Cardiac POCUS for the Hematologist

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Cardiac Ultrasound Keys

- Purpose: To answer clinical question at the bedside
- Examples: Yes or no questions
  - Does my patient have a pericardial effusion?
  - What is the gross ejection fraction of my patient?
  - Is there evidence of Right heart strain?
  - Will my patient respond to fluids? Is my patient volume overloaded?
- Not meant to replace formal Echocardiography

Probe Selection

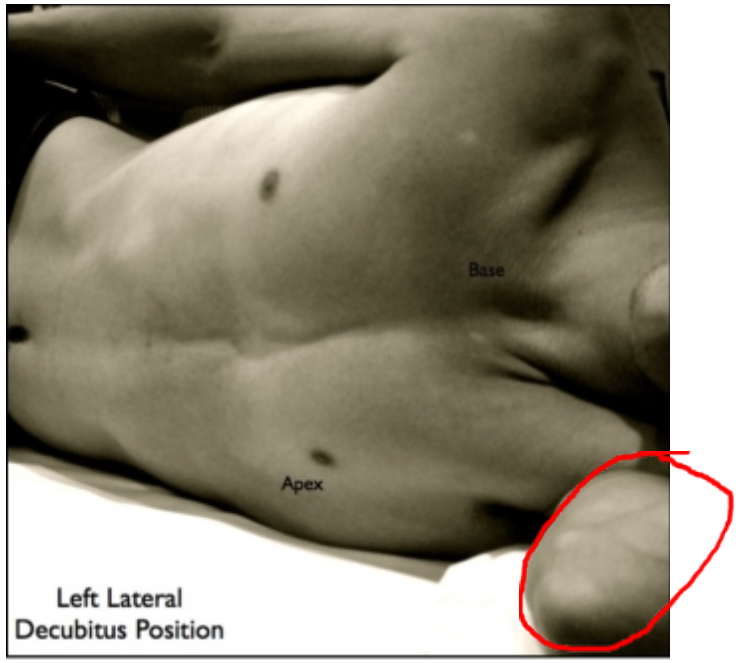
- Phased Array Probe
- Low Frequency, High Penetration
- Small Footprint to Fit in between rib spaces

Holding the Probe

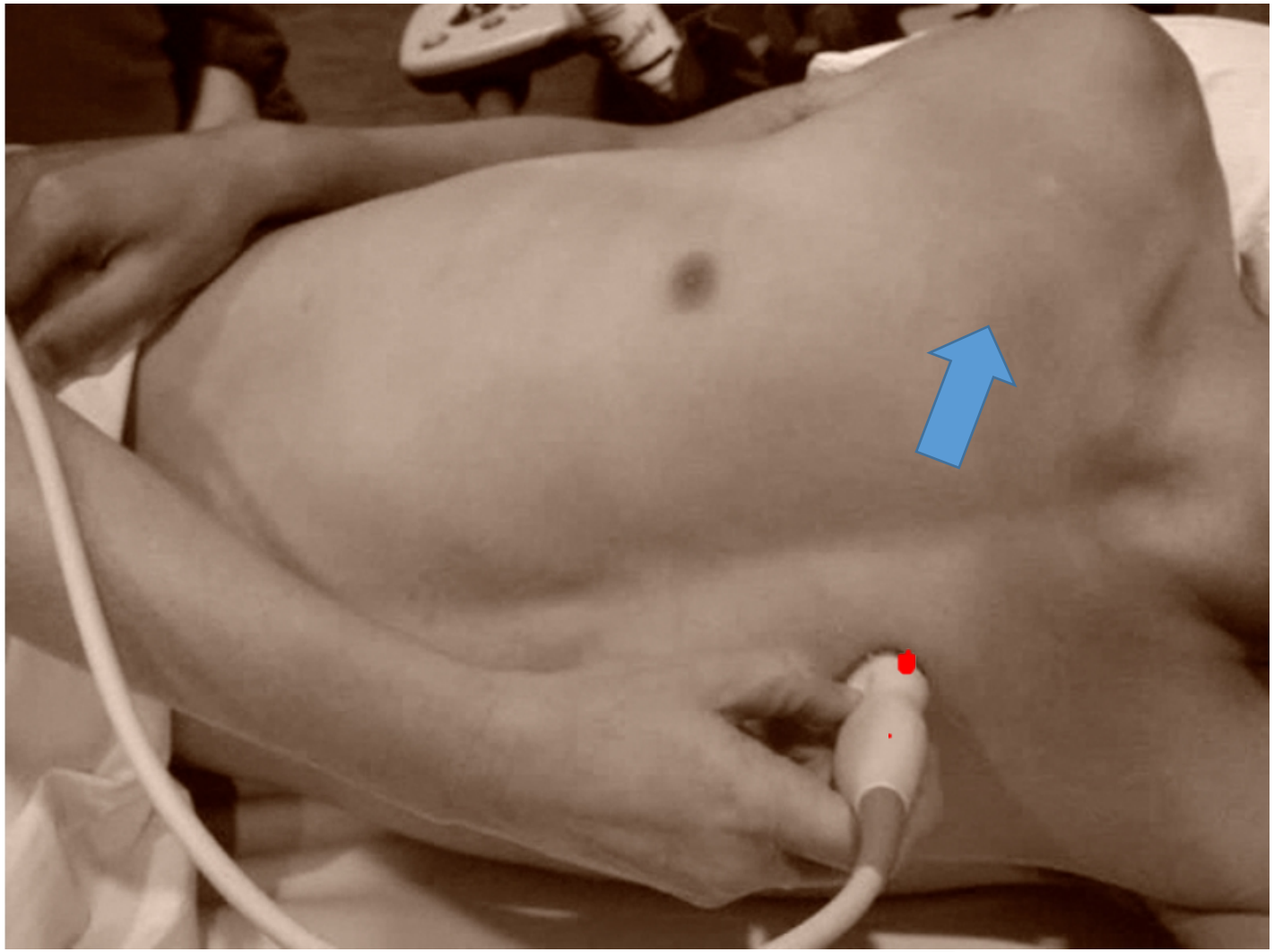
- Like a pencil
- Brace your hand on the patient to prevent sliding
- Use ample amount of gel

Patient Positioning

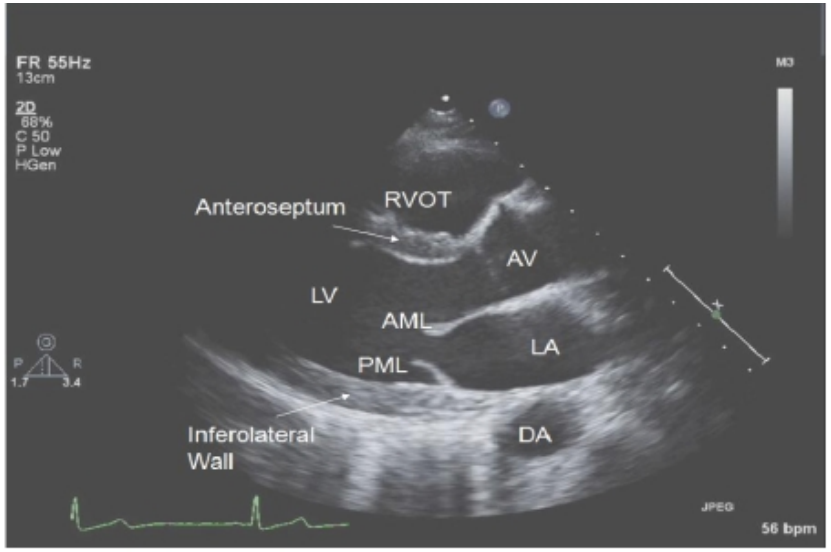
- Supine or Left Lateral Decubitus (usually improves image quality)

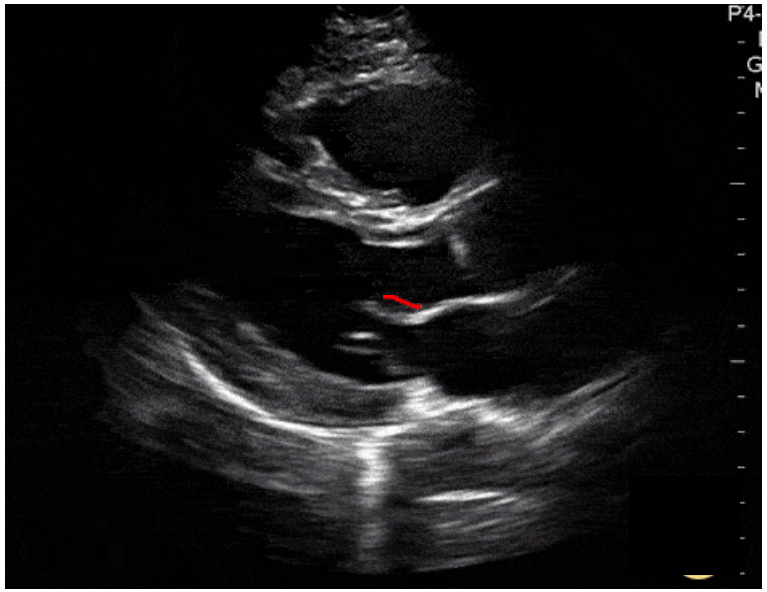


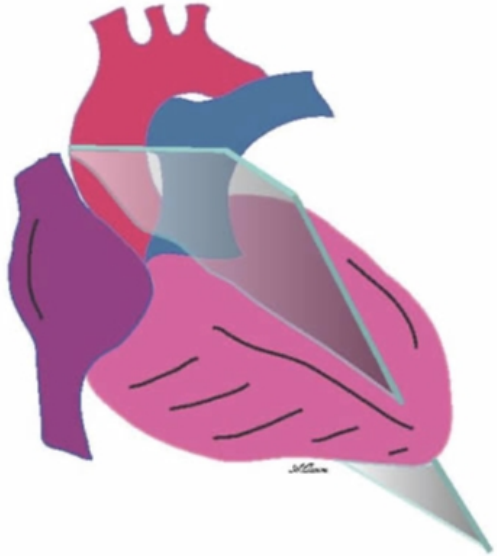
Parasternal Long Position

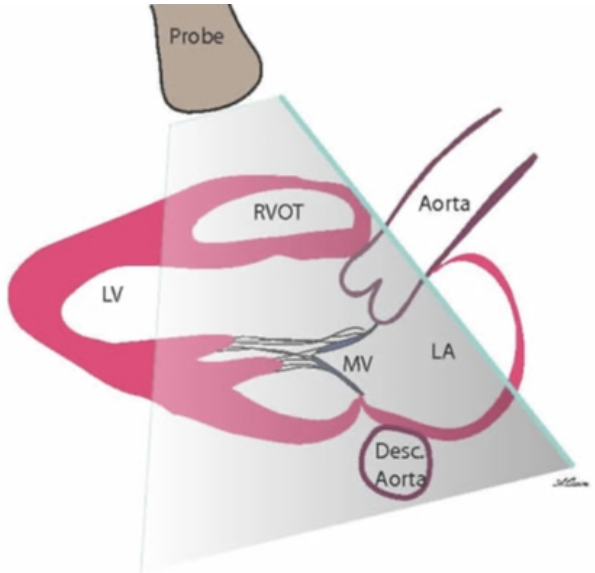


Parasternal Long Axis View





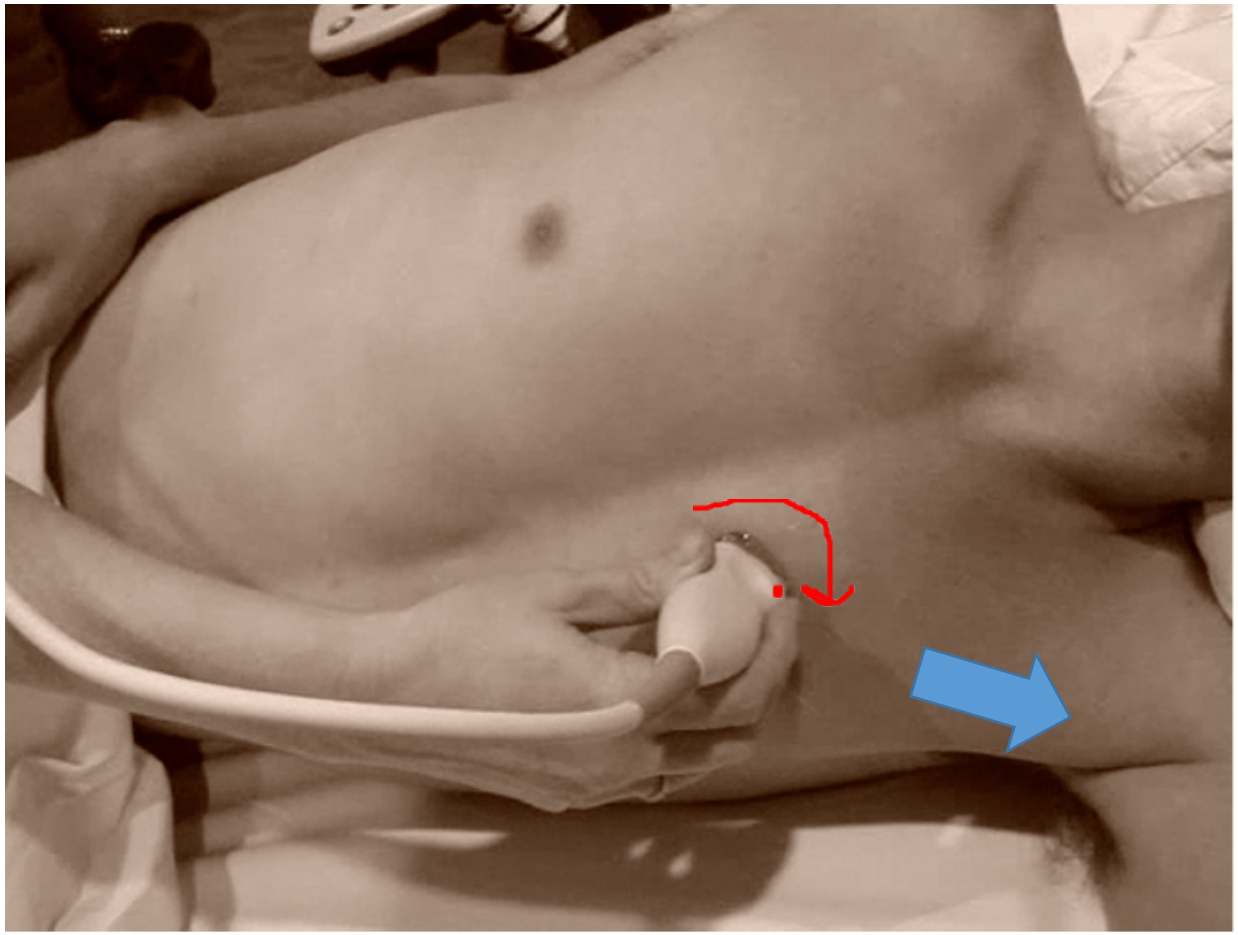




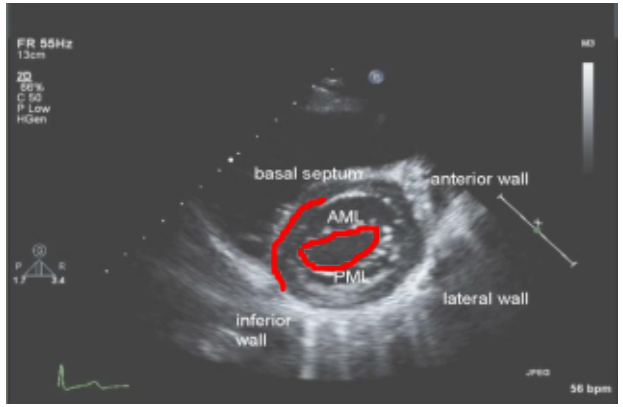
Parasternal Long: Interpretation

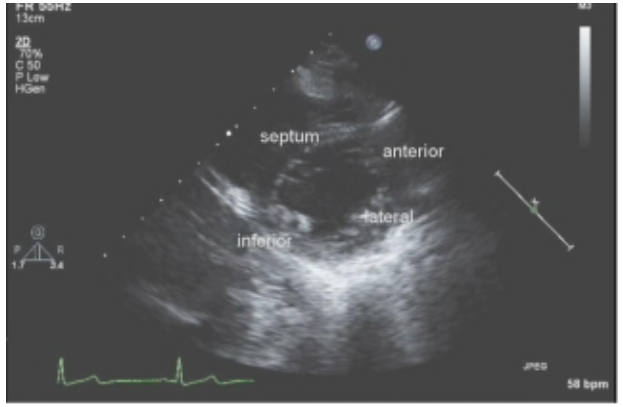
- Evaluate for Effusion
- LV Function
  - LV wall thickening
  - Change in chamber size
  - EPSS (end point septal separation)
- Functional Assessment
  - Hyperdynamic vs normal vs decreased

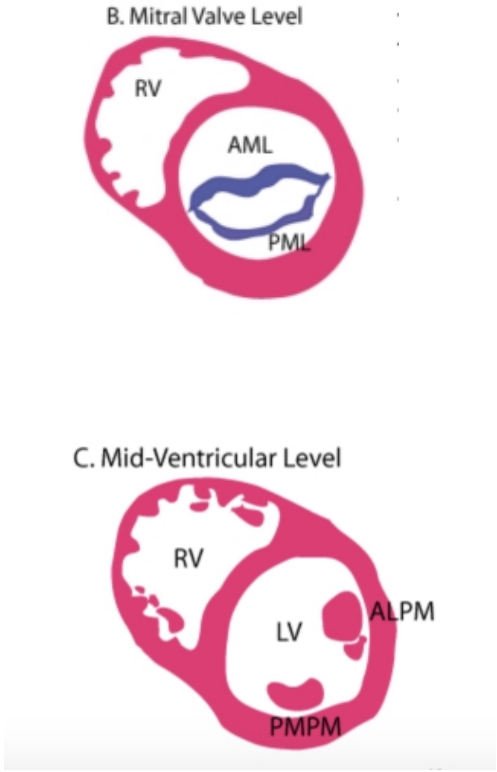
Parasternal Short: Patient Positioning

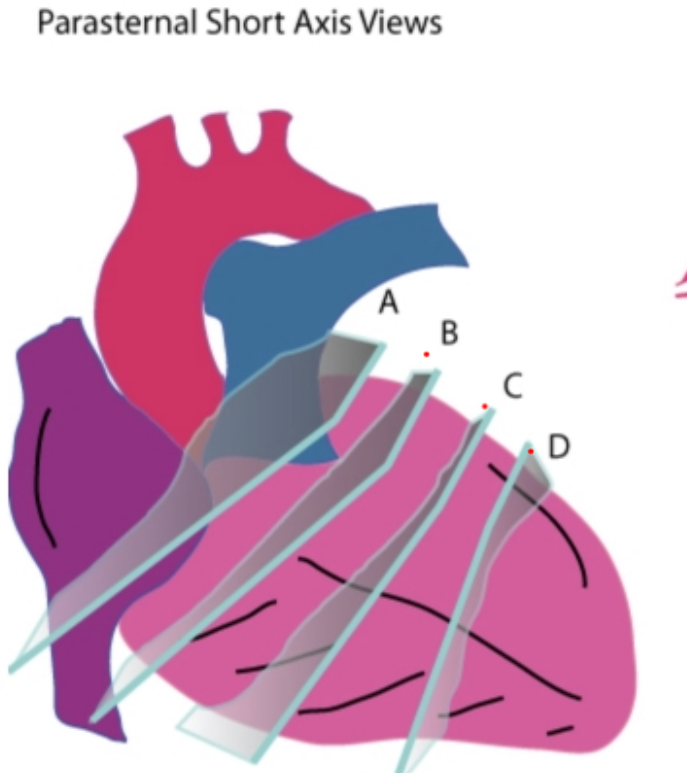


Parasternal Short Views

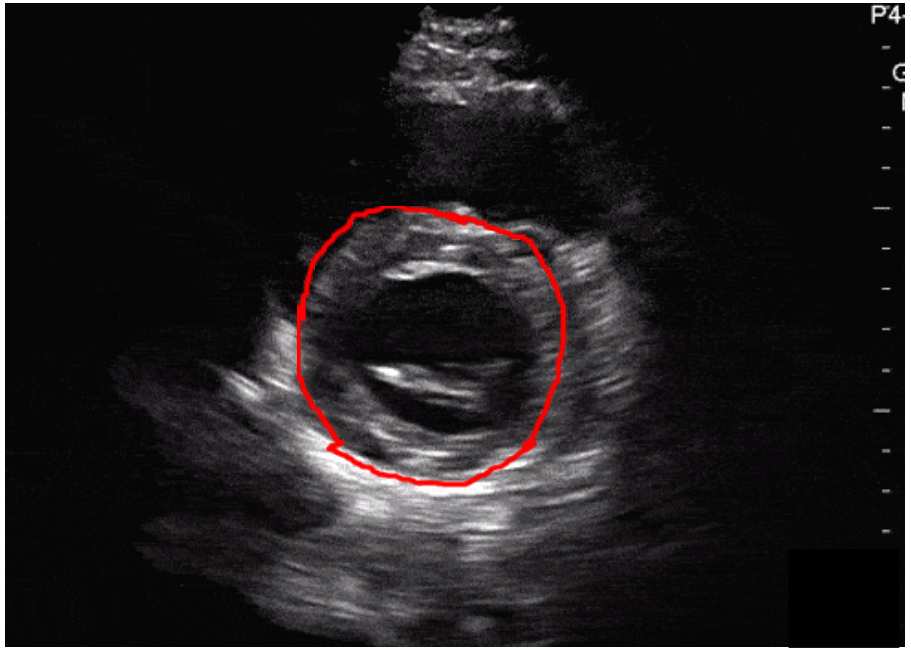


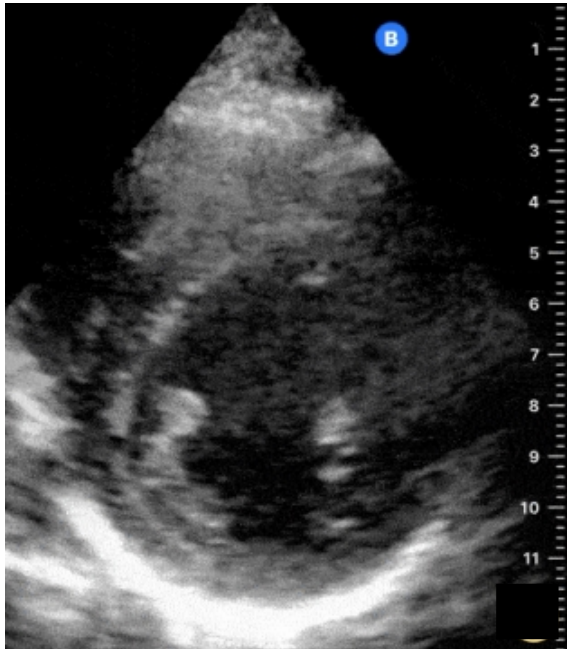






Parasternal Short Axis View

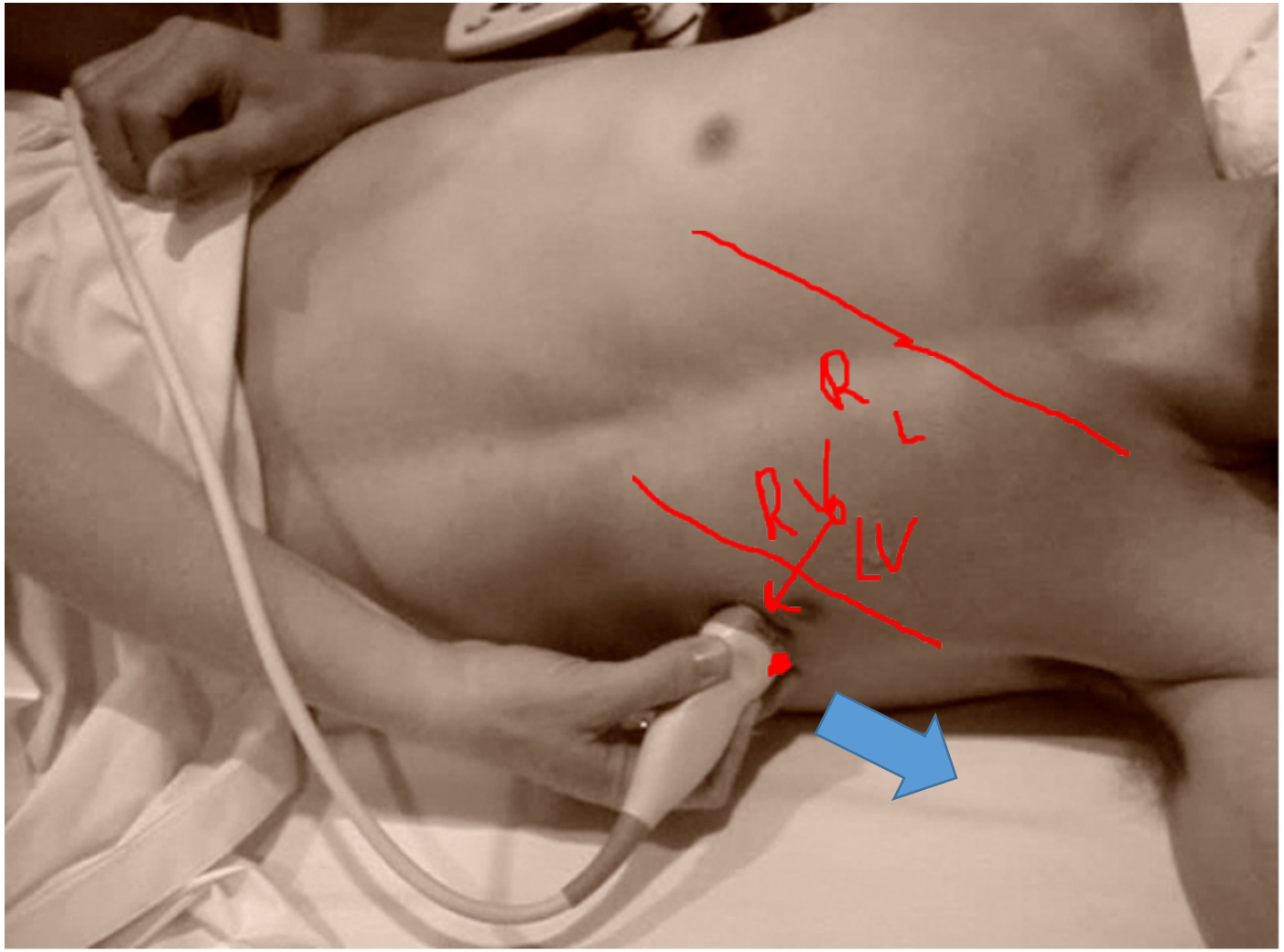




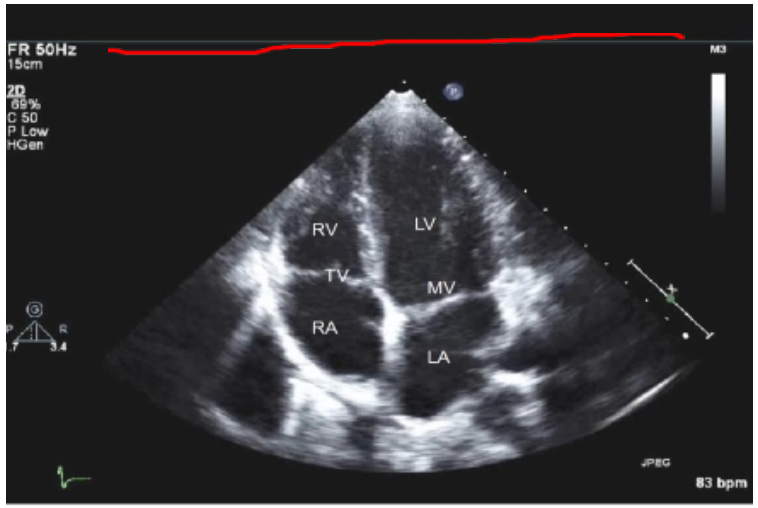
Parasternal Short: Interpretation

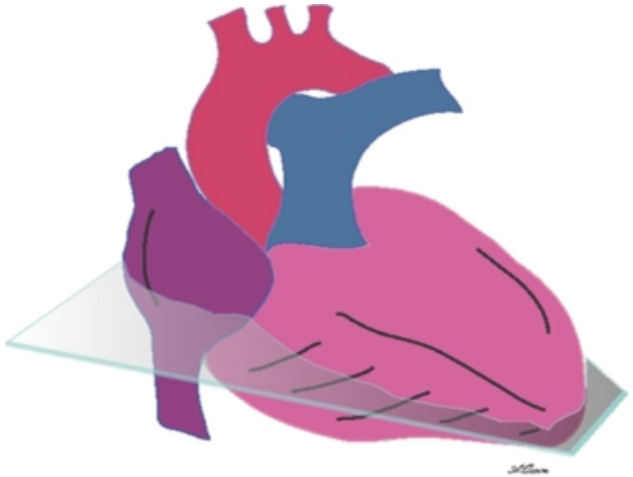
- Utility:
  - Gross LV systolic function (at the level of the papillary muscles)
  - RV Size
  - Evaluate for septal flattening or “D Sign”

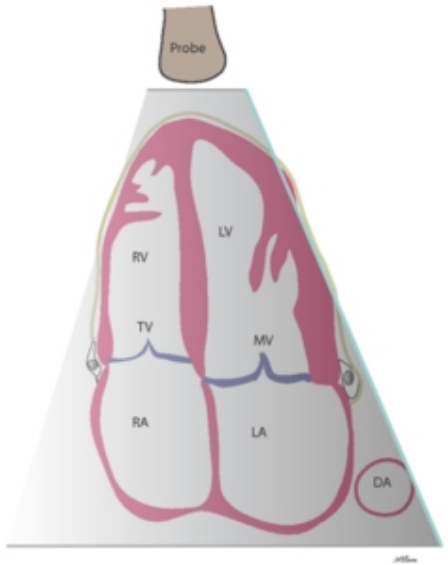
Apical 4 Chamber View: Patient Positioning

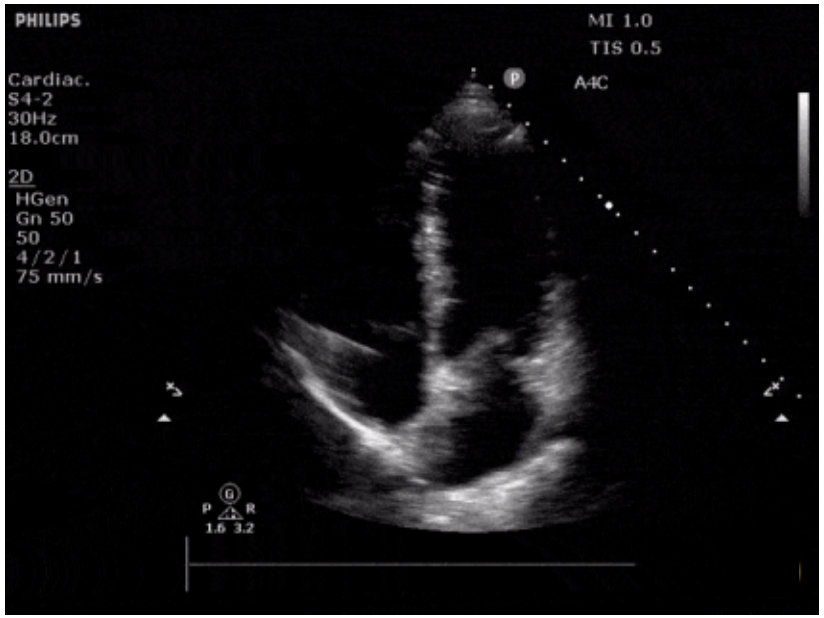


Apical Four Chamber View: Views





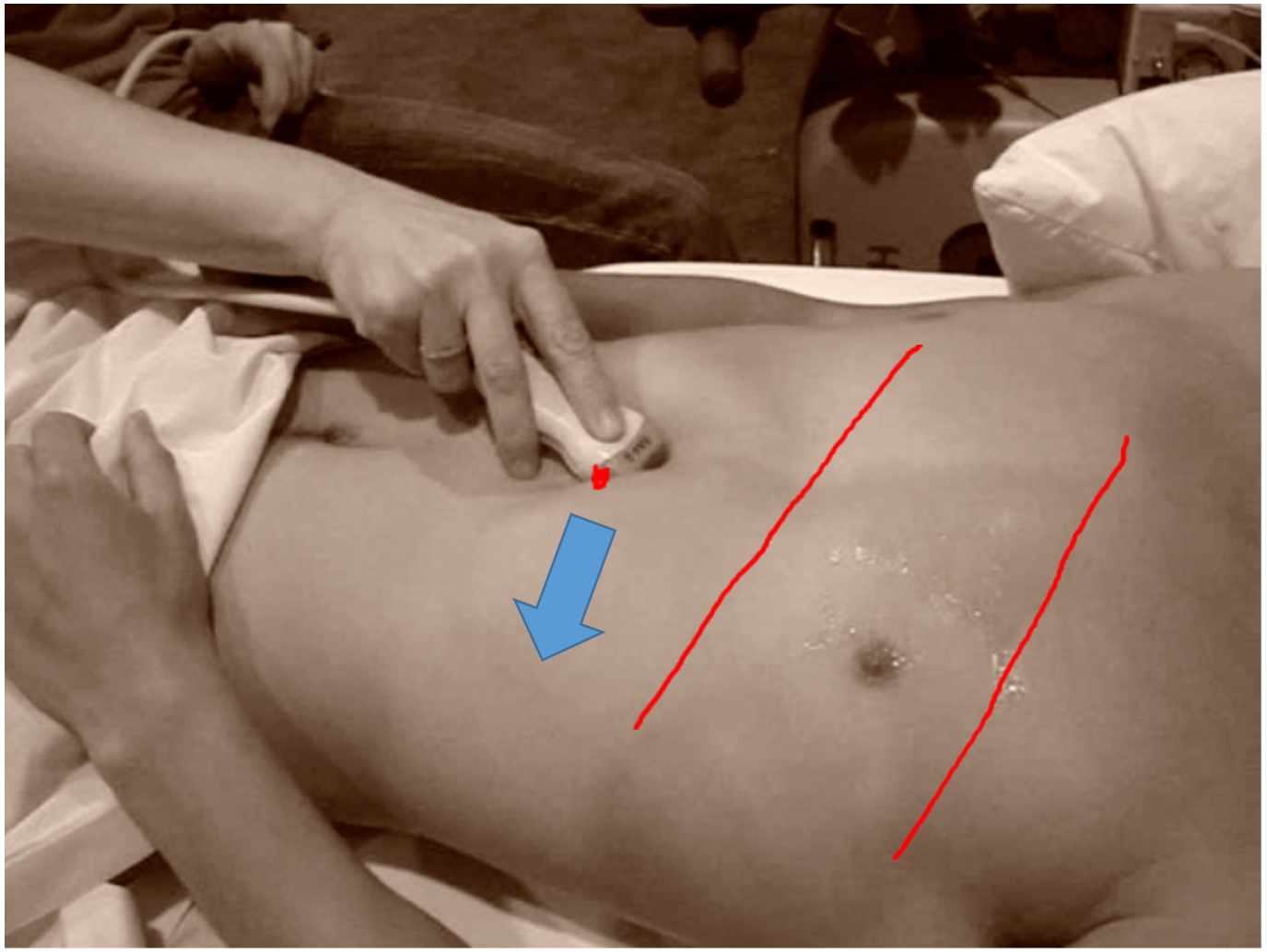




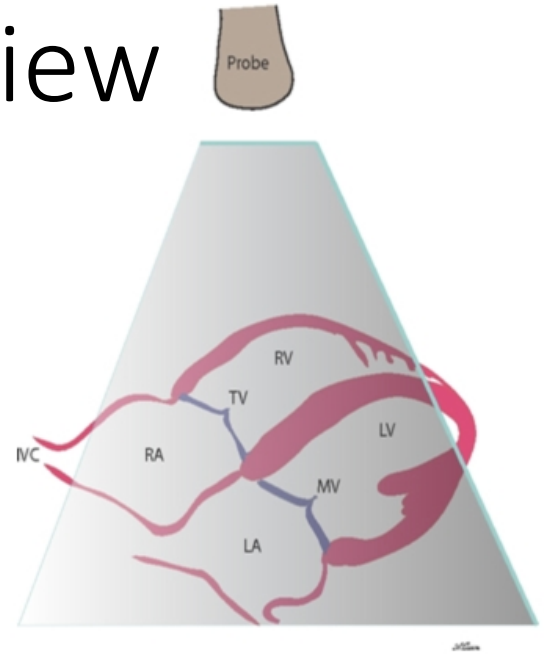
Apical 4: Interpretation

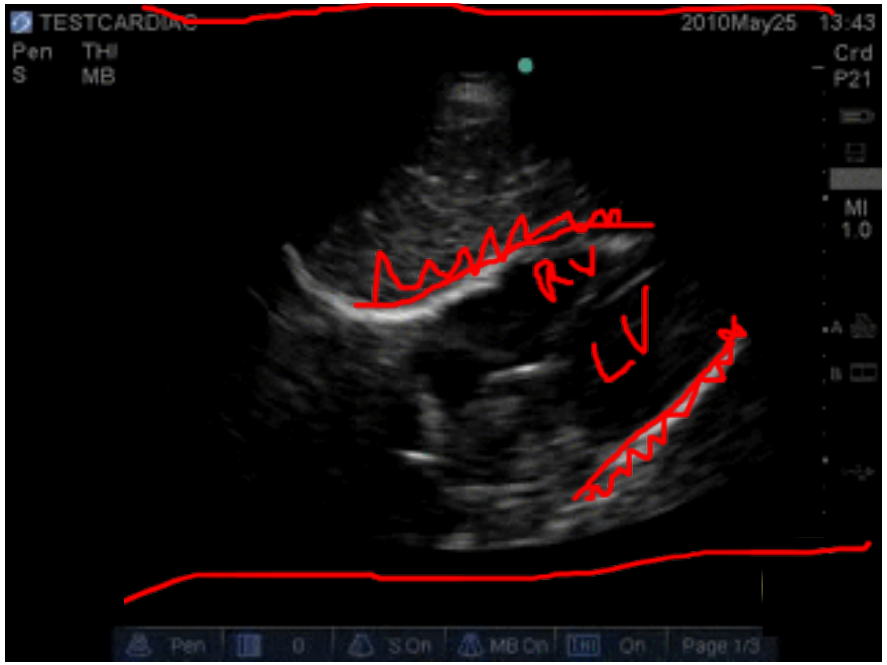
- Utility:
  - LV Systolic function
  - Pericardial Effusion
  - Right Ventricle Size (should be roughly 2/3 size of LV)

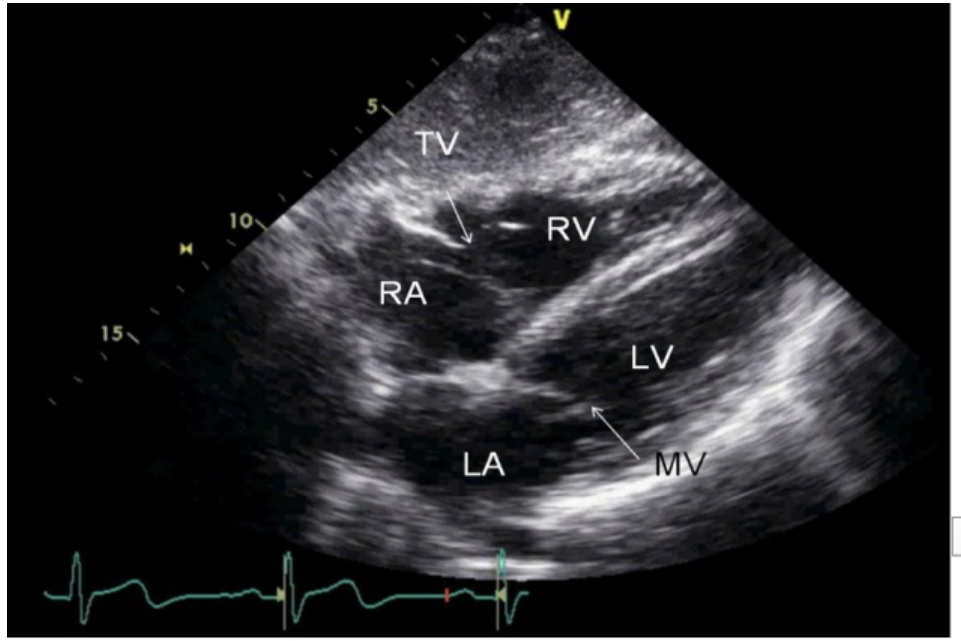
Sub-Xiphoid: Patient Positioning



Subcostal/Sub-xiphoid View





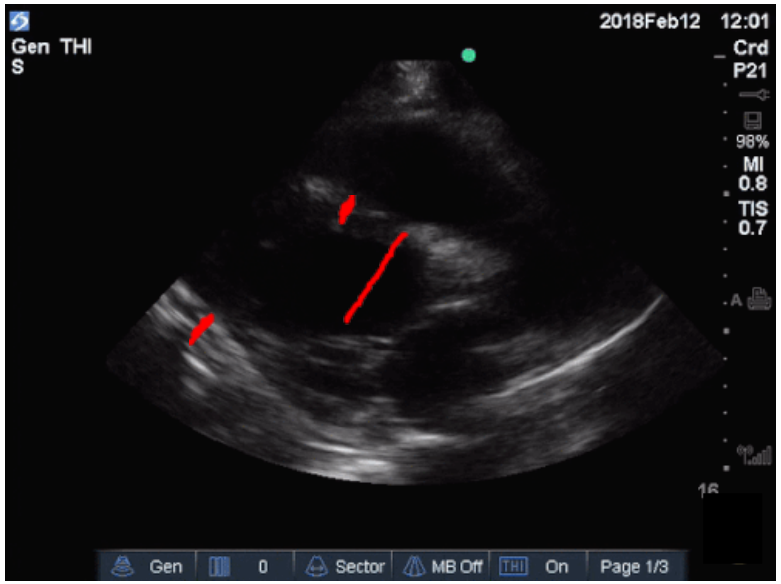


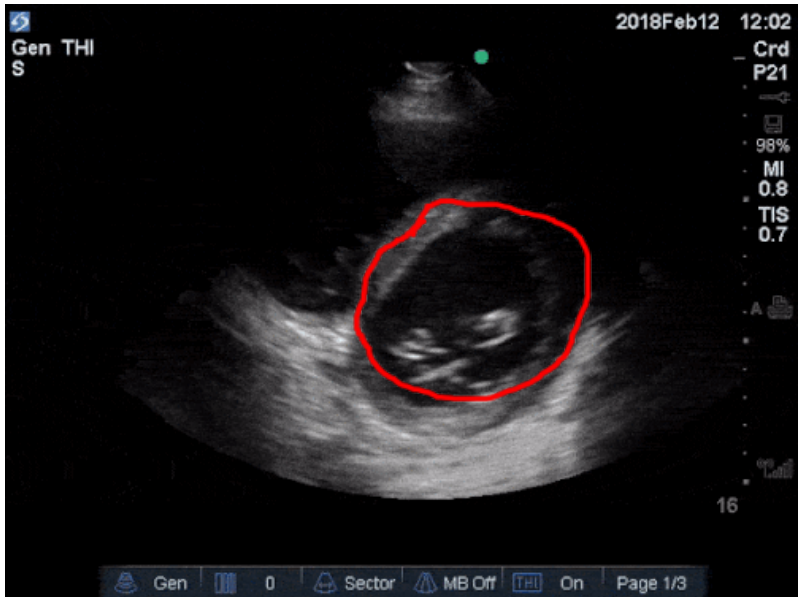
Subcostal View Interpretation

- Utility
  - LV systolic Function
  - Pericardial Effusion
  - Right Ventricular Size

Assessment of LV Function

- Best in Parasternal Long Axis View
  - Visual estimation
    - LV Chamber size not decreasing by ~ 1/3, myocardium not thickening during systole, how far anterior leaflet of mitral valve is from septum during diastole (EPSS)
  - EPSS (end point septal separation): distance of anterior leaflet of mitral valve from septum during diastole (should be < 1 cm)

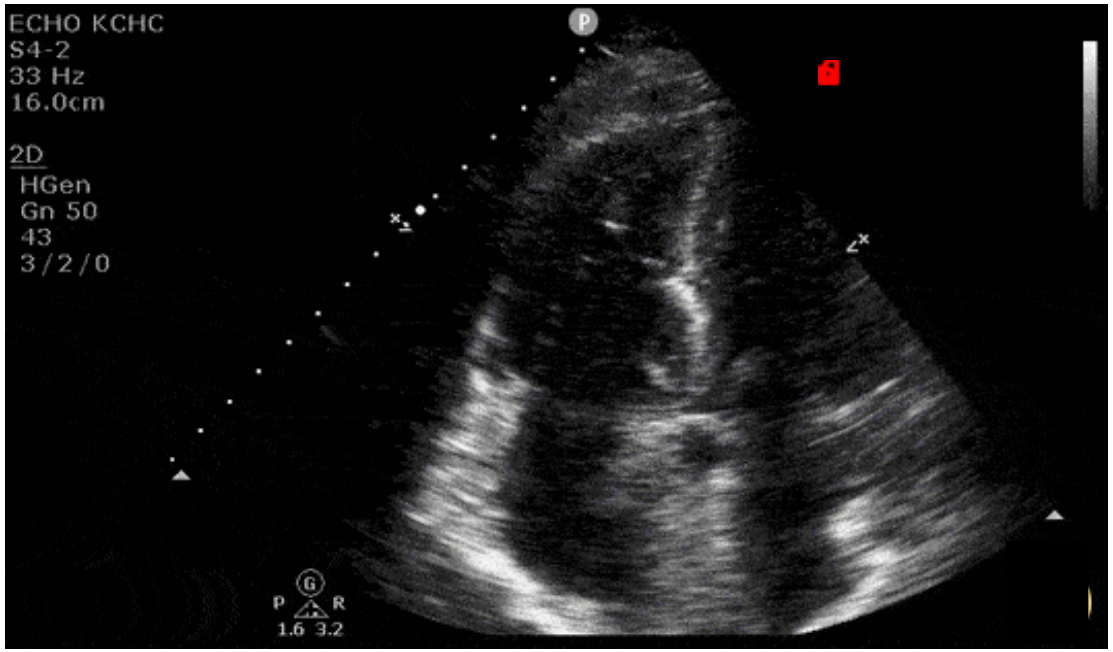


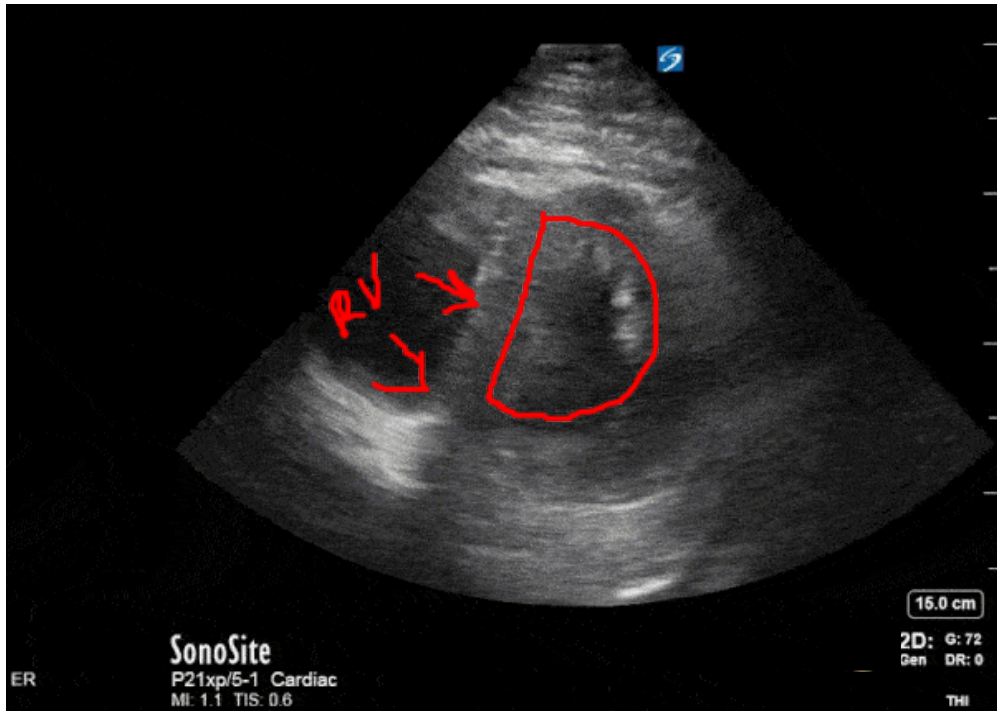


Assessment of RV function

- Best evaluated in apical and short axis view
- In apical view, RV should be ~ 2/3 size of LV
- In short axis view, right ventricle may appear dilated secondary to increased pulmonary artery pressures leading to bowing of the inter-ventricular septum into LV, resulting in “D Sign”
- Note: these findings can be seen in acute and chronic RV dysfunction
- Images of D Sign and Enlarged RV

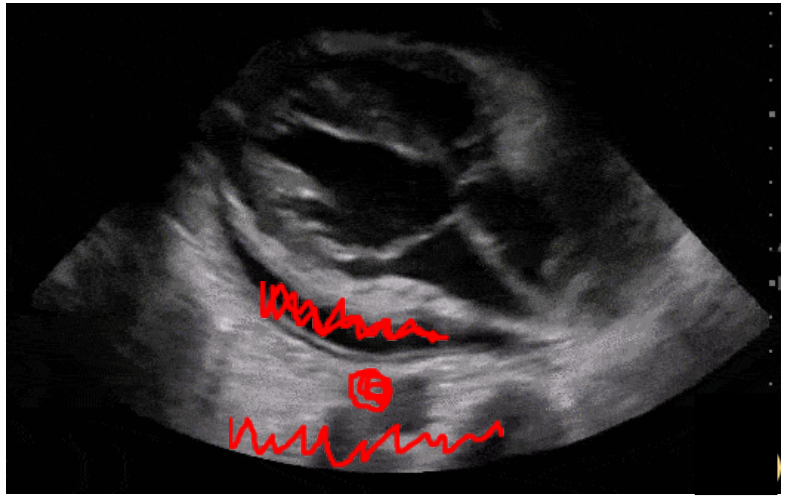
RV Dysfunction

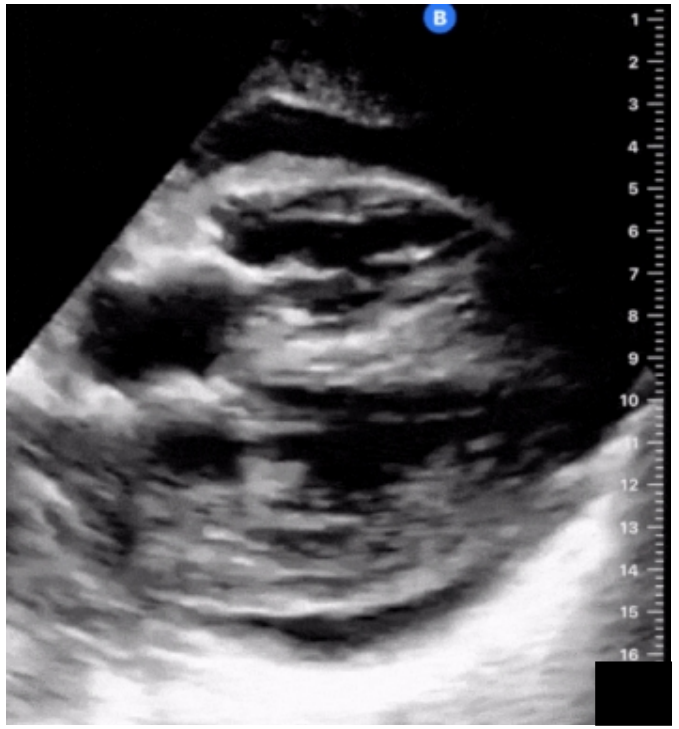




Pericardial Effusion/ Tamponade

- Circumferential pericardial effusion raises suspicion
- Look for Right ventricular Diastolic Collapse, plethoric IVC (decreased venous return to right atrium secondary to high pericardial pressure)
- Possible to view in all 4 views

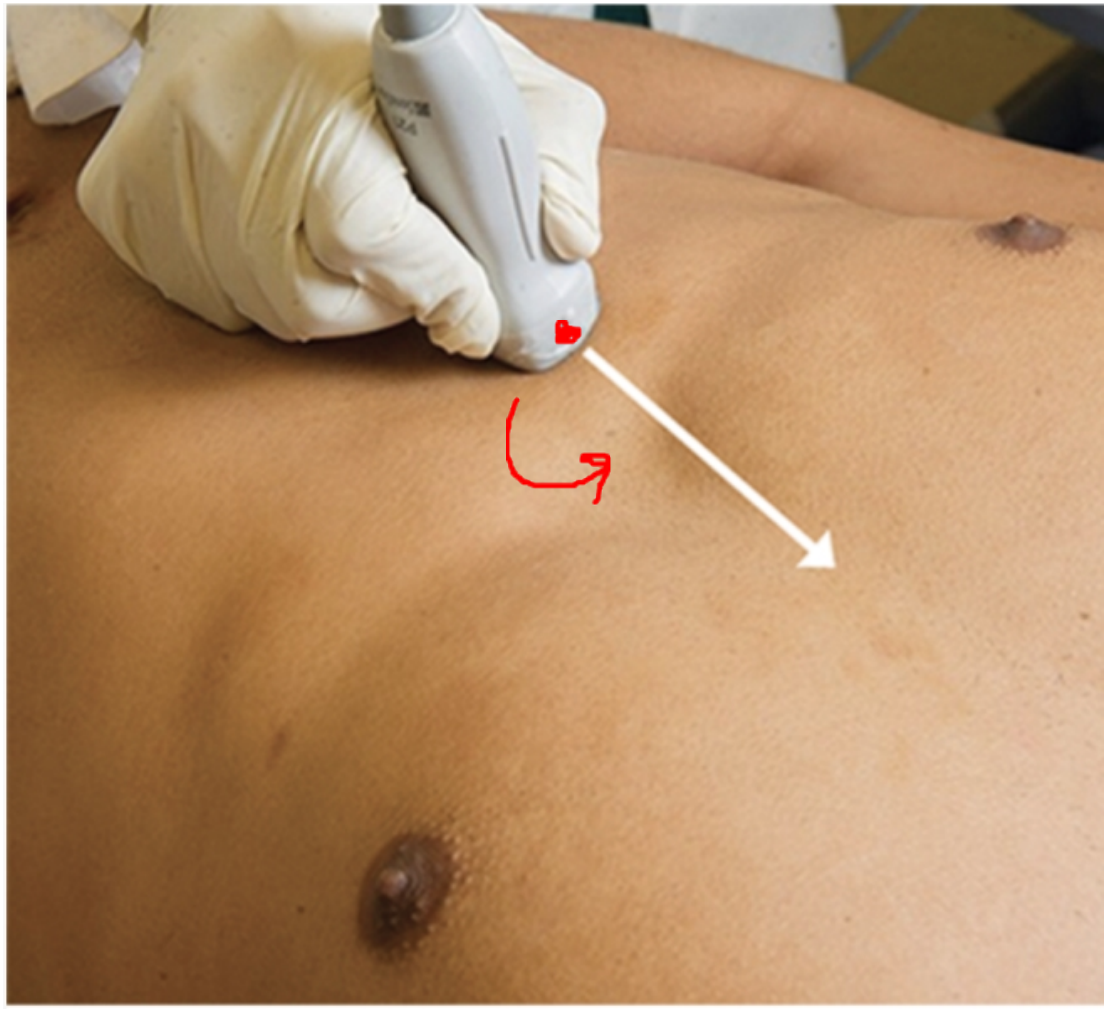


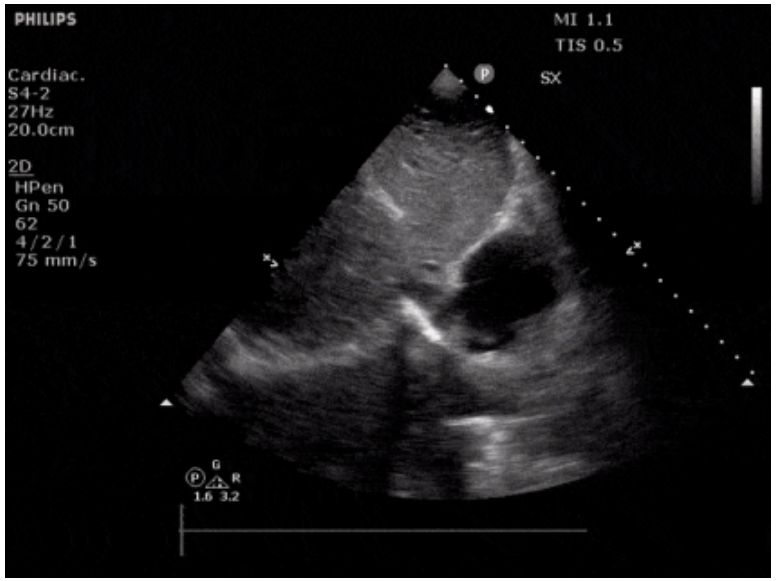


Evaluation of Inferior Vena Cava

- Purpose: Assist in determining volume status of patient
- IVC size and respirophasic variation can be used to estimate right atrial pressure

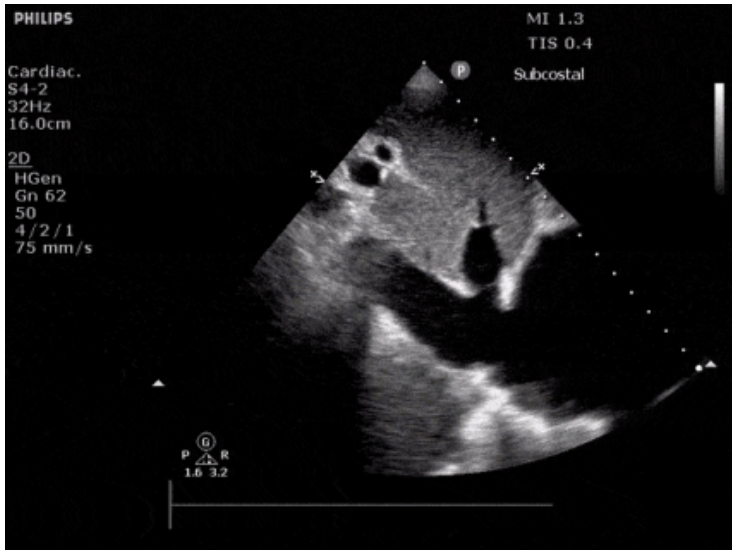
Patient Positioning: IVC





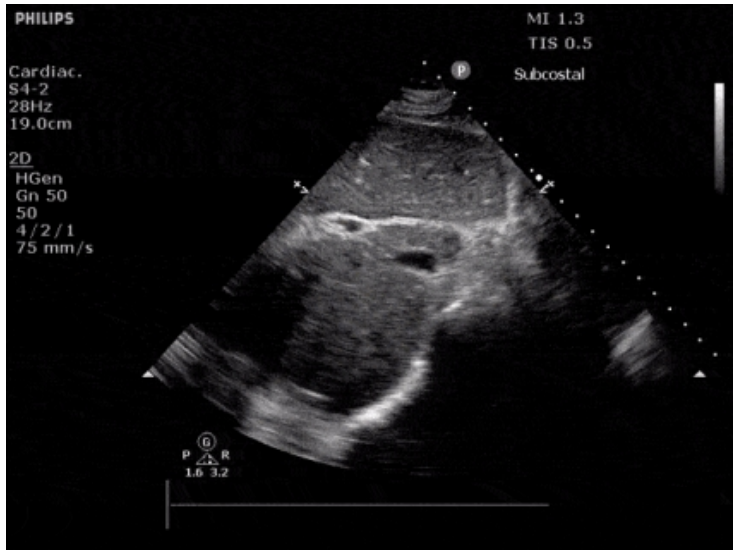
Normal

Max diameter is 1.5 – 2cm, collapses with respiratory variation



Plethoric

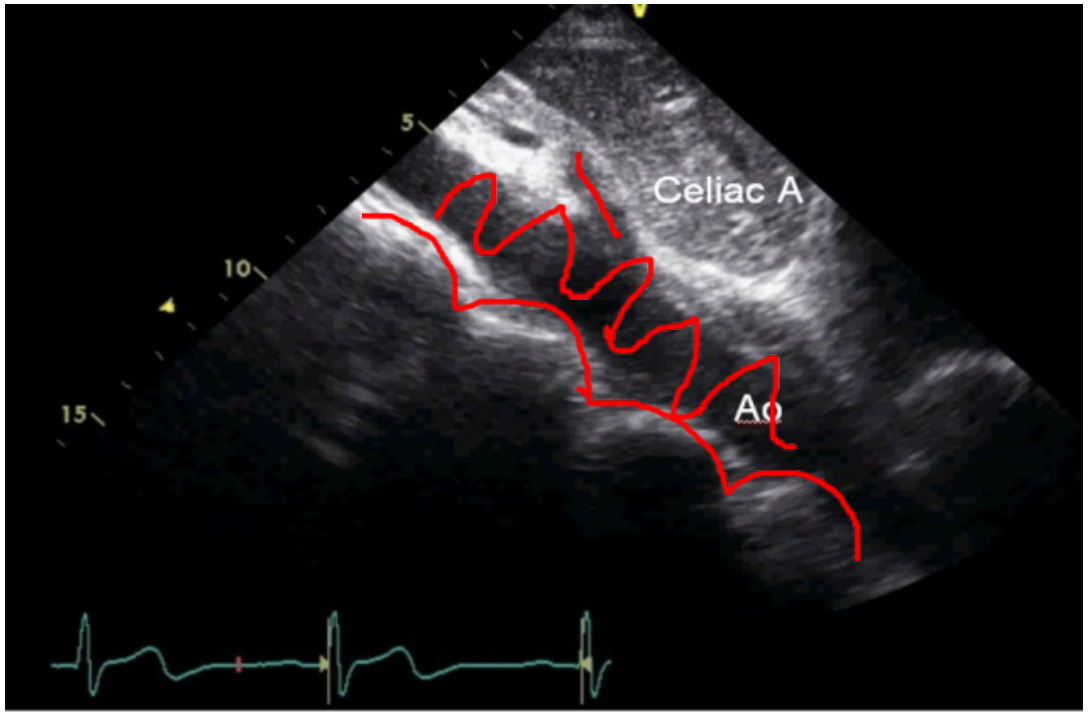
> 2 cm, minimal respiratory variation (LV failure, PE, tamponade, volume overload)

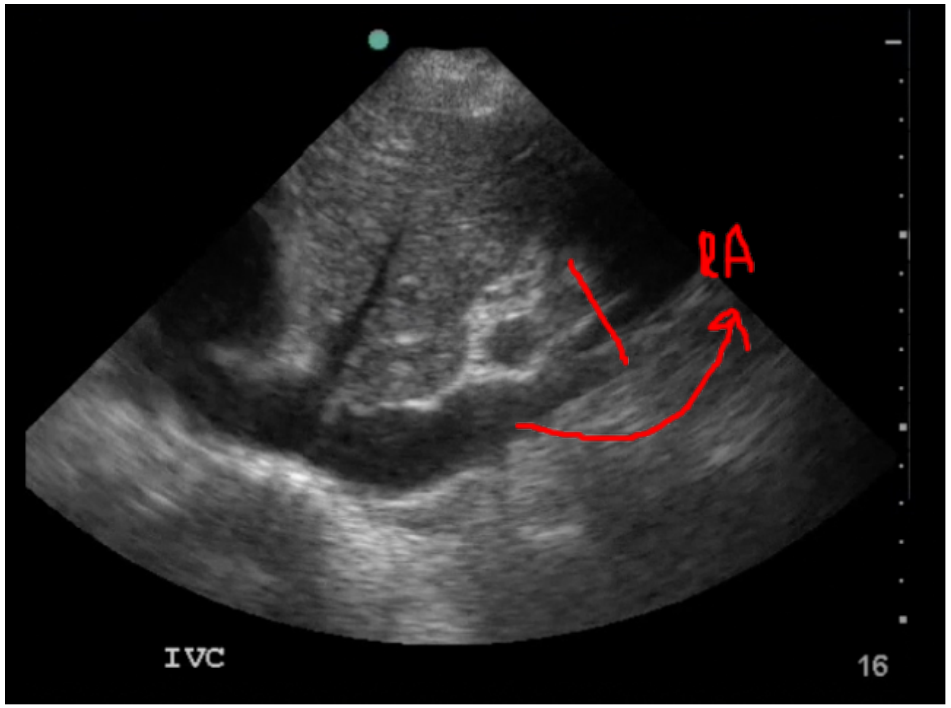


Collapsed

Dehydration
Hypovolemic Shock,
Hemorrhagic Shock

Important: Don’t Mistake IVC for Aorta!





In Summary: Cardiac Pocus

- Answer specific clinical questions
  - Gross Left Ventricular Function, Evaluate for Pericardial Effusion/Tamponade, Right Ventricular Function, Volume Status
- Individual views in the context of all other Views
- Can assist in making real-time clinical decisions
- Obtain Follow up imaging to confirm abnormal findings