

# Cardiac POCUS: day 2

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# Disclosures

- None

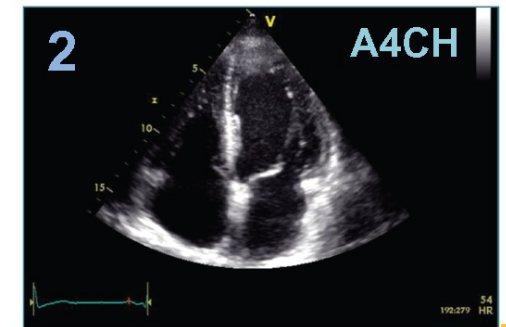
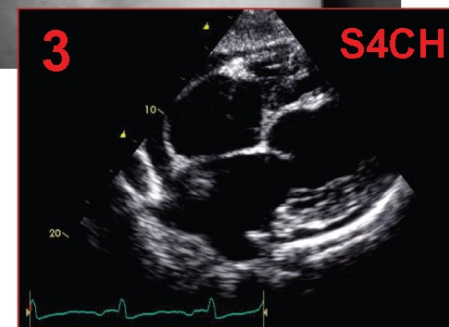
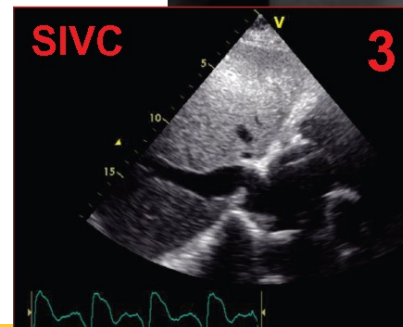
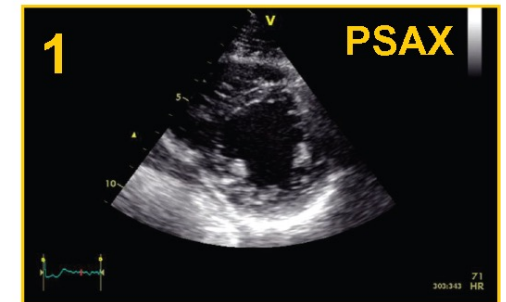
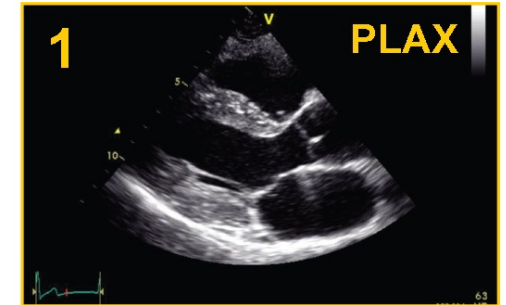
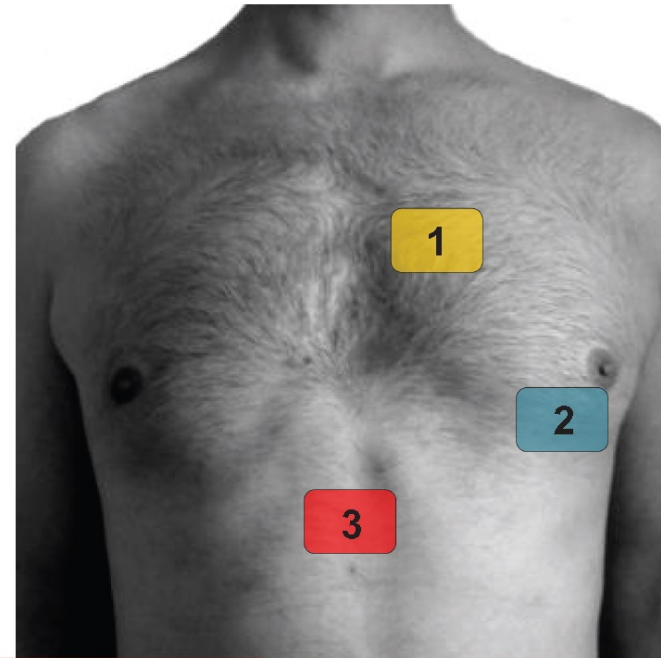


# Learning Objectives

- Obtain the parasternal short-axis views
- Obtain the apical 4-chamber view
- Assess LV/RV systolic function
- Assess pericardial effusion & recognize cardiac tamponade
- Recognize clues of aortic valve stenosis

# Cardiac Ultrasound Exam Views

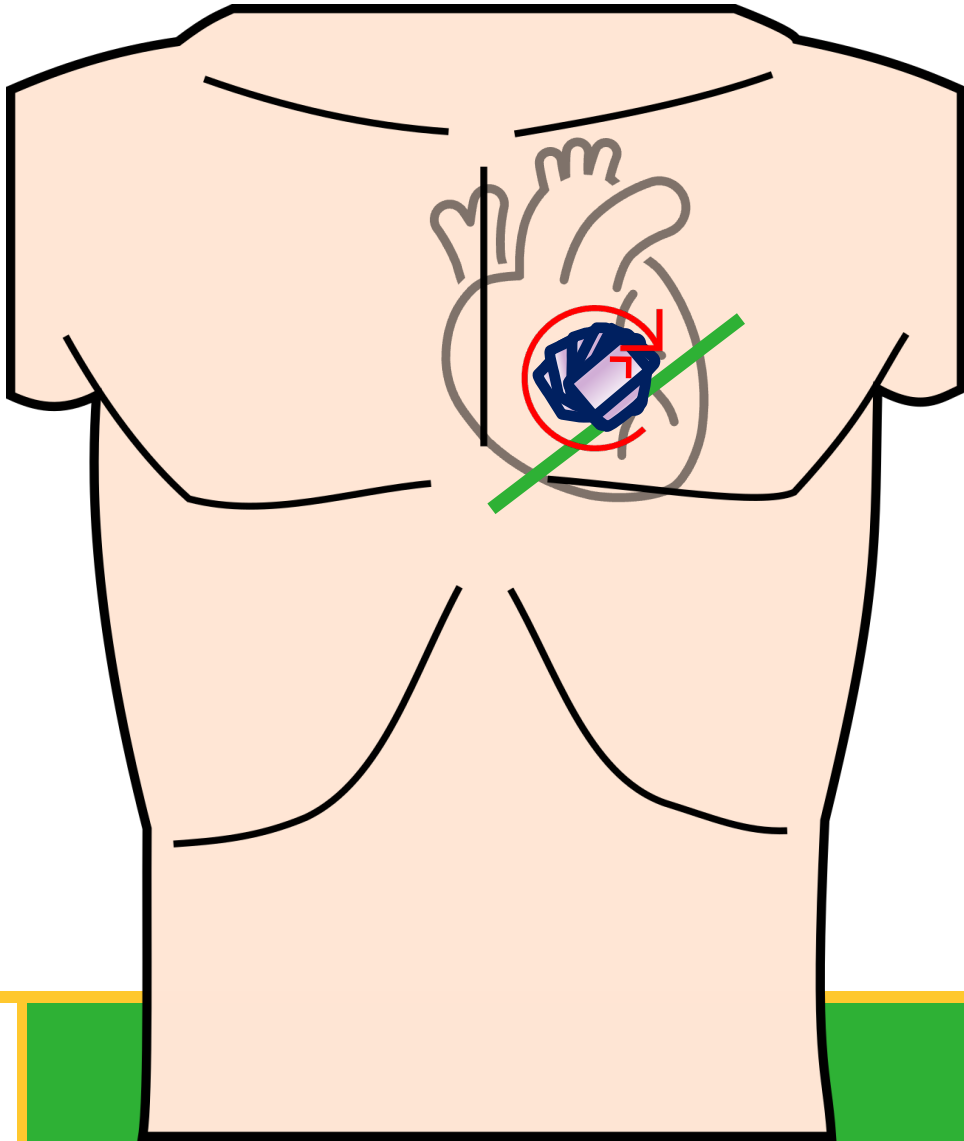
- Parasternal long axis
- **Parasternal short axis**
- Apical four chamber
- Subcostal four chamber
- Inferior vena cava



# Parasternal Short Axis- major uses

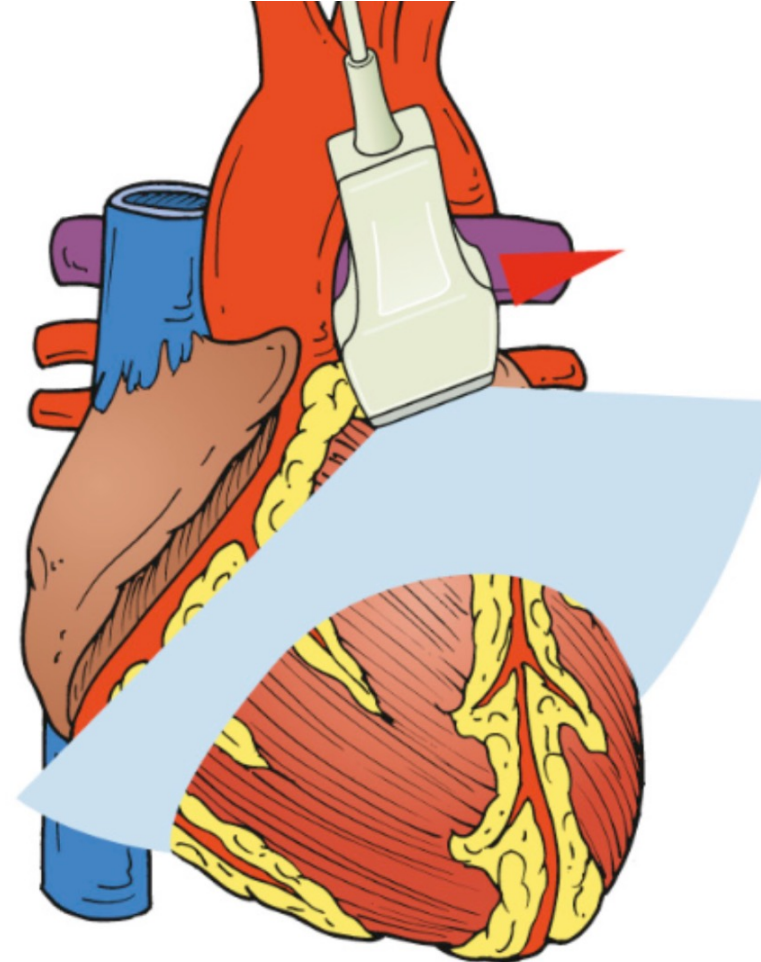
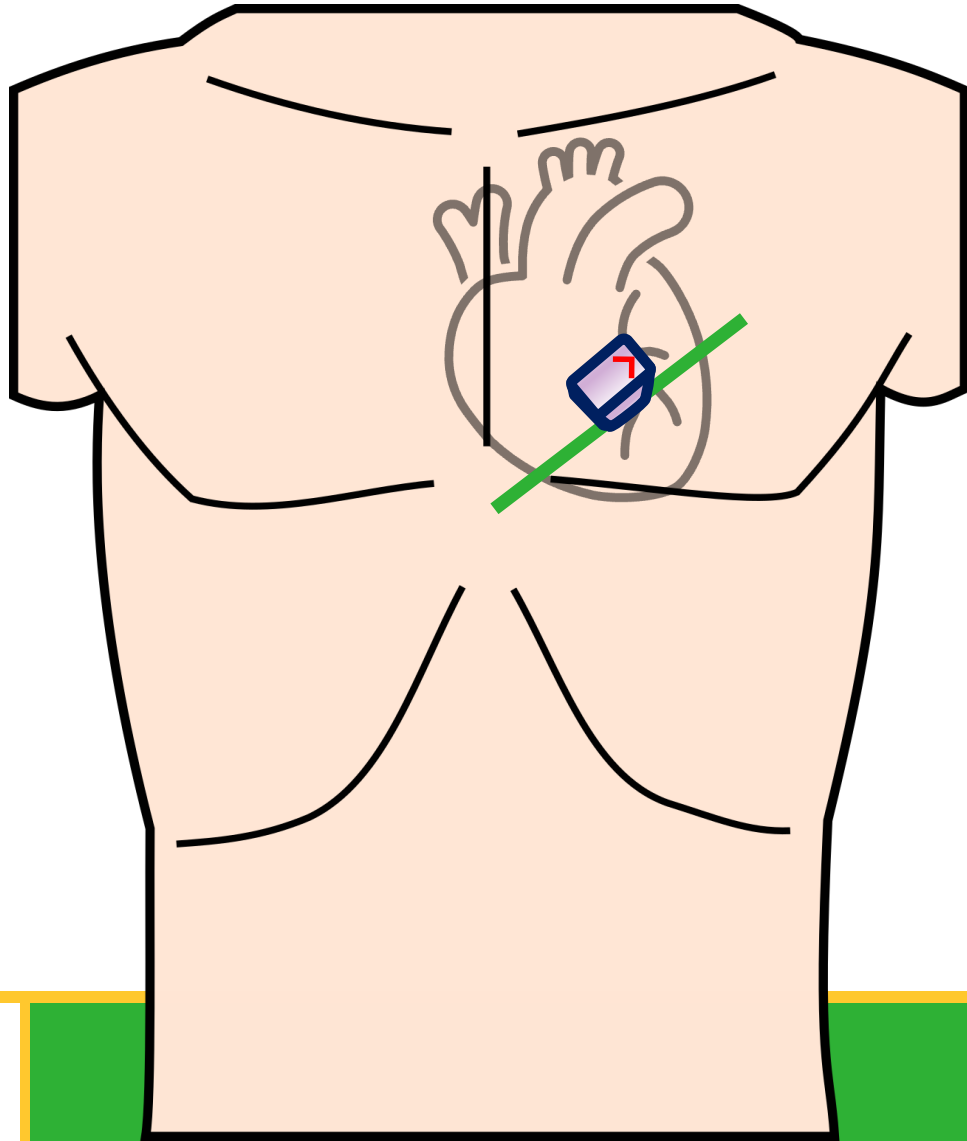
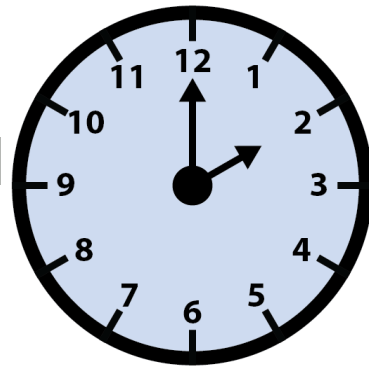
- Estimate LV systolic function
- Compare RV vs LV size
  - Recognizing severe vs non-severe RV enlargement
- Identify/localize pericardial effusion
- Recognize obvious aortic valve abnormalities (more on this later)

# Image Acquisition



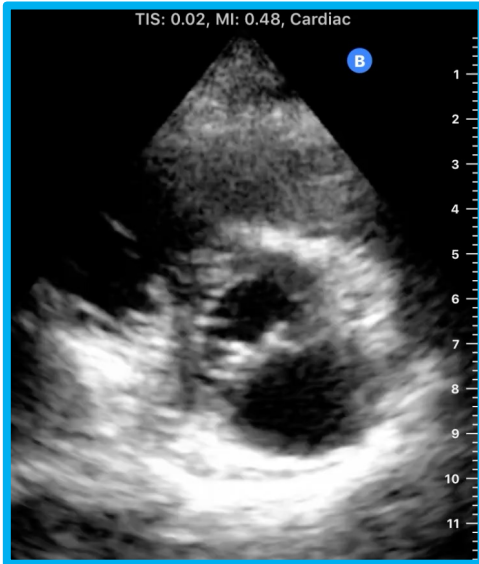
- Transducer: Rotate 90° clockwise from the PLAX view
- Index marker: Left shoulder or 2:00
- Multiple imaging planes can be obtained by tilting/fanning the transducer
- Left lateral decubitus positioning is your friend here!

# Image Acquisition

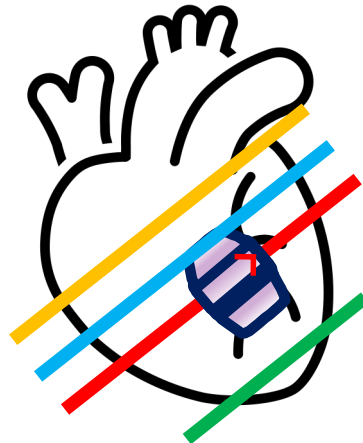
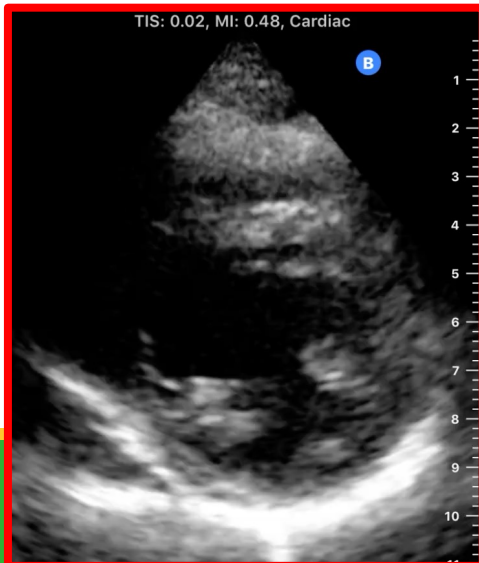


# Parasternal Short Axis Views

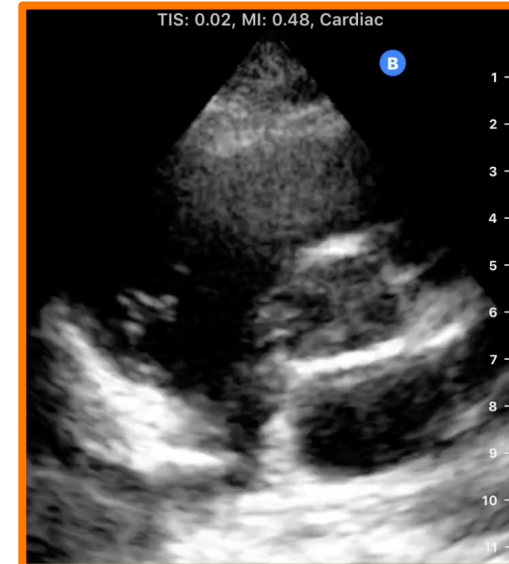
Mitral valve



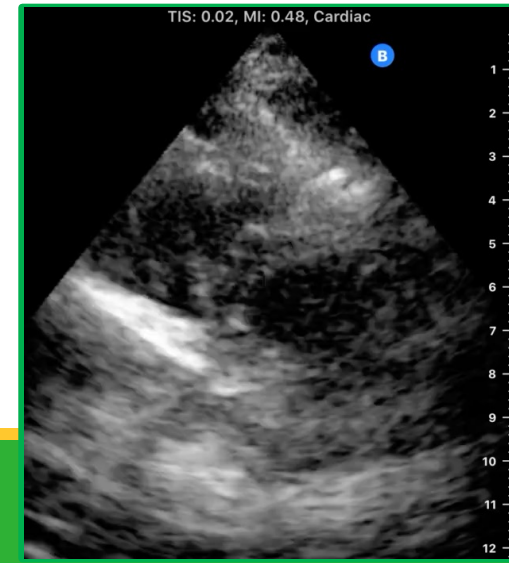
Mid ventricle



Aortic valve



Apical





# Parasternal Short Axis: Mitral valve level

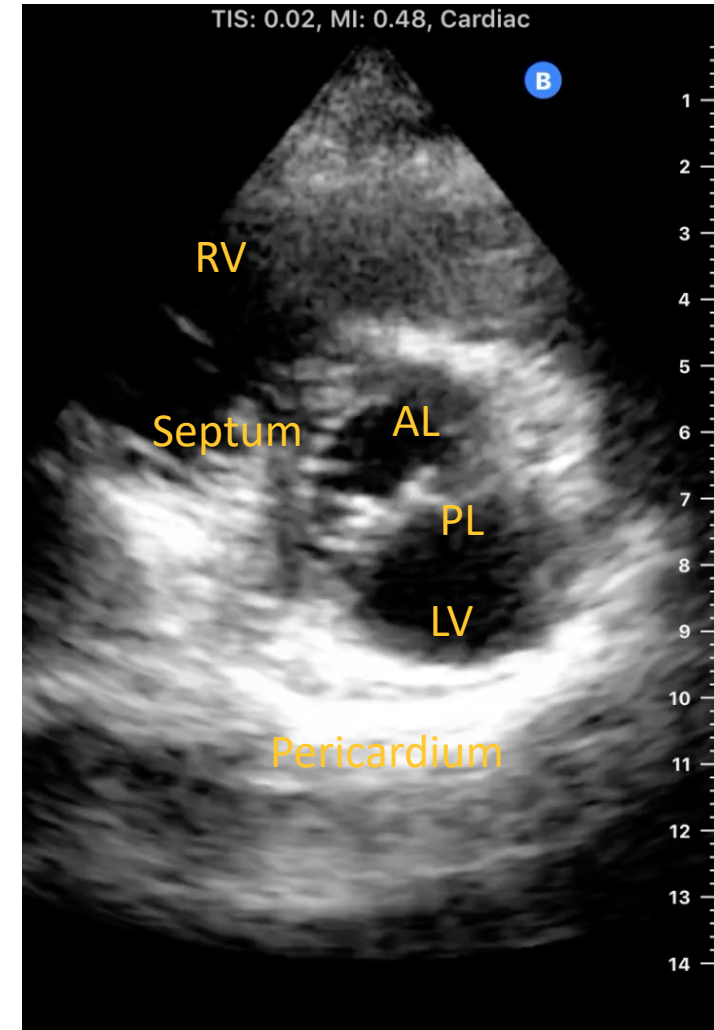
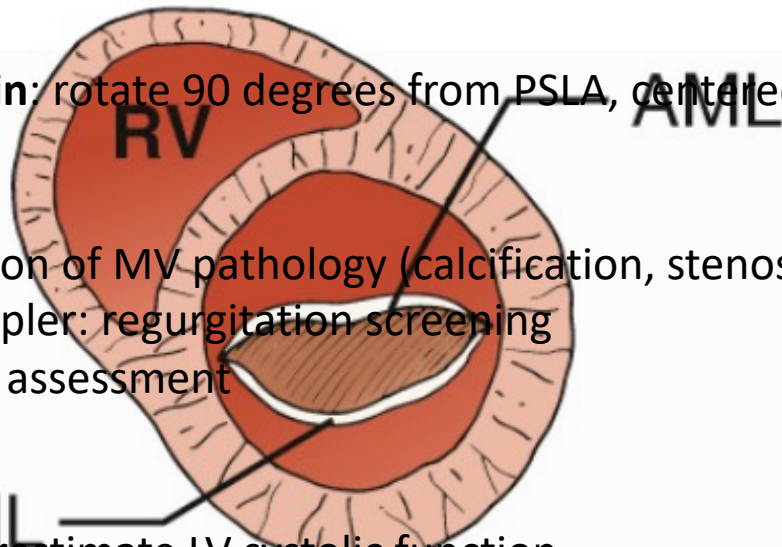
**How to obtain:** rotate 90 degrees from PSLA, centered on MV

**Utilities:**

- Visualization of MV pathology (calcification, stenosis)
- Color Doppler: regurgitation screening
- RV:LV size assessment

**Pitfalls/Tips:**

- Will underestimate LV systolic function



Point of Care Ultrasound 2<sup>nd</sup> edition. N. Soni

# Parasternal Short Axis: Mid-ventricular (papillary) level

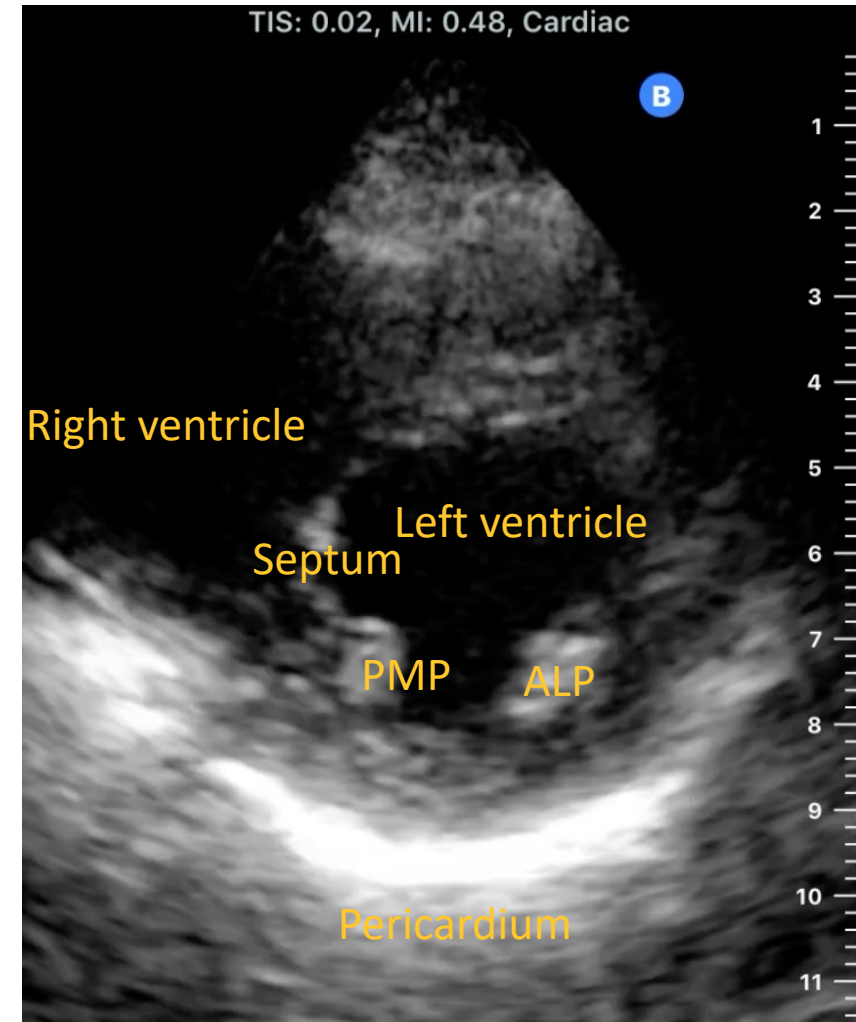
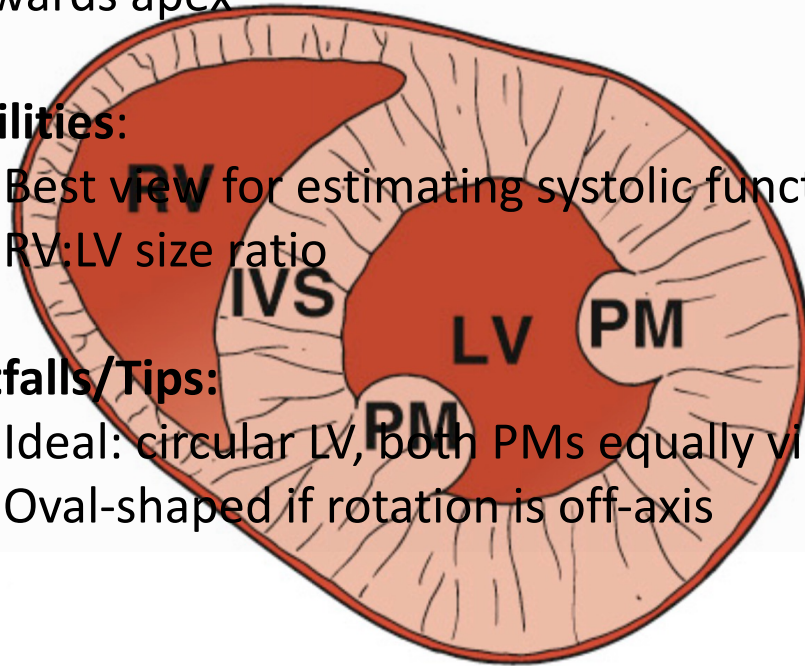
**How to obtain:** from MV level, tilt/angle down towards apex

**Utilities:**

- Best view for estimating systolic function
- RV:LV size ratio

**Pitfalls/Tips:**

- Ideal: circular LV, both PMs equally visualized
- Oval-shaped if rotation is off-axis



# Parasternal Short Axis: aortic valve level/RVOT

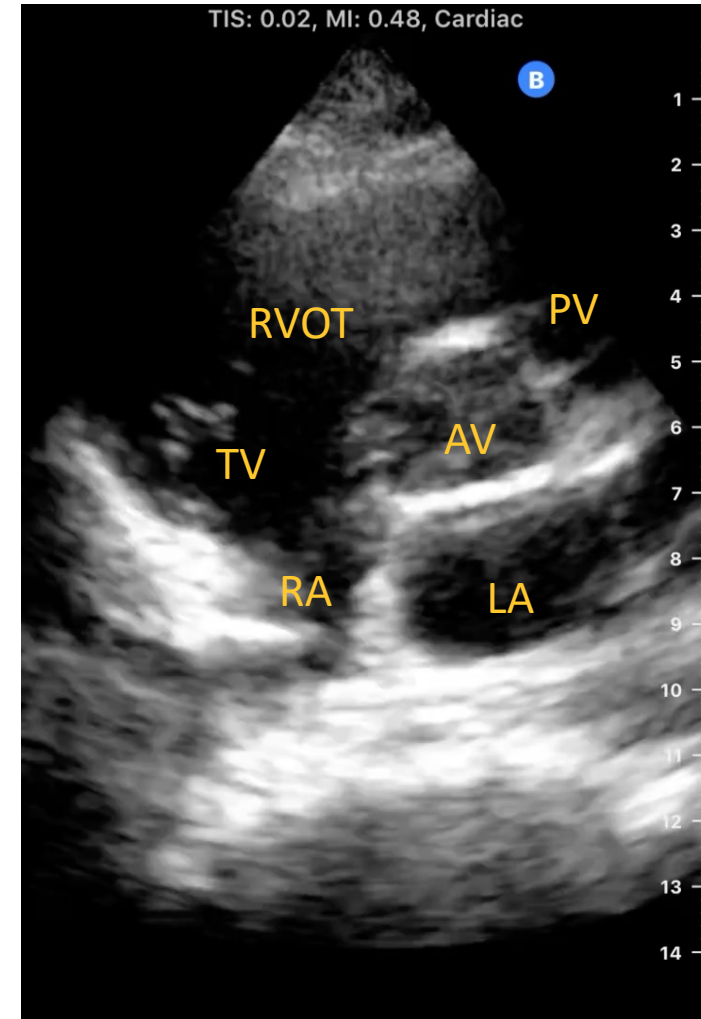
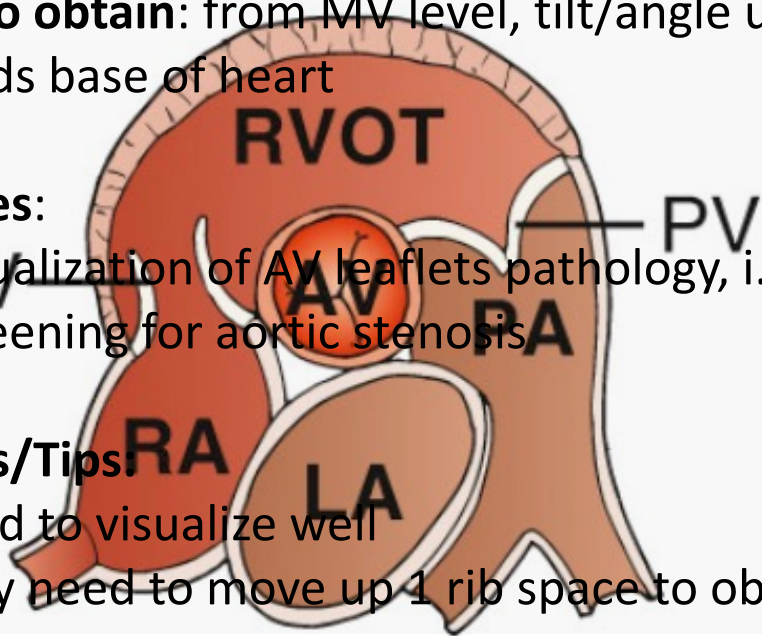
**How to obtain:** from MV level, tilt/angle up towards base of heart

**Utilities:**

- Visualization of AV leaflets pathology, i.e., screening for aortic stenosis

**Pitfalls/Tips**

- Hard to visualize well
- May need to move up 1 rib space to obtain



# Parasternal Short Axis: apical level

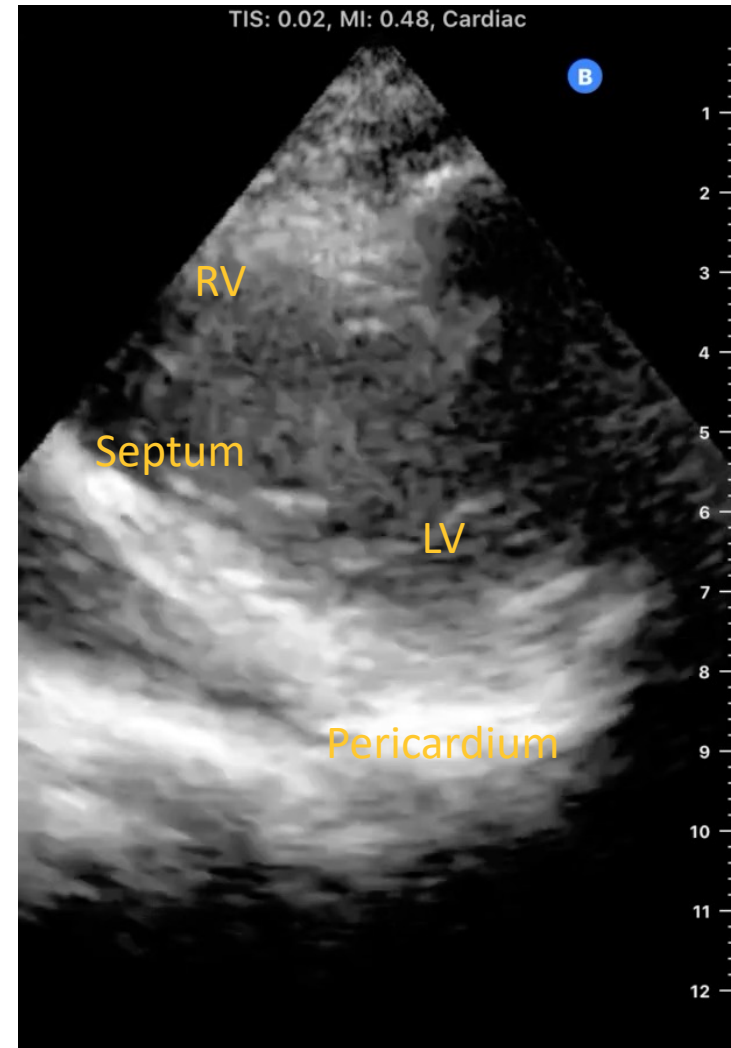
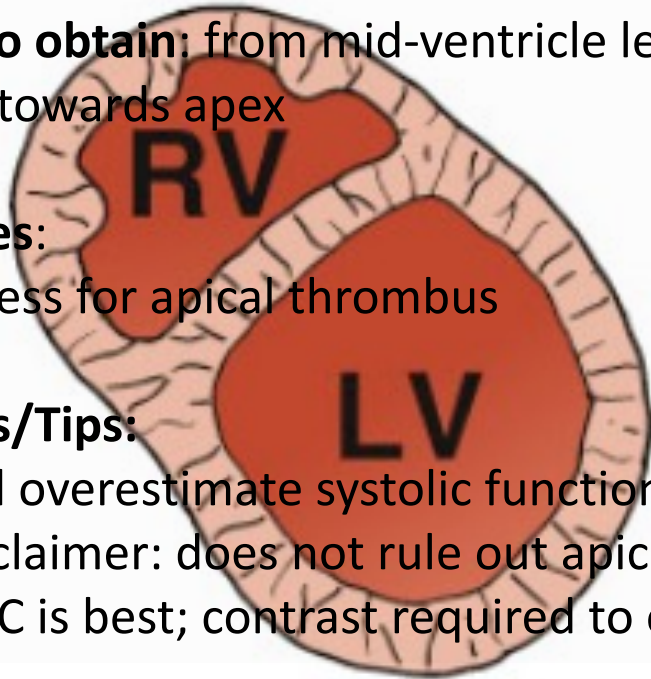
**How to obtain:** from mid-ventricle level, tilt/angle down towards apex

**Utilities:**

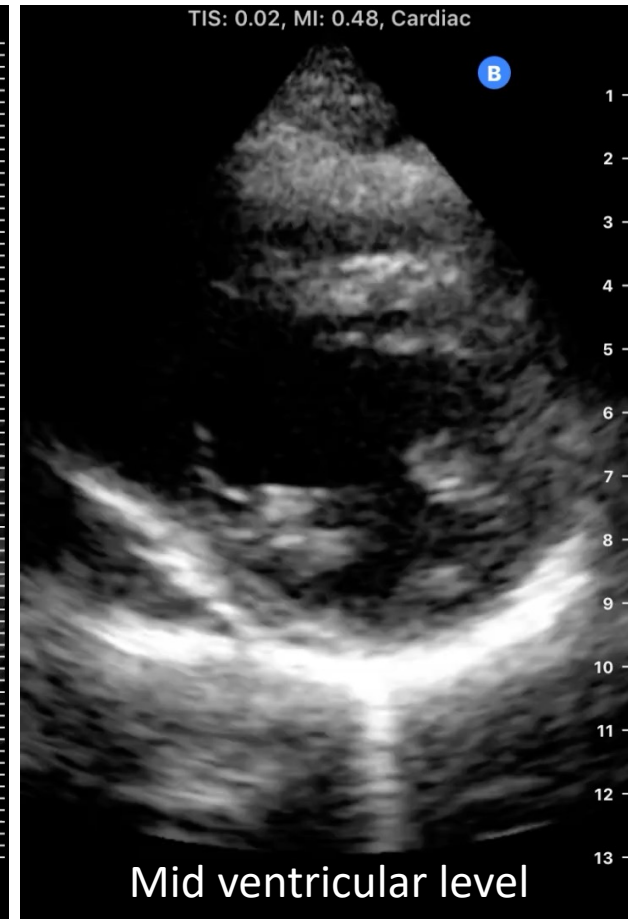
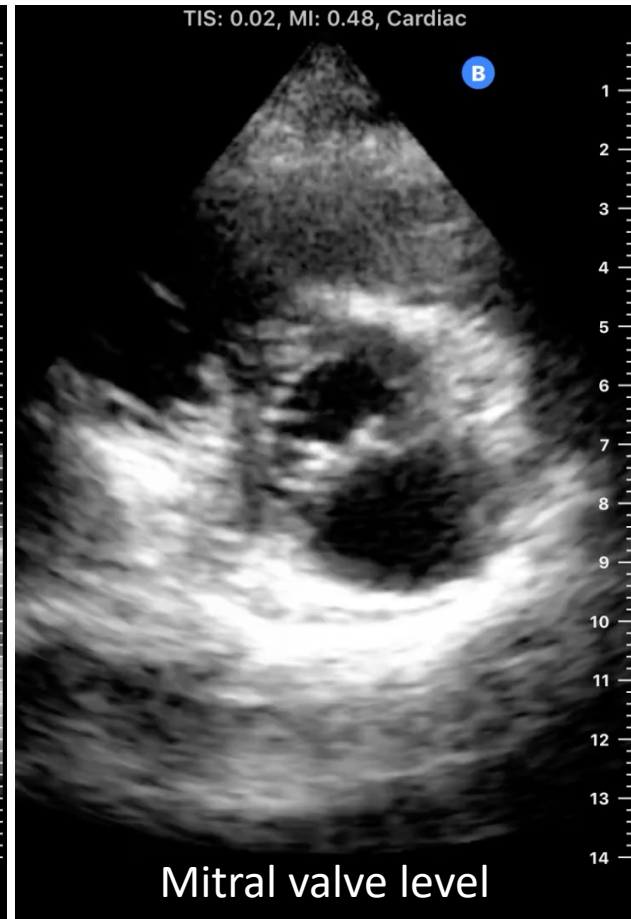
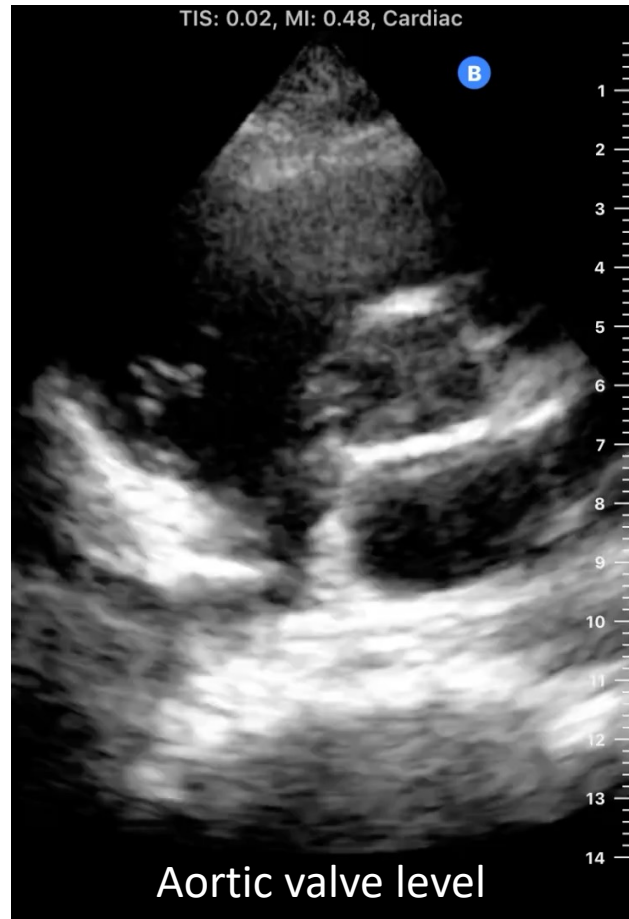
- Assess for apical thrombus

**Pitfalls/Tips:**

- Will overestimate systolic function
- Disclaimer: does not rule out apical thrombus (A4C is best; contrast required to exclude)

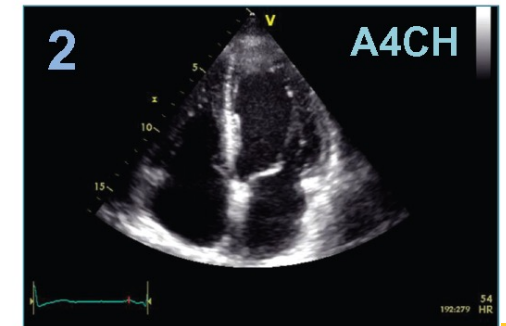
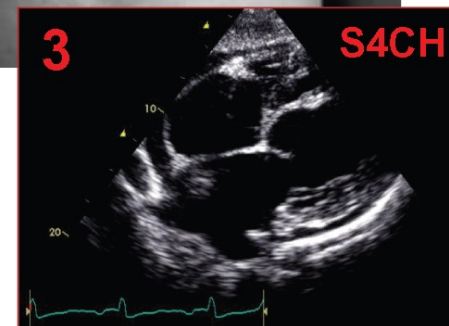
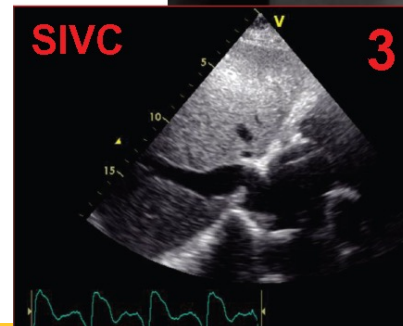
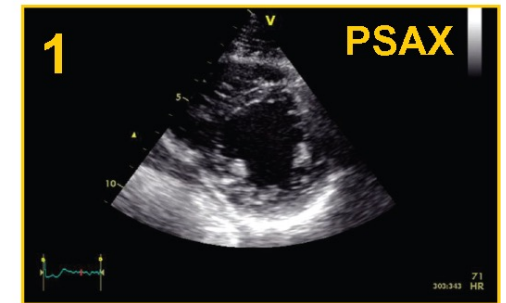
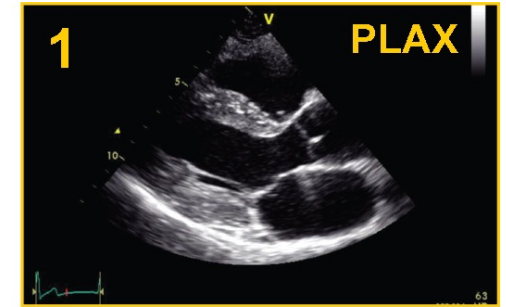
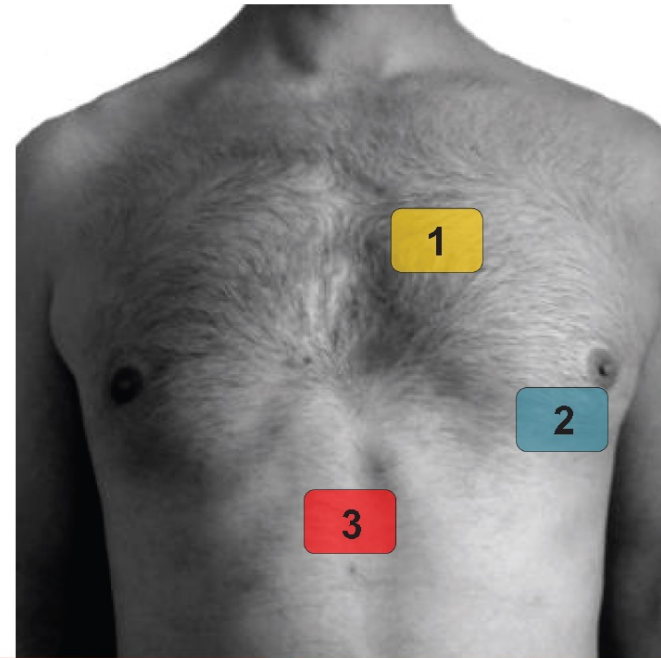


# Parasternal Short Axis- Summary



# Cardiac Ultrasound Exam Views

- Parasternal long axis
- Parasternal short axis
- **Apical four chamber**
- Subcostal four chamber
- Inferior vena cava



# Apical 4-Chamber View: major uses

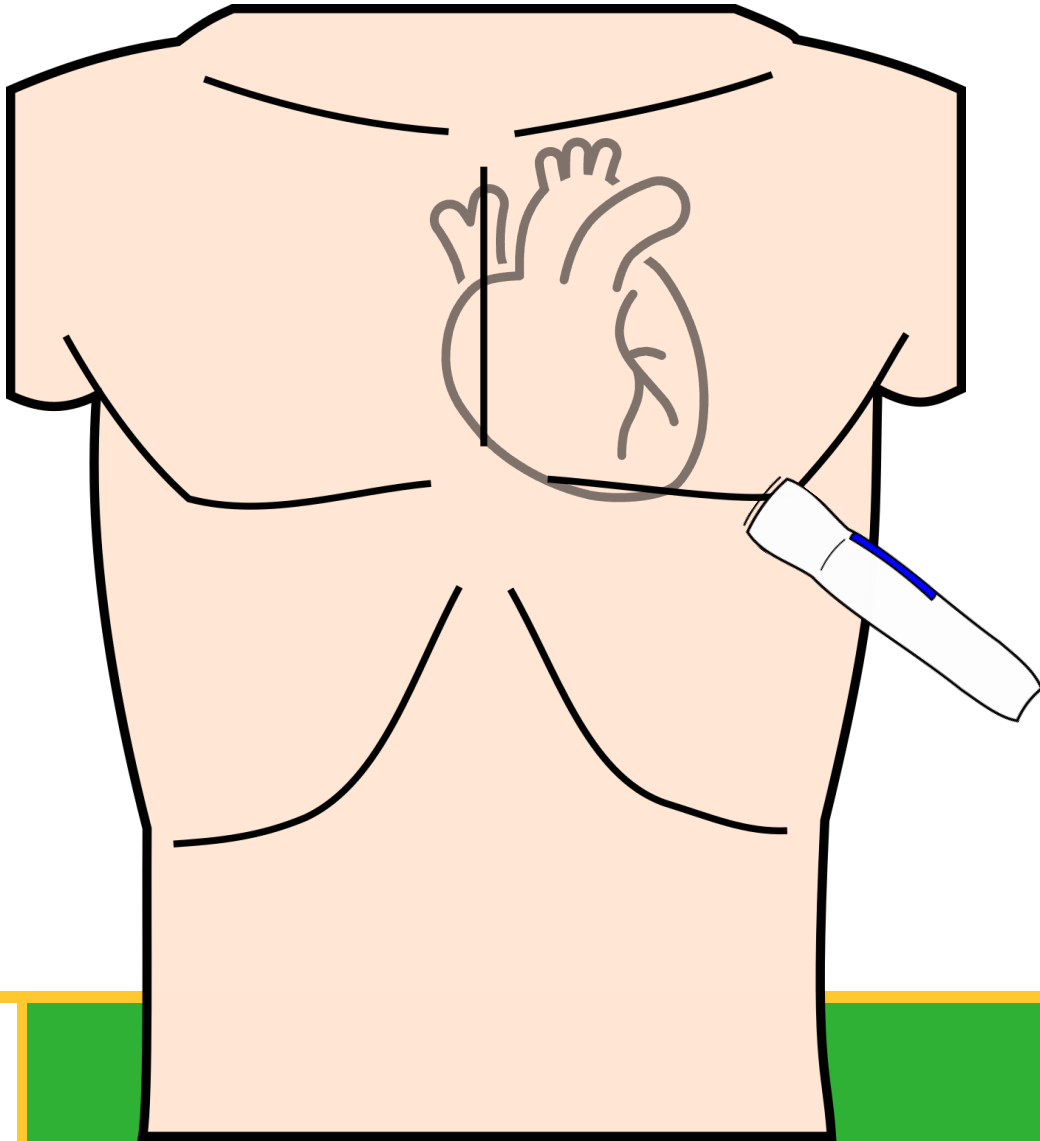
- Estimate RV and LV systolic function
- Assess RV and LV sizes
- Color Doppler: evaluate mitral and tricuspid regurgitation
- Identify pericardial effusion
  
- Enormously helpful for more advanced cardiac applications

# Apical 4 Chamber View- Image Acquisition

- Palpate the PMI to find the initial transducer location
  - Alternatively, start inferolateral to left nipple in men or inferolateral quadrant of breast in women
- Transducer then aimed toward patient's R shoulder
- Probe marker to L side of patient (generally 3:00)

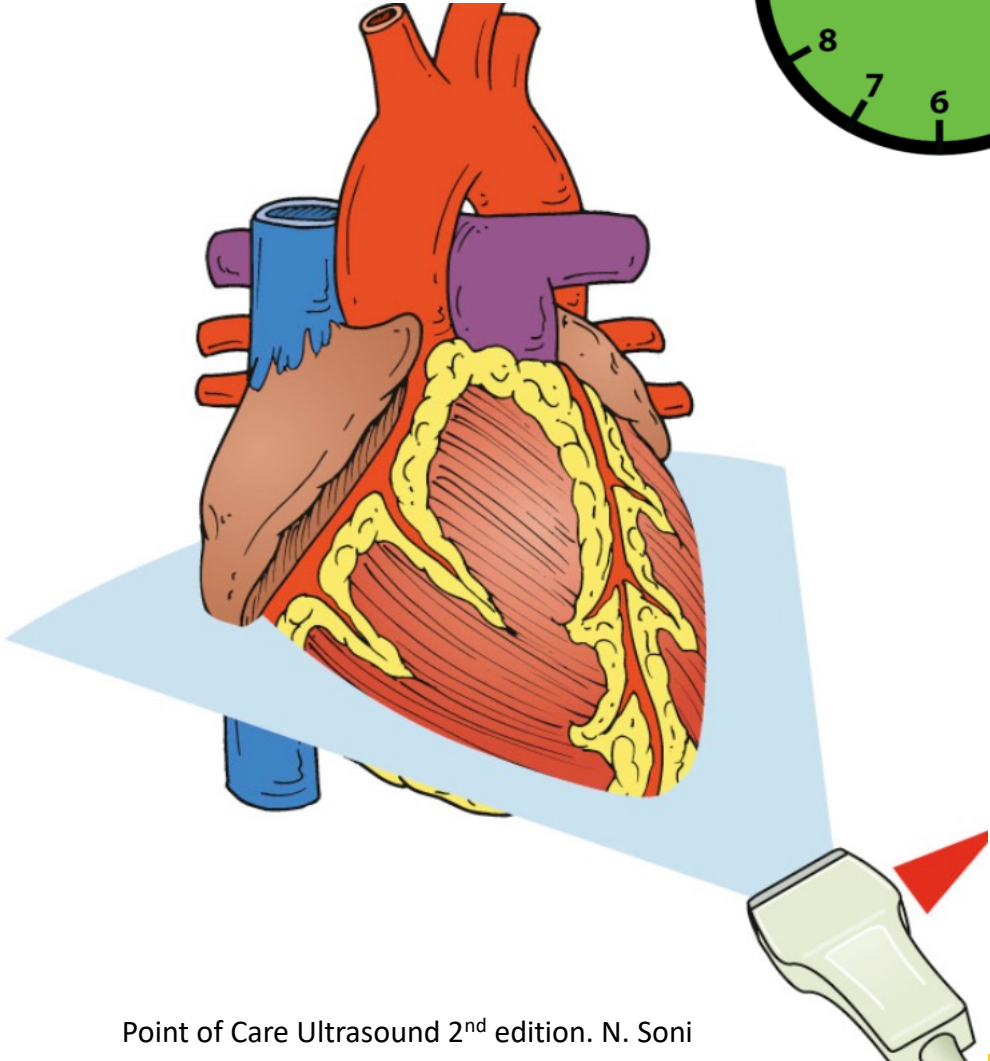
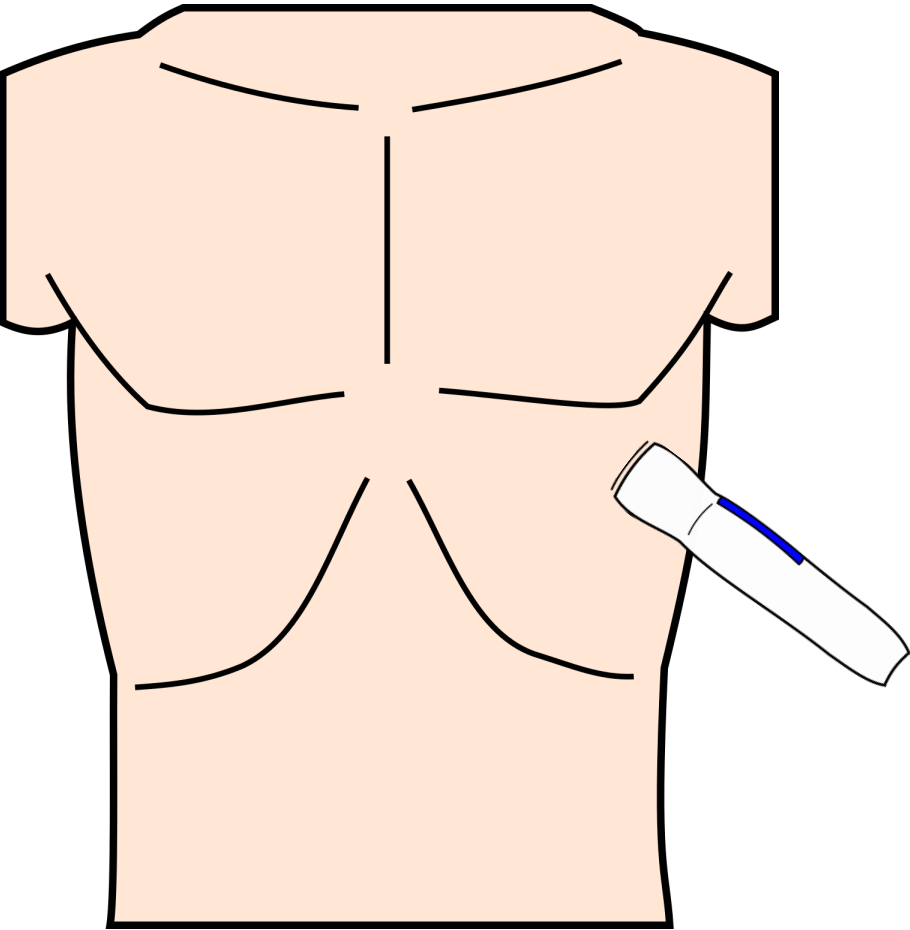
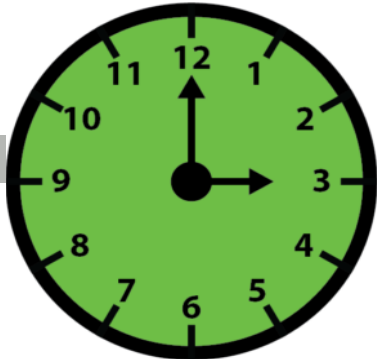


# Image Acquisition



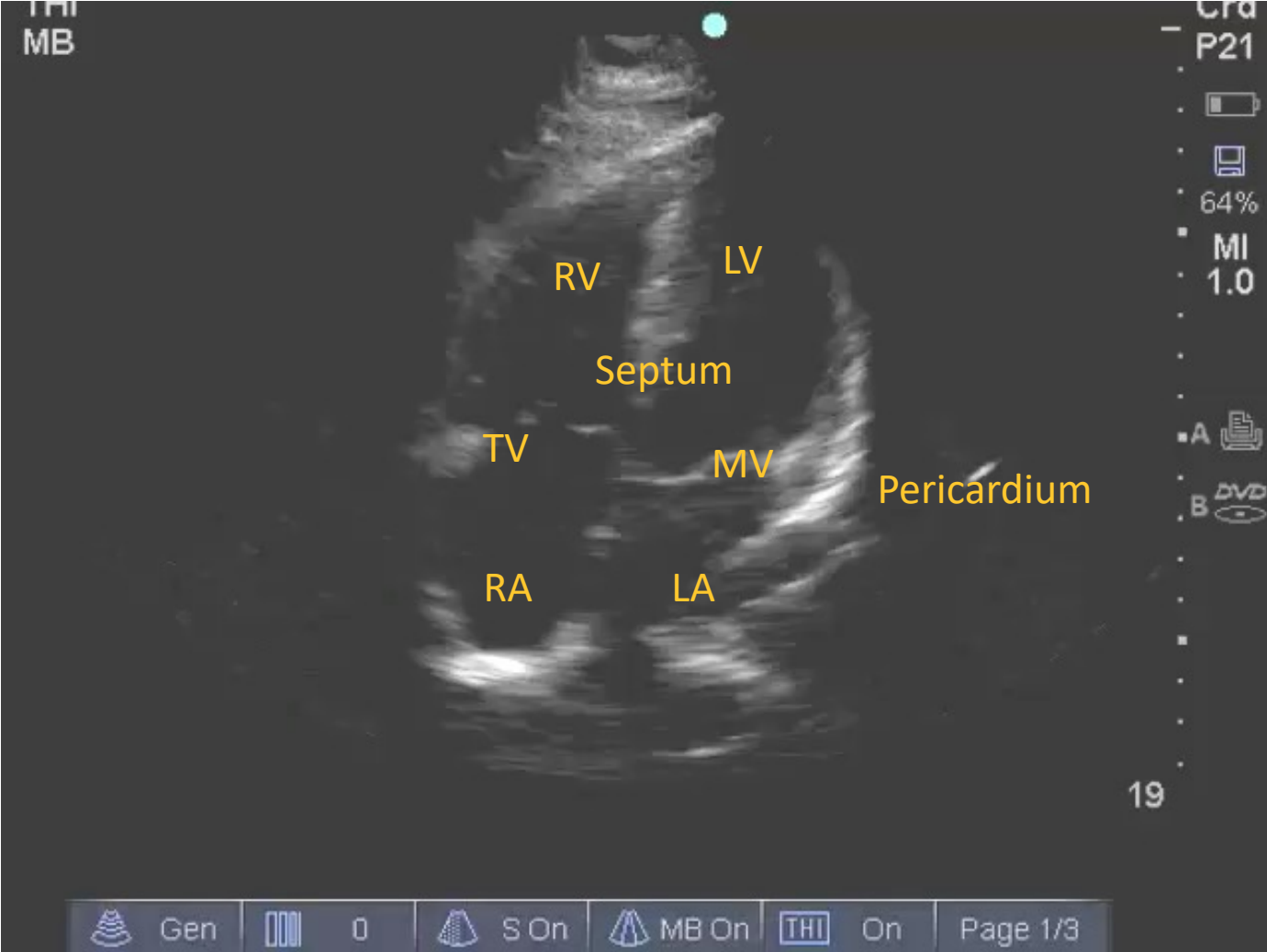
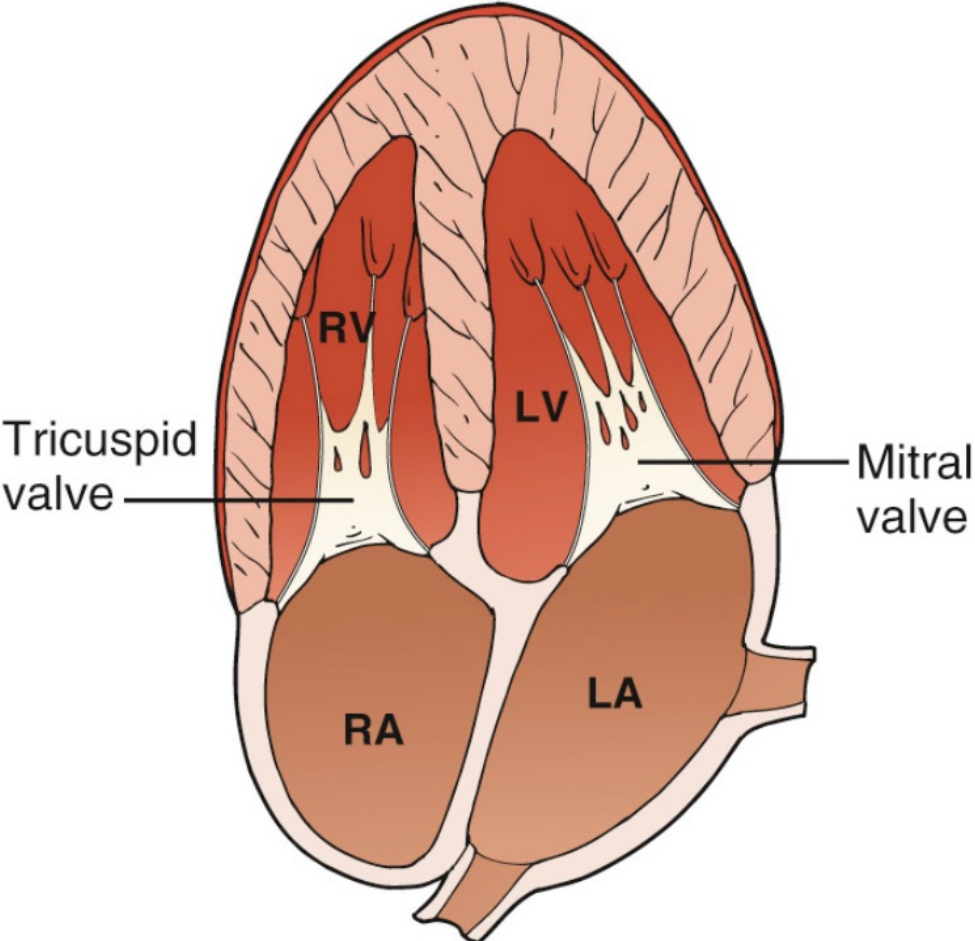
- Palpate PMI or start inferolaterally
- Index marker: Left shoulder (3:00)
- Direct probe angle to mirror cardiac axis
- Left lateral decubitus positioning!

# Apical 4-Chamber View



Point of Care Ultrasound 2<sup>nd</sup> edition. N. Soni

# Apical 4-Chamber View



# Apical 4-Chamber View- Tips

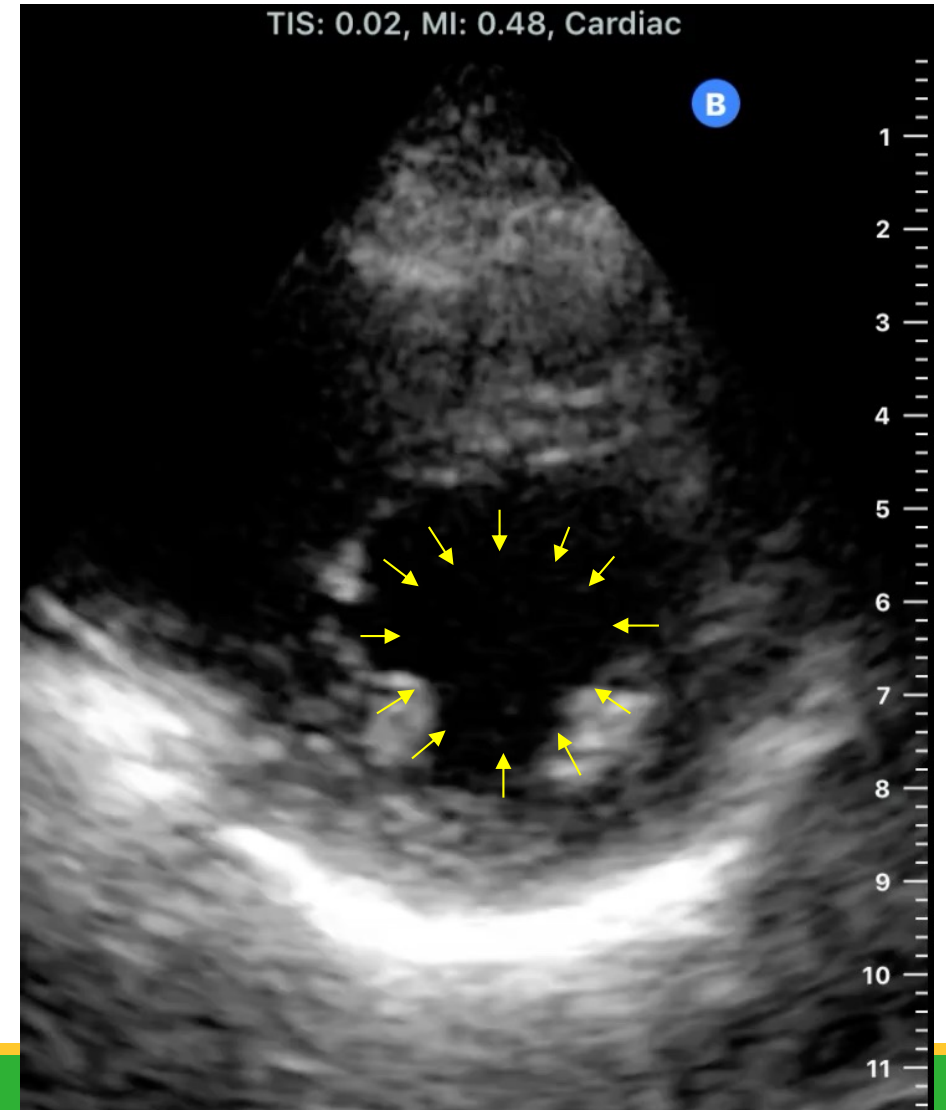
- Ideal: all 4 chambers with interventricular septum centered
- Slide OR rock transducer to patient's right to fully visualize RV
  - especially free wall and lateral tricuspid annulus
- Tilt upwards to visualize atria or LVOT/AV

# Left Ventricular Systolic Function

- Mostly a qualitative assessment
- Categorized as hyperdynamic, normal, reduced or severely reduced
  1. Endocardial excursion
  2. Myocardial thickening

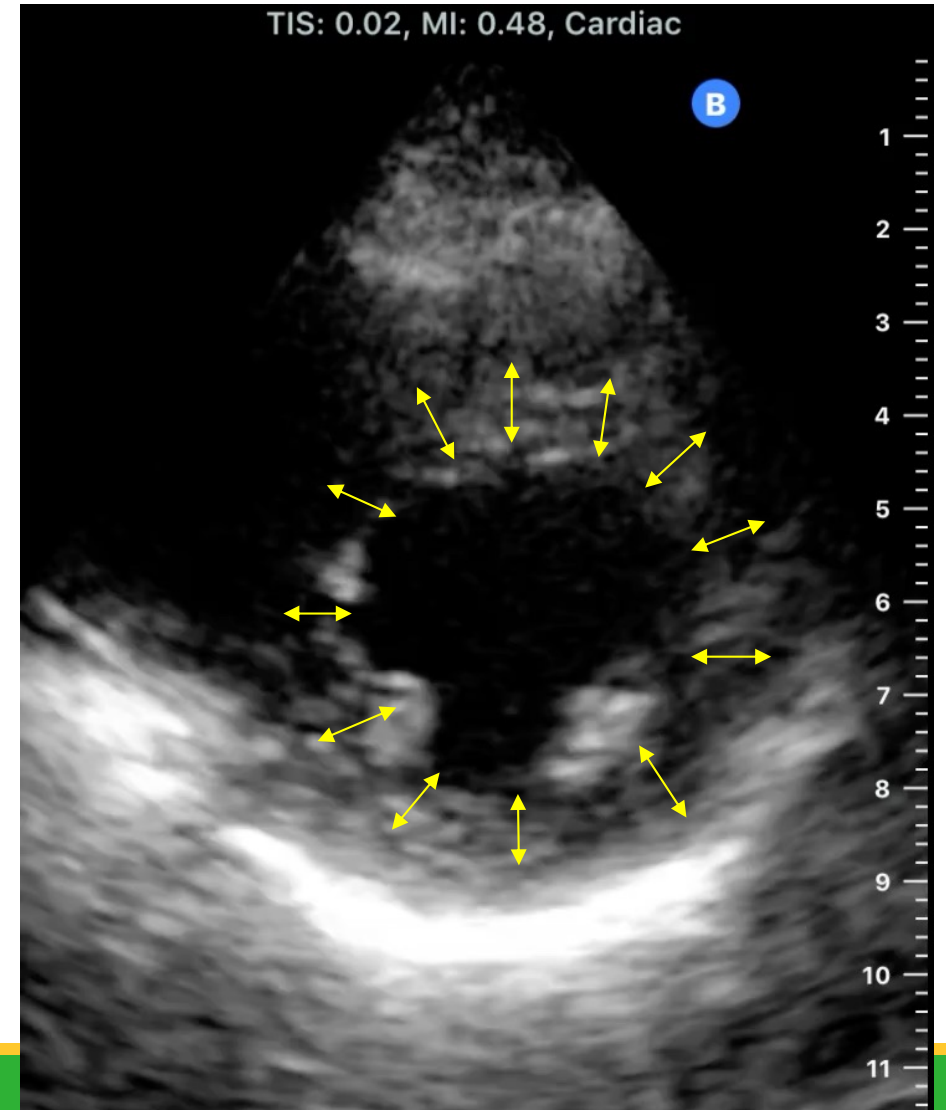
# Left Ventricular Systolic Function

- 1. Endocardial excursion:**  
Symmetric endocardial motion towards the LV chamber

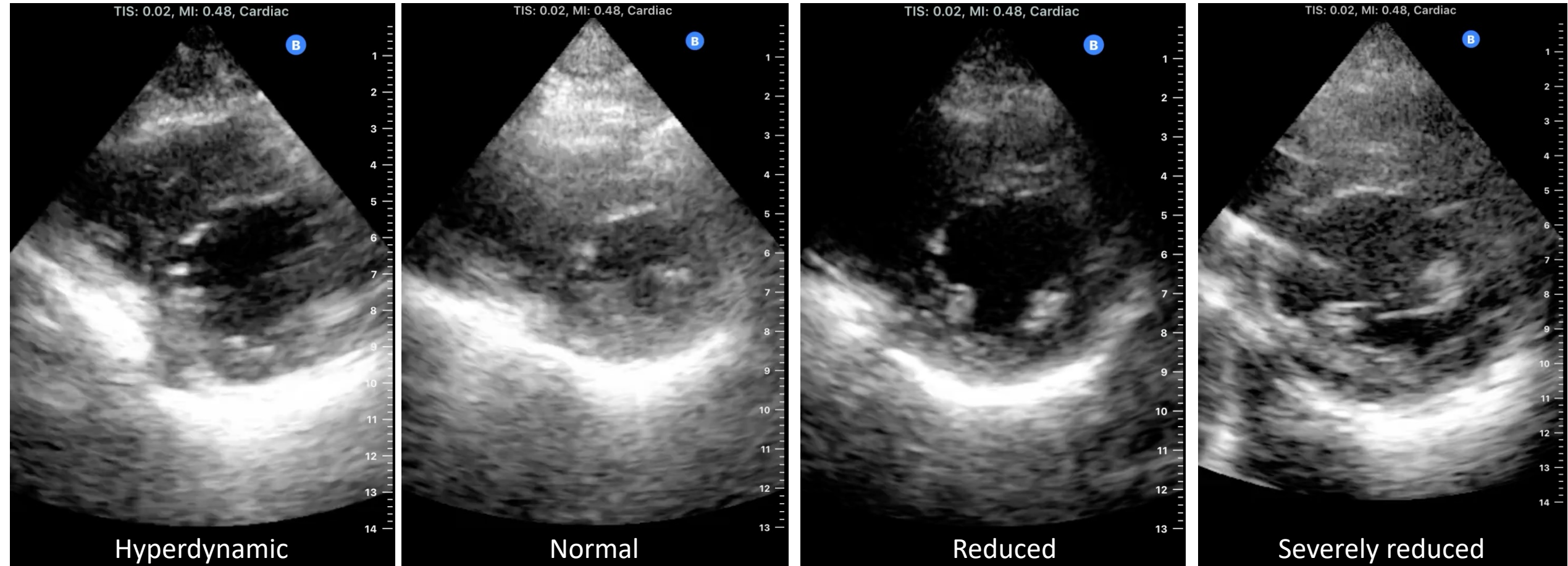


# Left Ventricular Systolic Function

- 2. Myocardial thickening:**  
>40% increase in thickness during systole



# Left Ventricular Systolic Function-PSSA





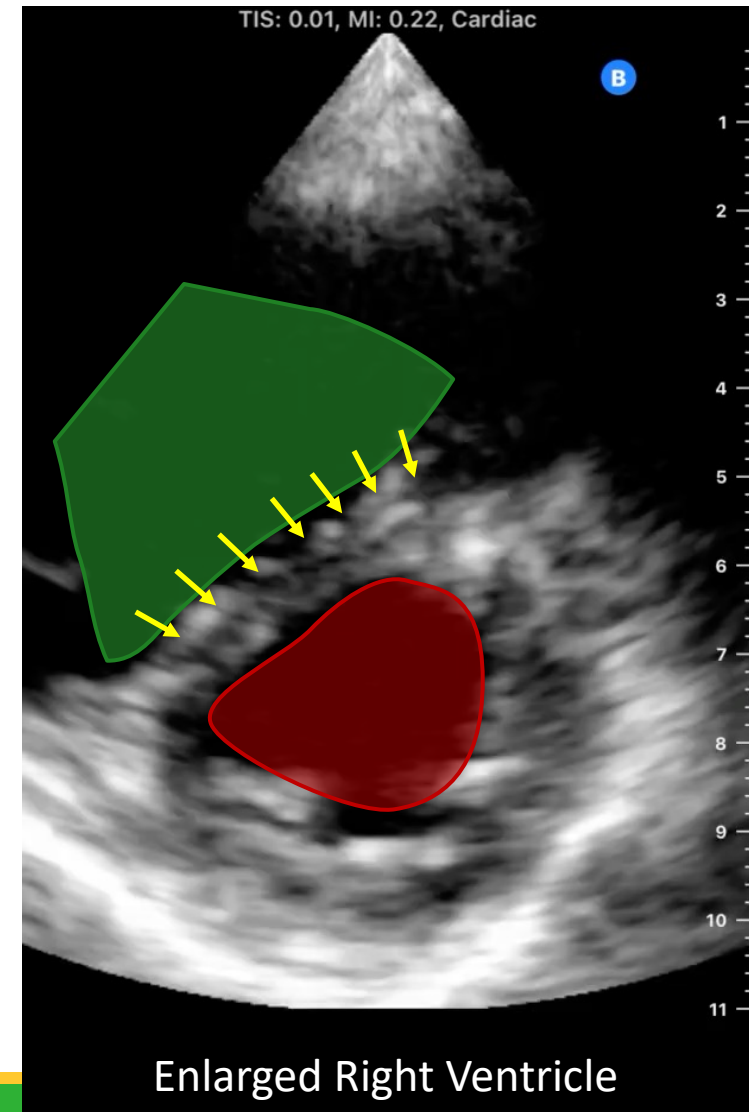
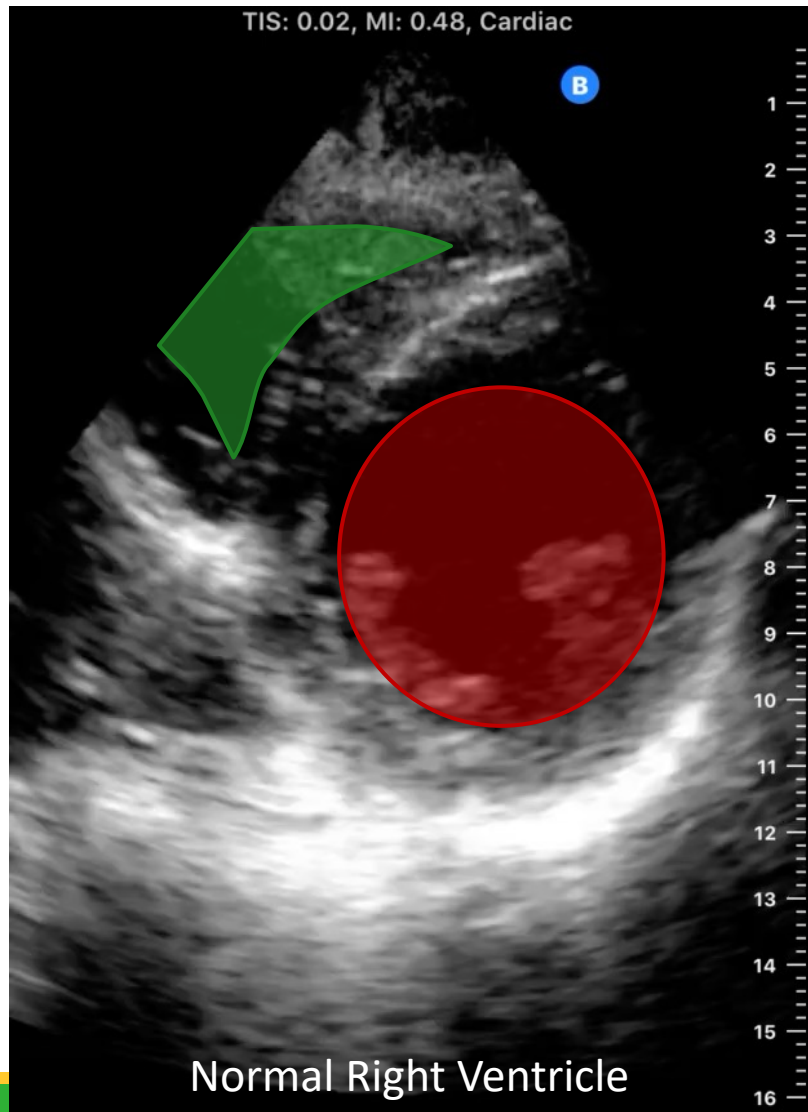
# Left Ventricular Systolic Function-A4C



# Right Ventricular Dilation

- Qualitative/visual assessment
- PSSA: RV goes from crescentic-shaped to globular/rounded
- A4C: RV goes from triangular-shaped to ovoid
- Categorized as normal, moderate, or severe dilation
  - Normal:  $< 2/3$  the size of LV
  - Moderate:  $>2/3$  but still smaller than LV
  - Severe: larger than LV

# Right Ventricular Enlargement

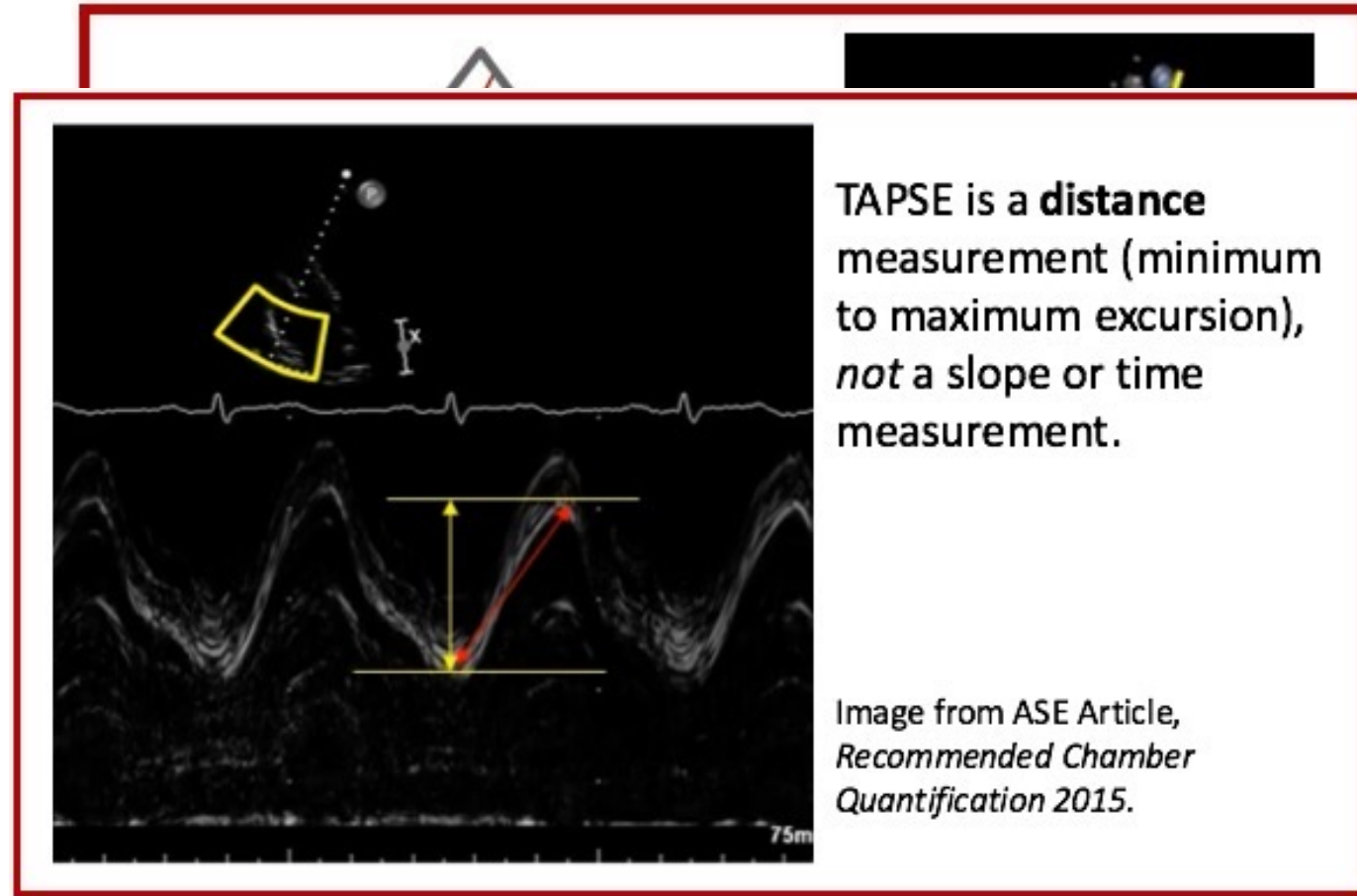


# Right Ventricular Systolic Function

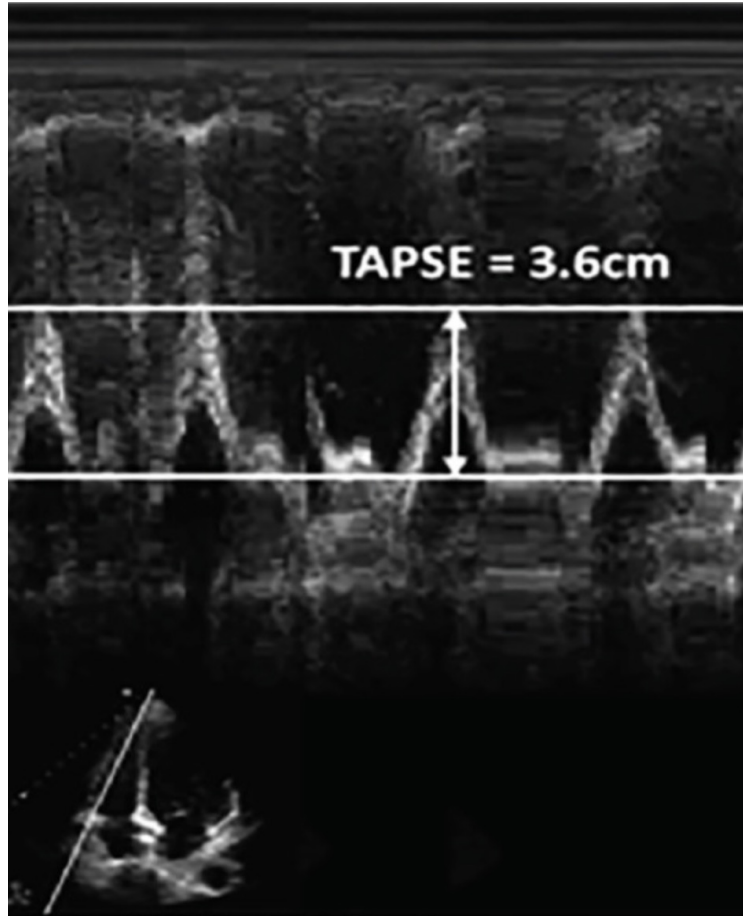
- Qualitative & quantitative assessment
- RV systolic function is controversial: gold standard is MRI, 3D Echo
- Categorized as normal, reduced or severely reduced
  1. Endocardial excursion
  2. Myocardial thickening (longitudinal vs concentric as with LV)
  3. Anterior to posterior motion of the tricuspid valve (TAPSE)

# Right Ventricular Systolic Function- TAPSE

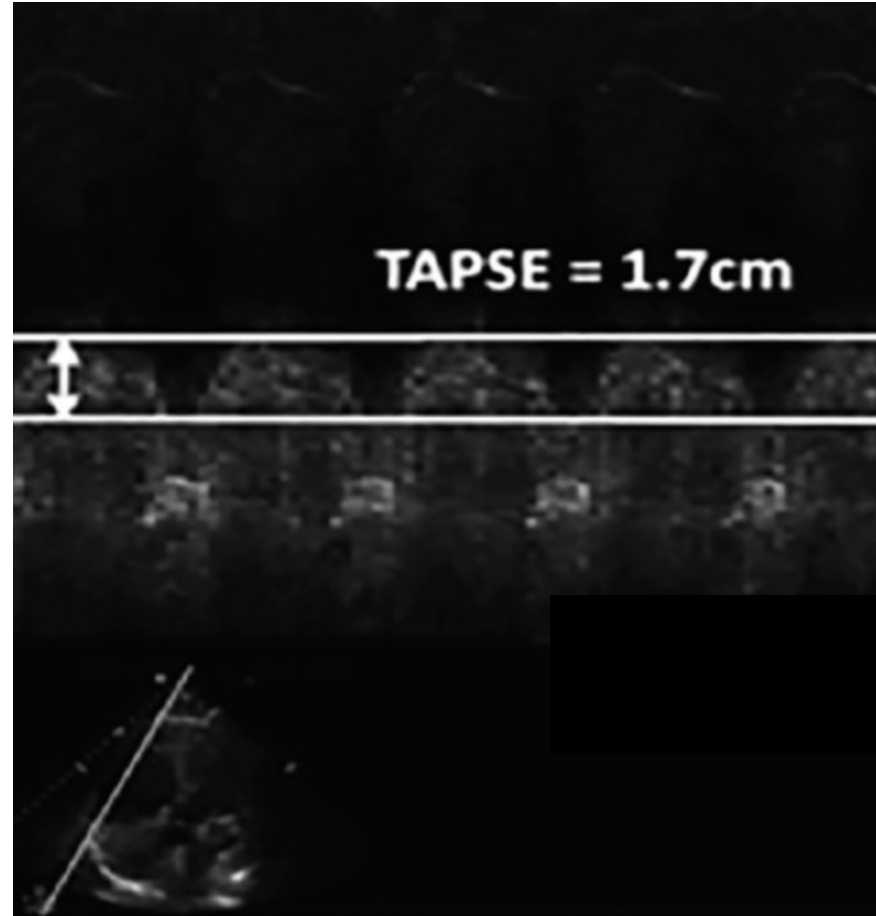
- Measure longitudinal excursion of lateral tricuspid annulus
- Technique:
  - Enable M-mode
  - Align cursor line parallel to movement of lateral TV annulus
  - Measure vertical distance
- Normal: >22-24 mm
- Reduced < 17 mm



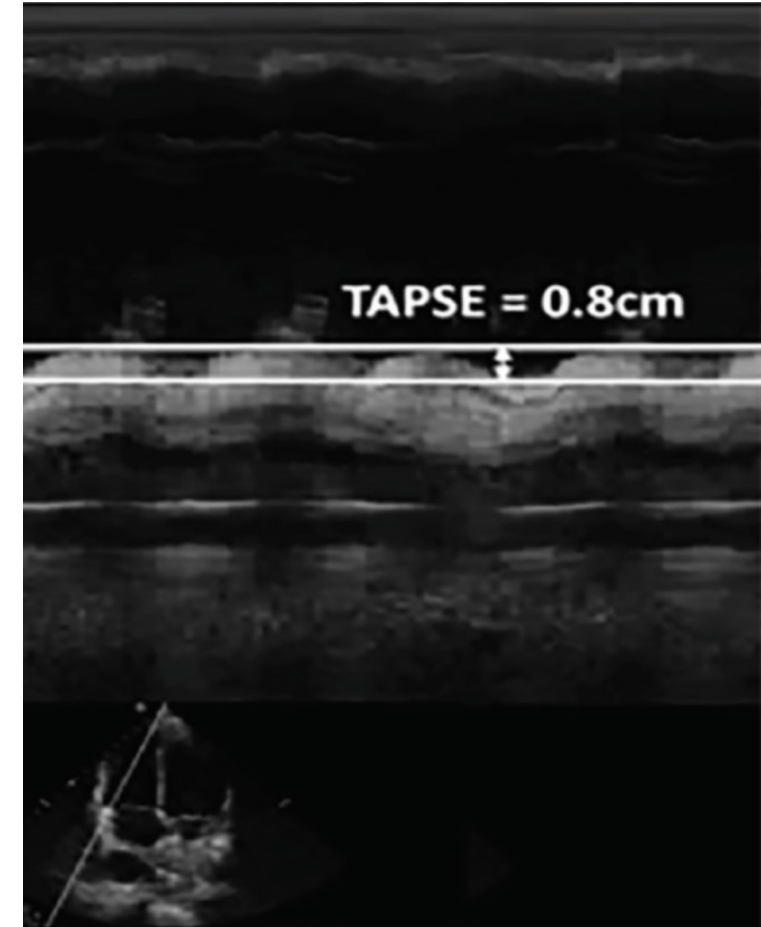
# Right Ventricular Systolic Function- TAPSE



Normal



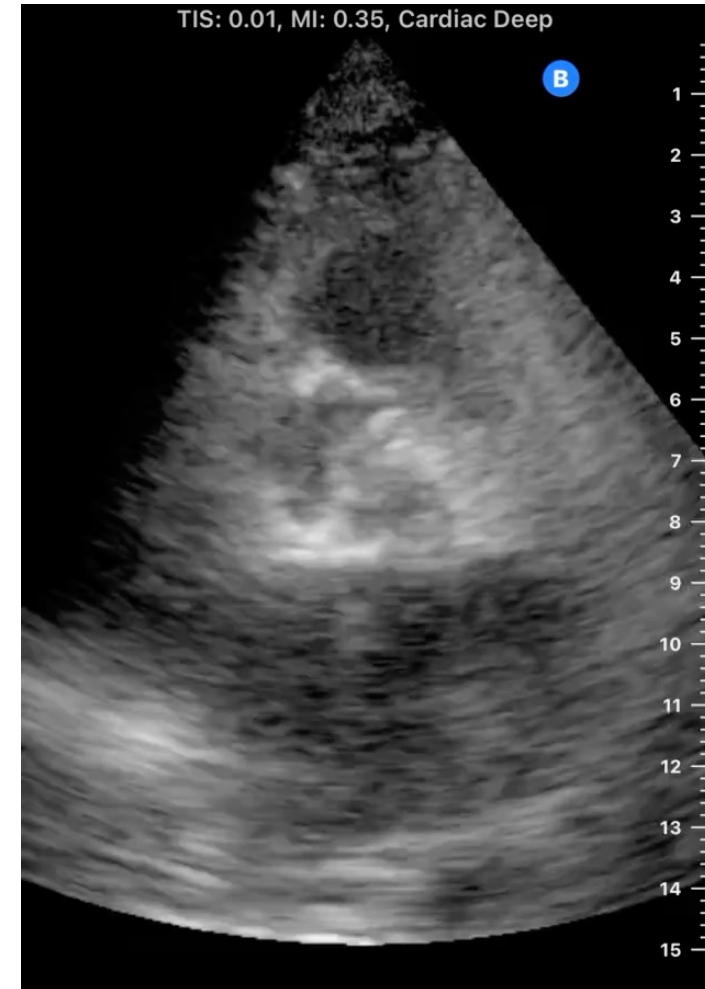
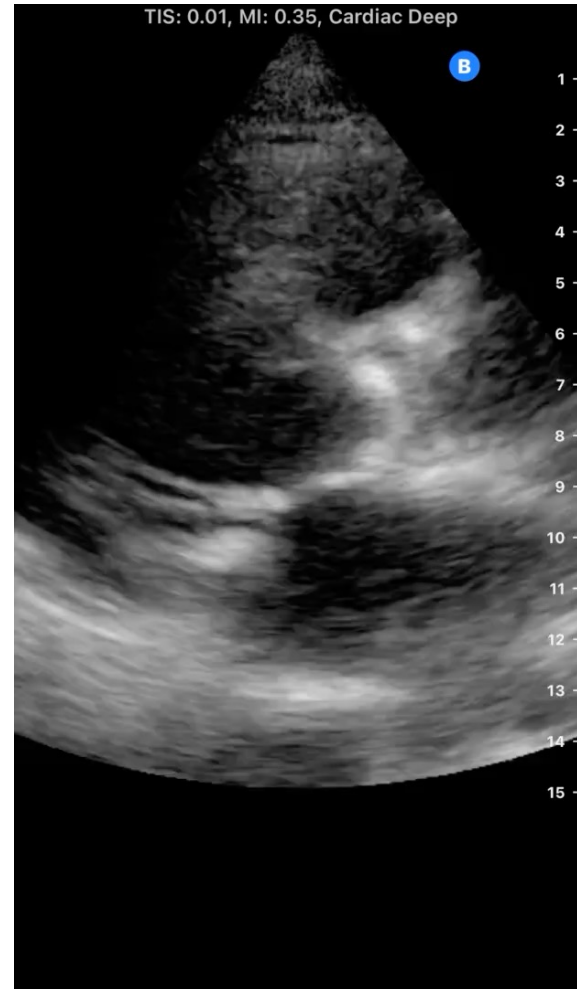
Borderline



Severely reduced

# POCUS & Aortic Stenosis

- Stenosis → diminished mobility, thickening, calcification
- Normal appearance essentially rules out severe AS
- Need comprehensive echo but POCUS can be used for screening<sup>1,2,3</sup>



# Cardiac Tamponade

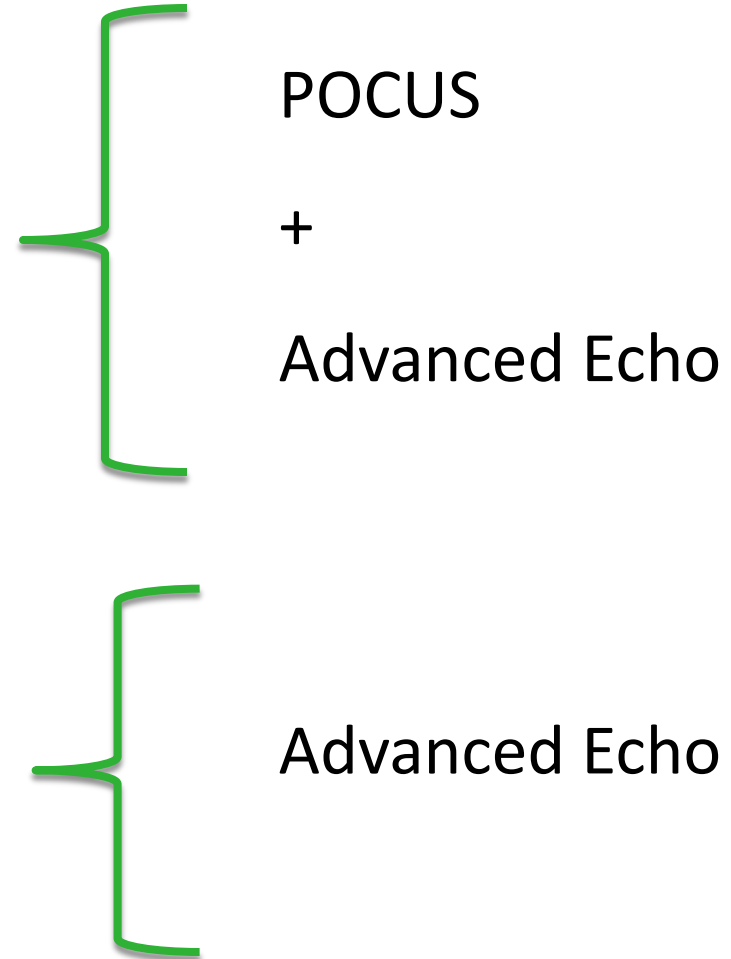
- Echo diagnostic criteria:

1. IVC Plethora

2. Cardiac chamber collapse

3. Exaggerated respiratory variation of transvalvular velocities

4. Expiratory hepatic vein diastolic flow reversals





# POCUS Findings in Cardiac Tamponade

## IVC Plethora:

>2.1 cm in diameter with < 50%  
inspiratory diameter decrease

*97% sensitive but 40% specific*

*(helpful NPV)*

## Cardiac chamber collapse

( $\geq 1/3$  of the cardiac cycle)

RV: early diastole

*60-90% sens; 85-100% spec*

RA: late diastole/early systole

*94% sens; 100% spec*

# Cardiac Tamponade



Q&A

Thank You!