal the presence of lung sliding, which indicates gliding of the visceral against the parietal pleura.

Amy Kule, MD (akule@lumc.edu)
Student Version

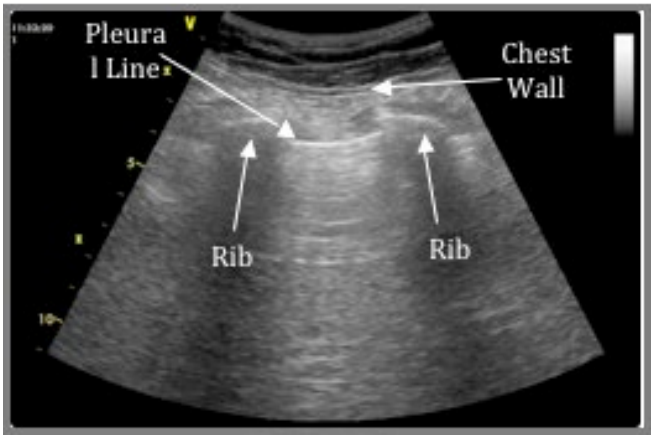


http://www.womens-health-advice.com/assets/images/human-body/respiration-diaphragm.jpg

- Confirmation of the pleural line is visualization of ribs (hyperechoic rim) flanking each side with associated rib shadow (artifact: "posterior acoustic shadowing").



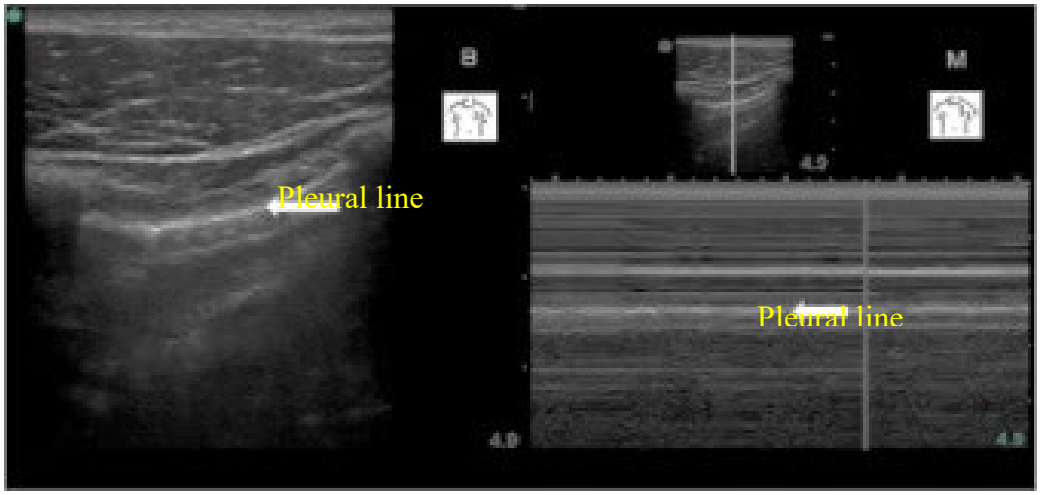
Credit: www.rebelem.com/ultrasound-detection-pneumothorax/



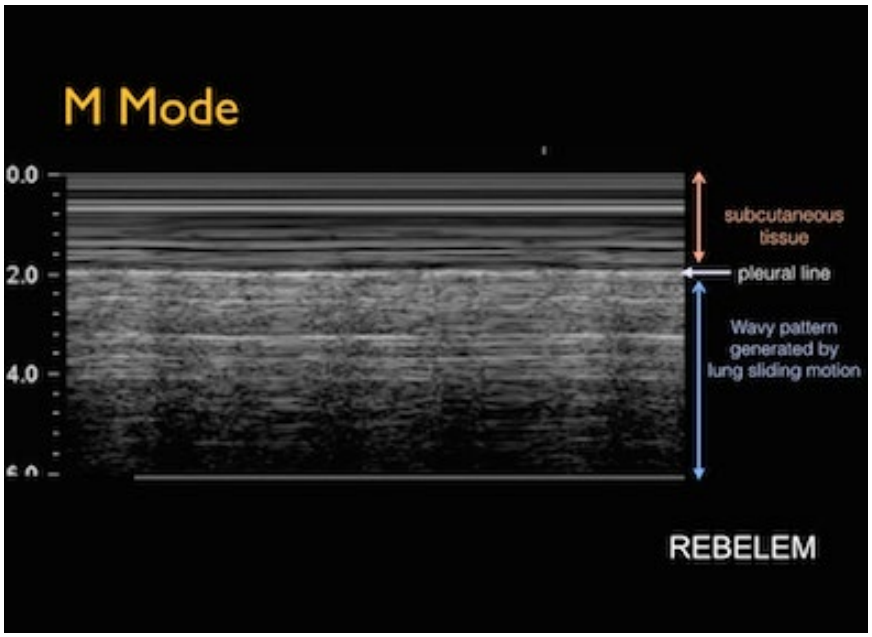
Credit: https://ukemigquickhit.files.wordpress.com/2013/08/efast2fig10.png

Amy Kule, MD (akule@lumc.edu)
Student Version

- In M-mode or "motion mode," movement of tissue at the designated line over time.
- M-mode can alternatively be used to detect lung sliding, which would reveal a "sea-shore sign" – the subcutaneous tissue towards the top of the screen produces horizontal straight lines and below the pleural line will appear wavy like sand on the beach.



Credit: http://www.hindawi.com/journals/crira/2014/906127/fig2/



Source: www.rebelem.com/ultrasound-detection-pneumothorax/

Structures to Identify:

- Rib
- Rib shadow
- Pleural line
- Lung slide
- Sea-shore sign (in M-mode)