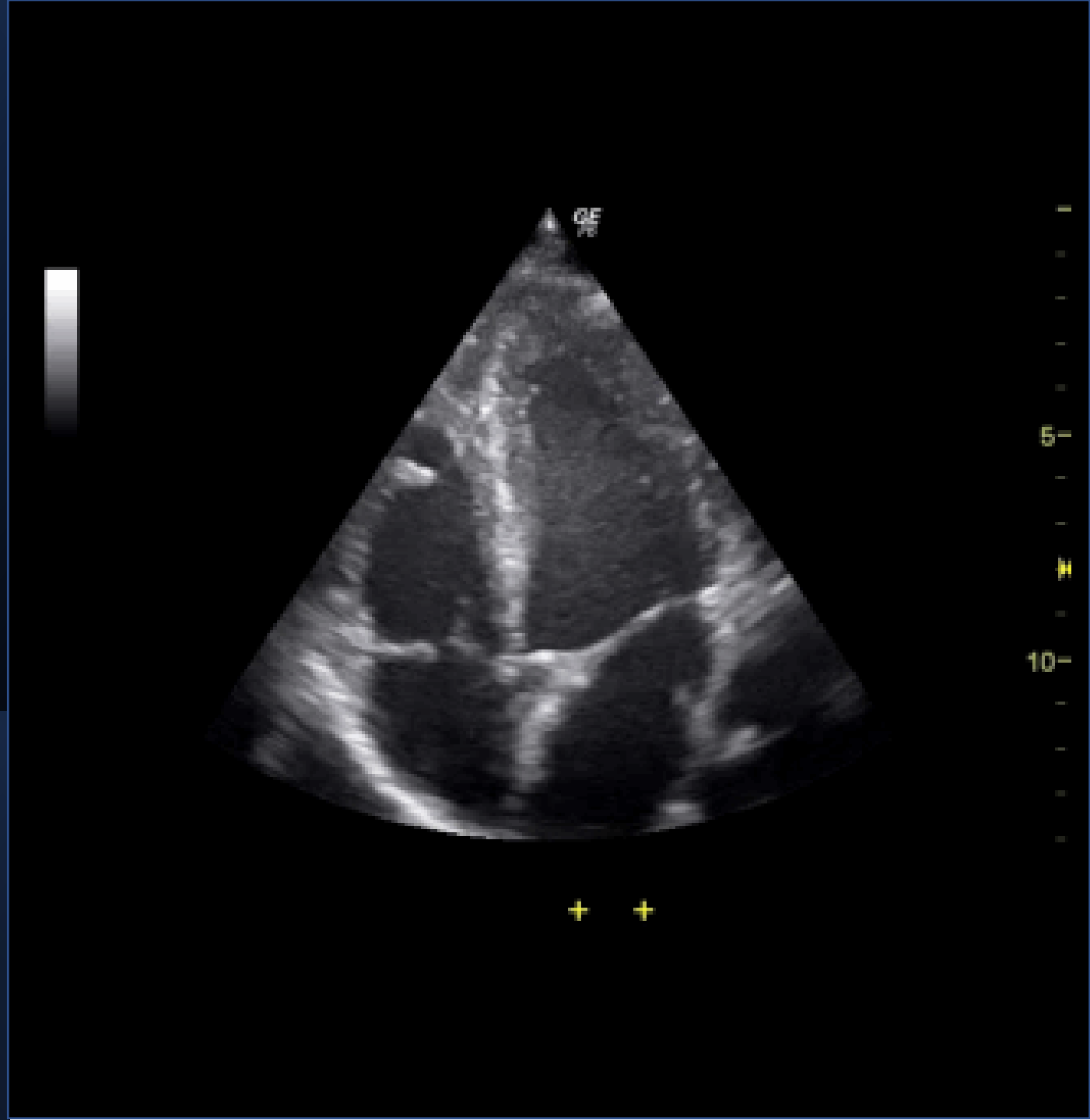


Introduction to Cardiac Point of Care Ultrasound (POCUS)

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TOMA CME Workshop: April 27th, 2023



Disclosures

- I have no financial interests or relationships to disclosure.

Objectives

1. List the views that should be acquired as part of the cardiac POCUS examination (Kirkpatrick et al., 2020).

Objectives when scanning later in session

1. Obtain all of the views that should be acquired as part of the cardiac POCUS examination (Kirkpatrick et al., 2020).
2. Identify normal sonographic anatomy for each of the cardiac views.

Lecture Overview

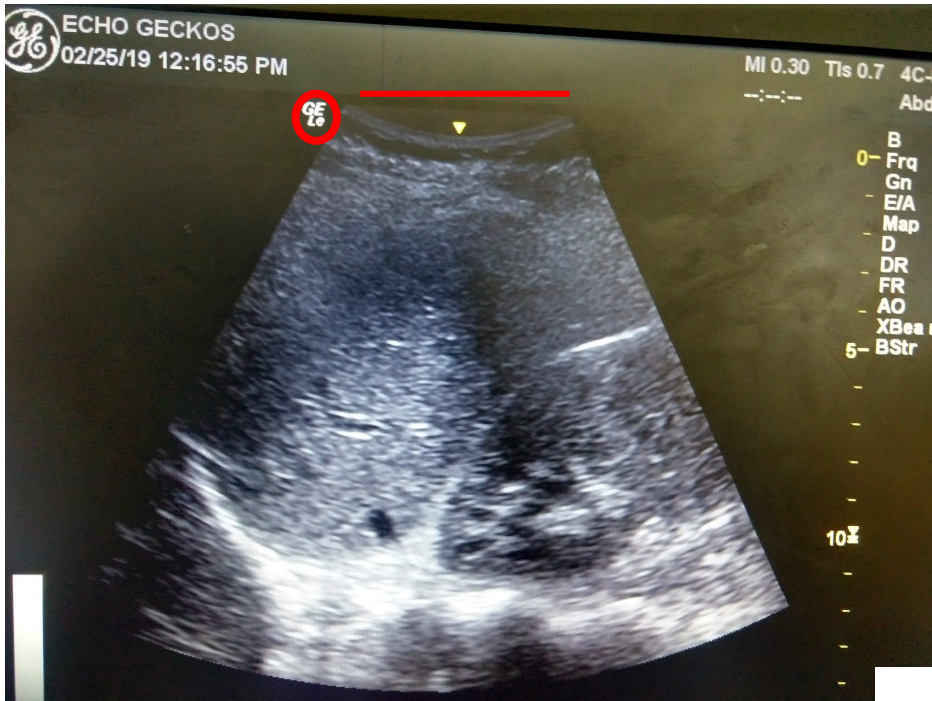
- Cardiac transducer & On-screen image
- Thoracic & Cardiac Anatomy Review
- Key cardiac views
 - Parasternal long axis (PLAX)
 - Parasternal short axis (PSAX)
 - Apical (Four/Five chamber)
 - Subcostal (Subxiphoid)

Cardiac (Phased Array) Transducer & Screen

- Low frequency (1-5Mhz)
 - Good for scanning deep structures
- Shape of probe (footprint)
 - Fits between ribs
- Has a probe marker like the other transducers

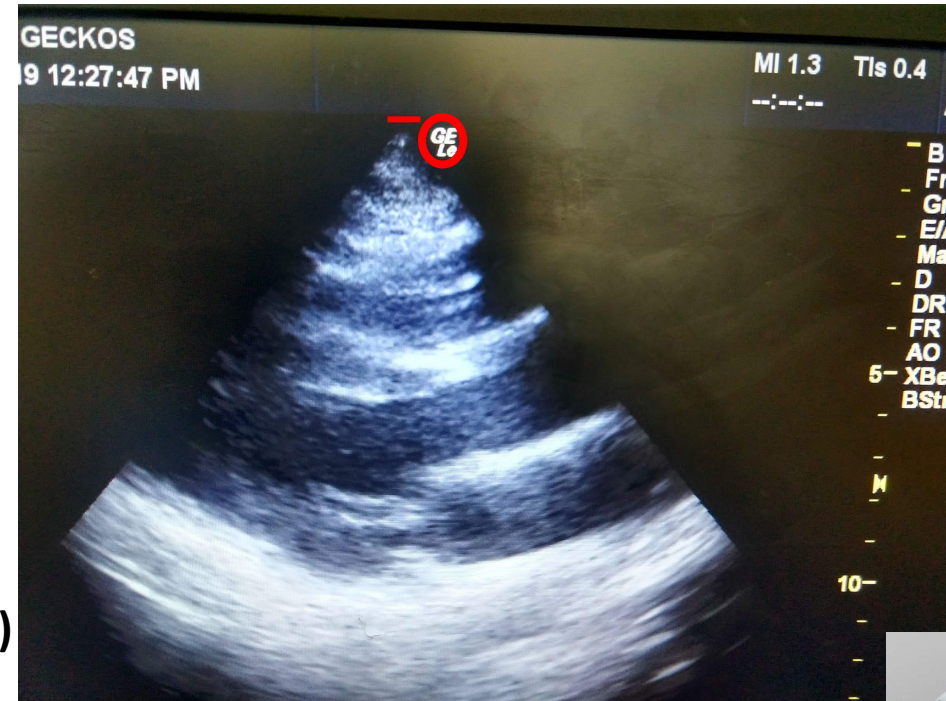


Cardiac Transducer On-Screen Image



On-screen image with curvilinear probe

Closest to
probe (top)

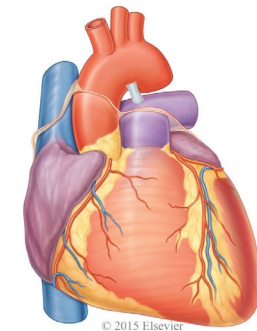


On-screen image with cardiac probe

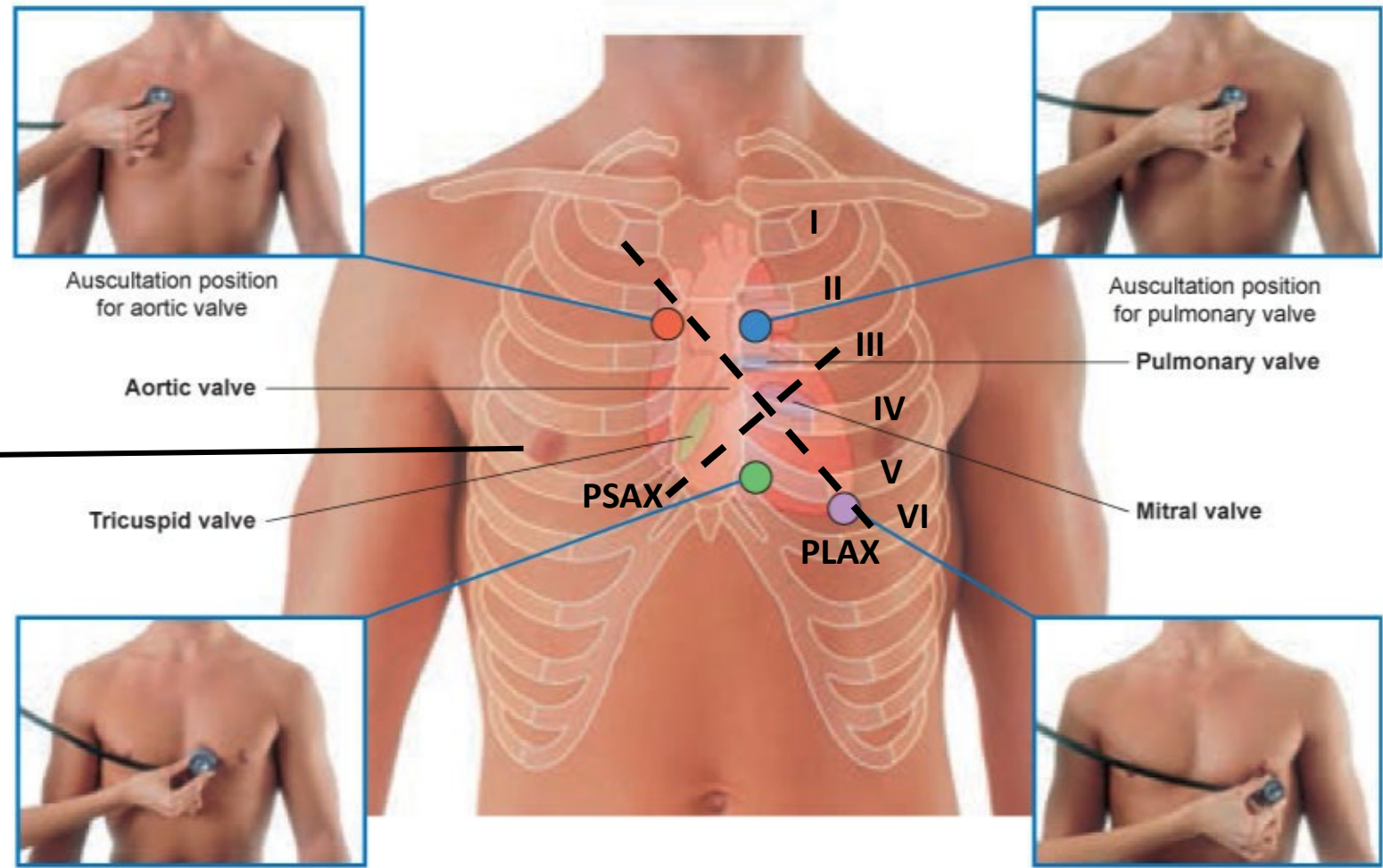
Further from
probe (bottom)



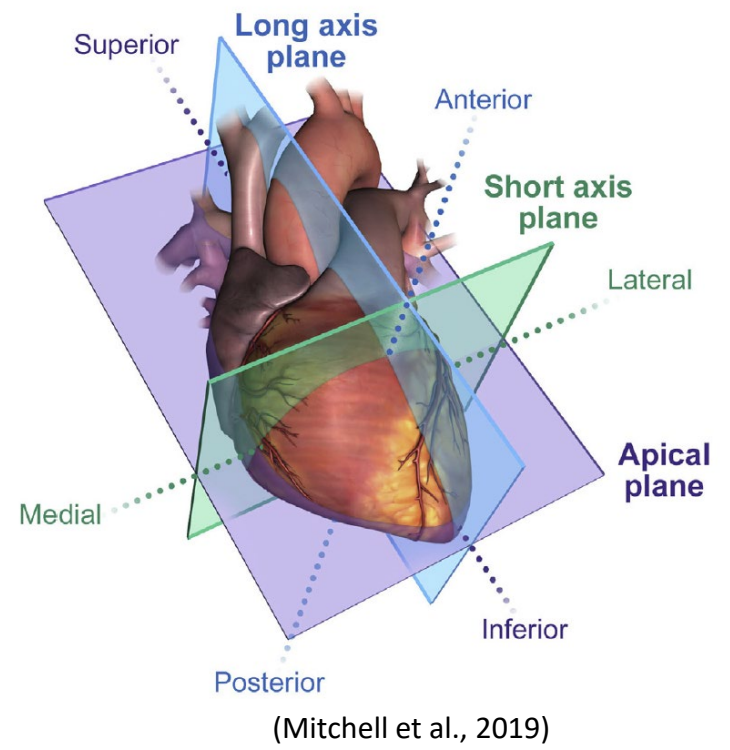
- Smaller footprint
- On-screen marker will move to right side of the screen with cardiac probe and cardiac preset



Thoracic & Cardiac Anatomy Review

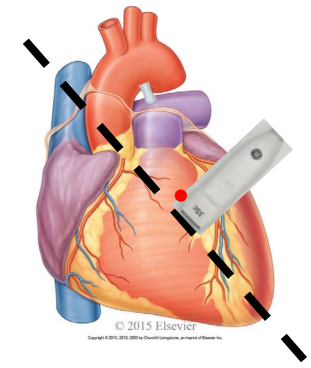


T4

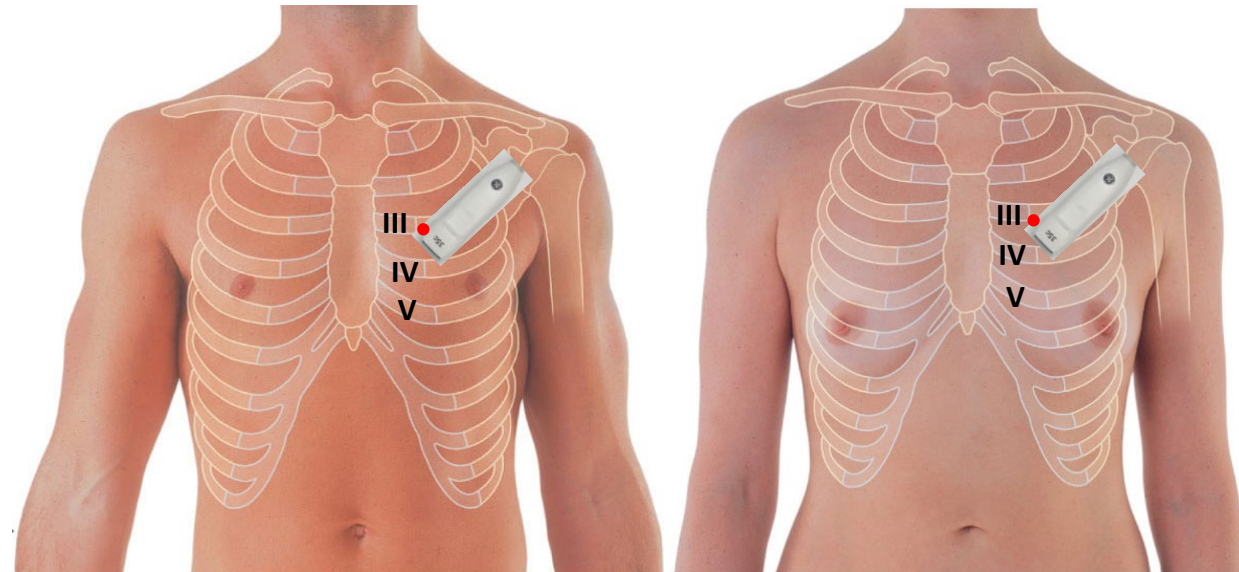


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1. Parasternal Long Axis View (PLAX)



Probe Placement

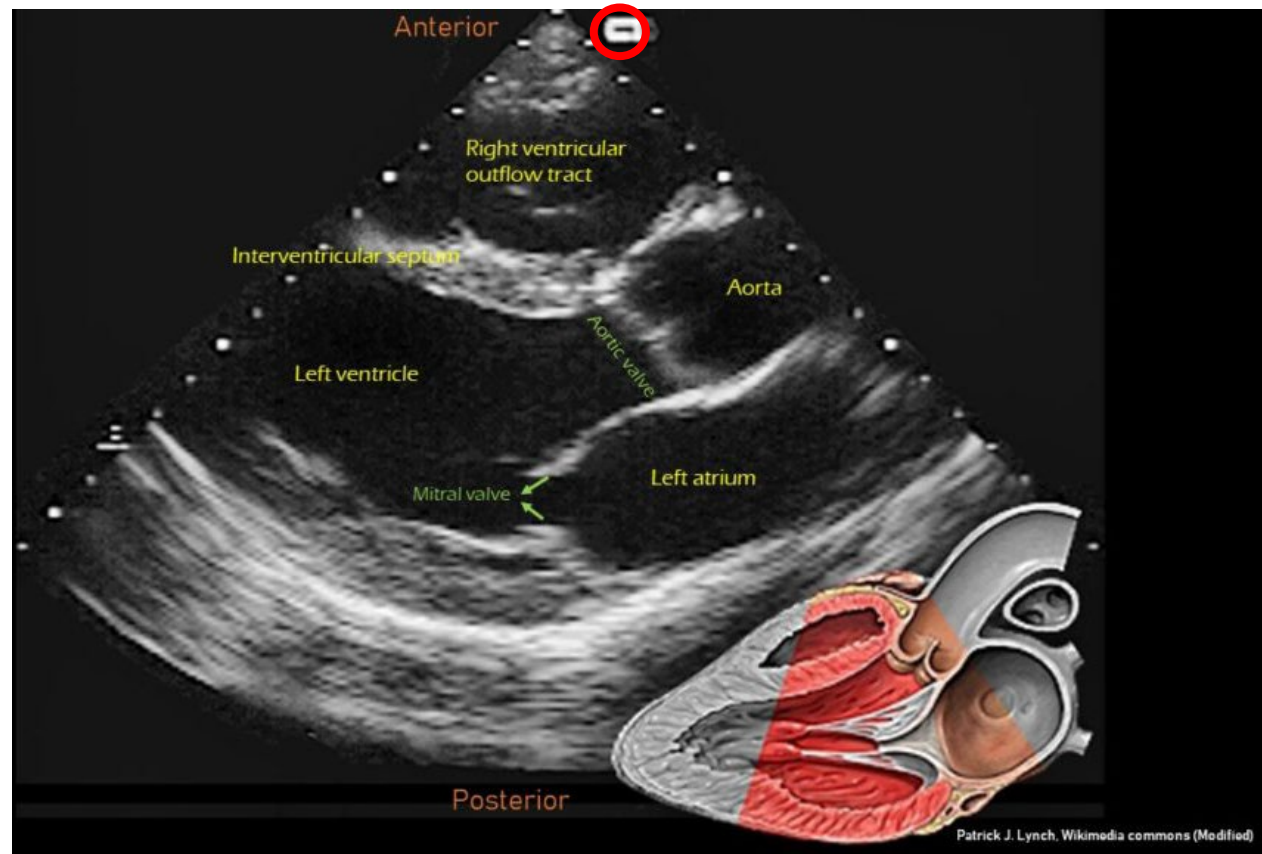


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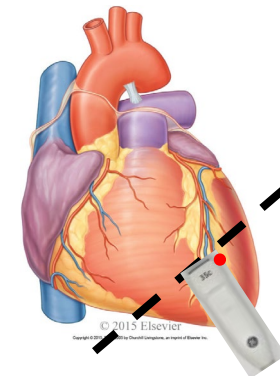
Position the probe toward the left of the sternum in the space between ribs 3 and 4 or 4 and 5 with the probe marker toward the model's right shoulder.

(Midsagittal cut of heart)

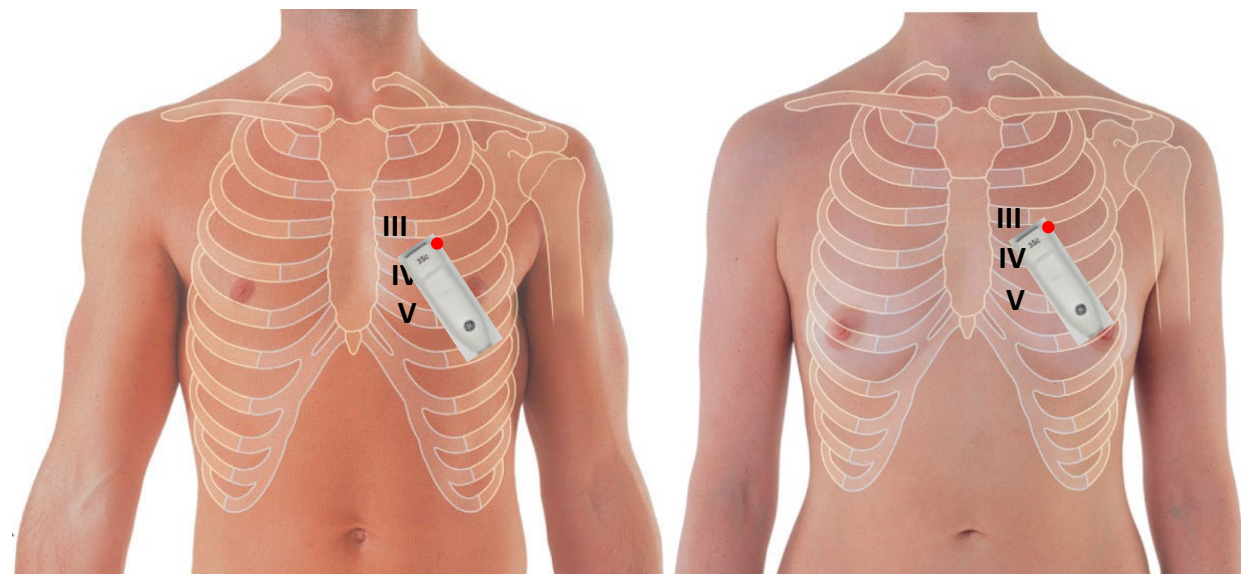


Patrick J. Lynch, Wikimedia commons (Modified)

2. Parasternal Short Axis View (PSAX)



Probe Placement

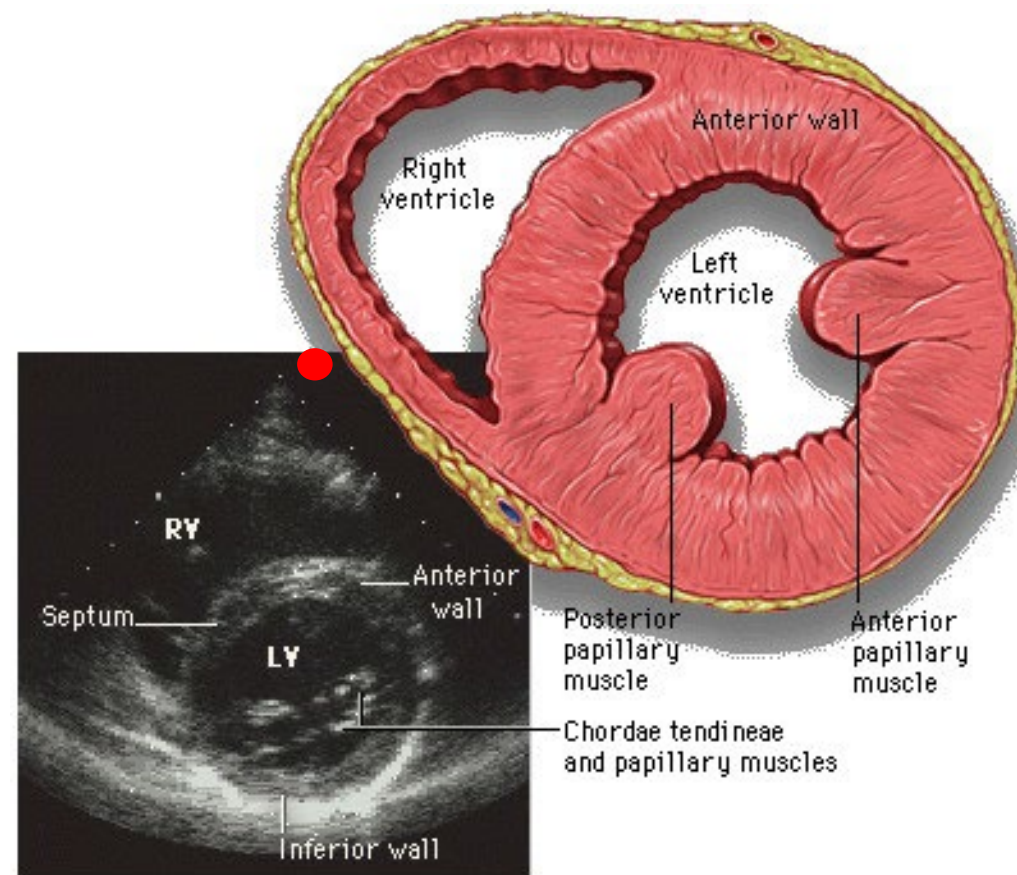


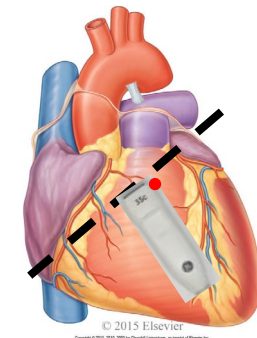
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From PLAX probe position, rotate the probe 90 degrees clockwise so that the probe marker is pointed toward the patient's left shoulder.

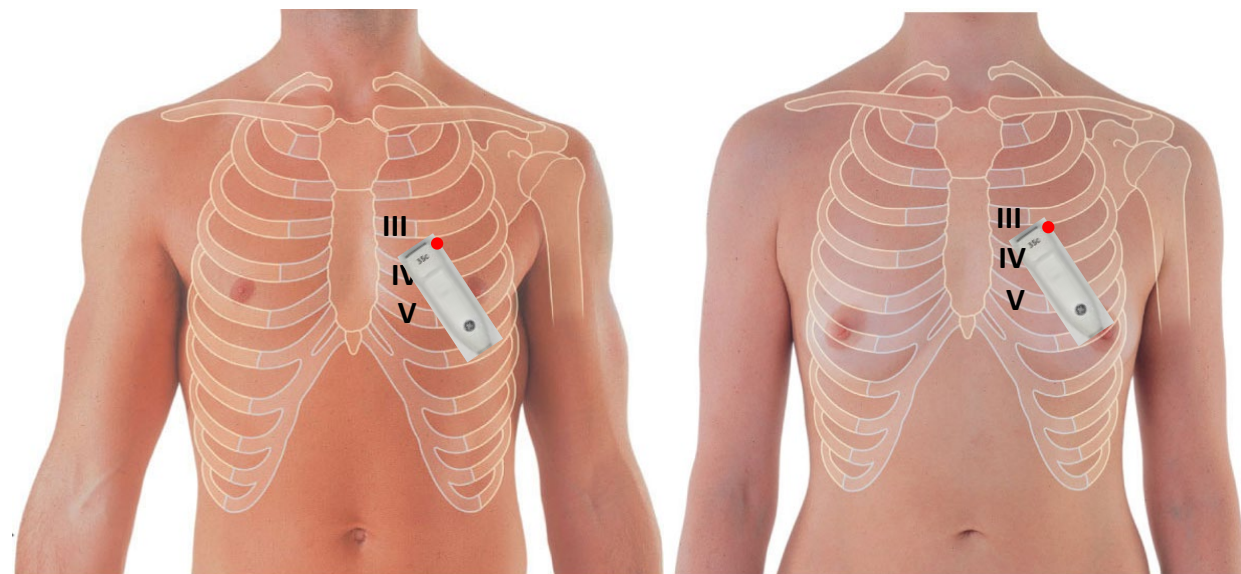
(Transverse cut of heart)





2. Parasternal Short Axis View (PSAX)

Probe Placement

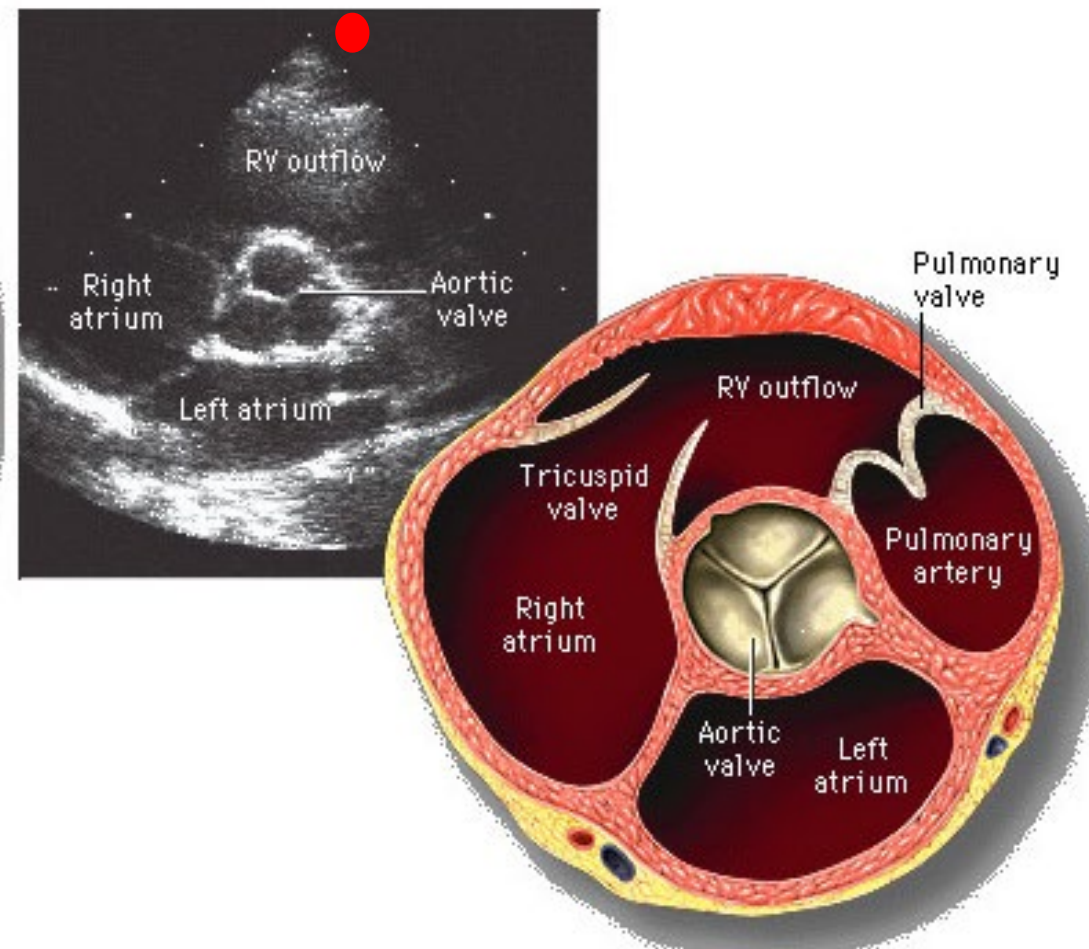


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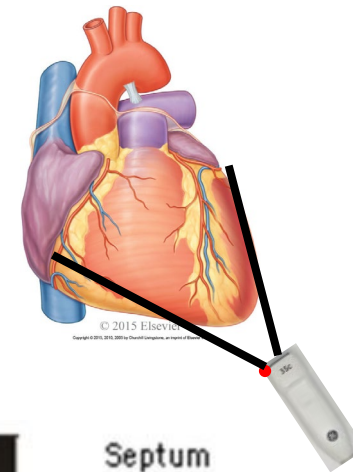
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Tilt or slide toward great vessels of heart to view a more superior PSAX view.

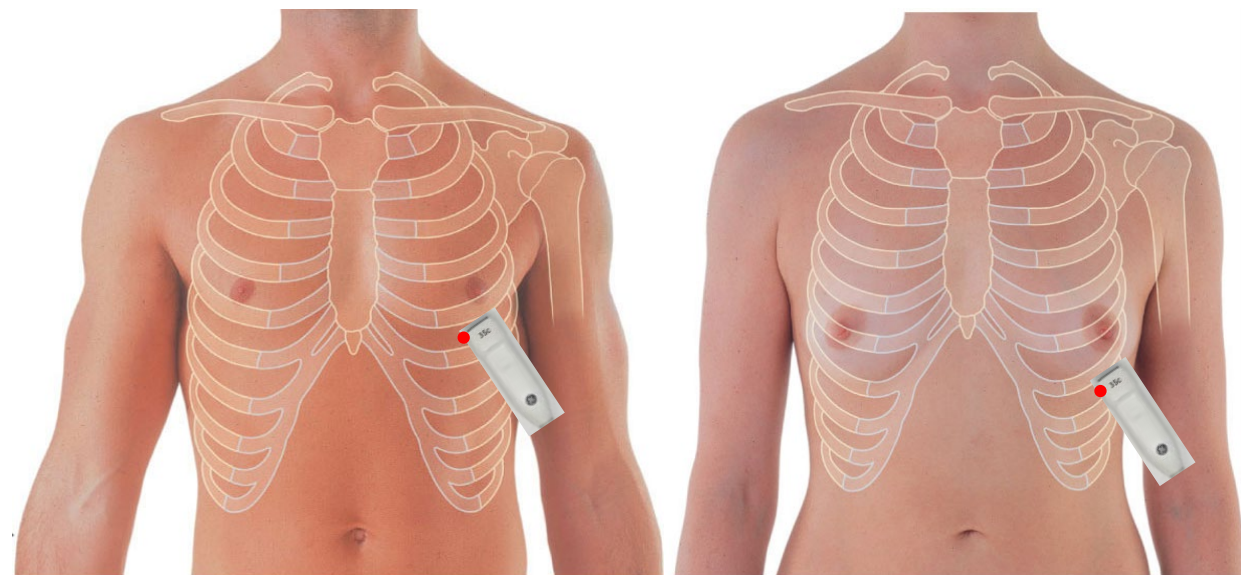
(Transverse cut of heart)



3. Apical (Four Chamber) View



Probe Placement

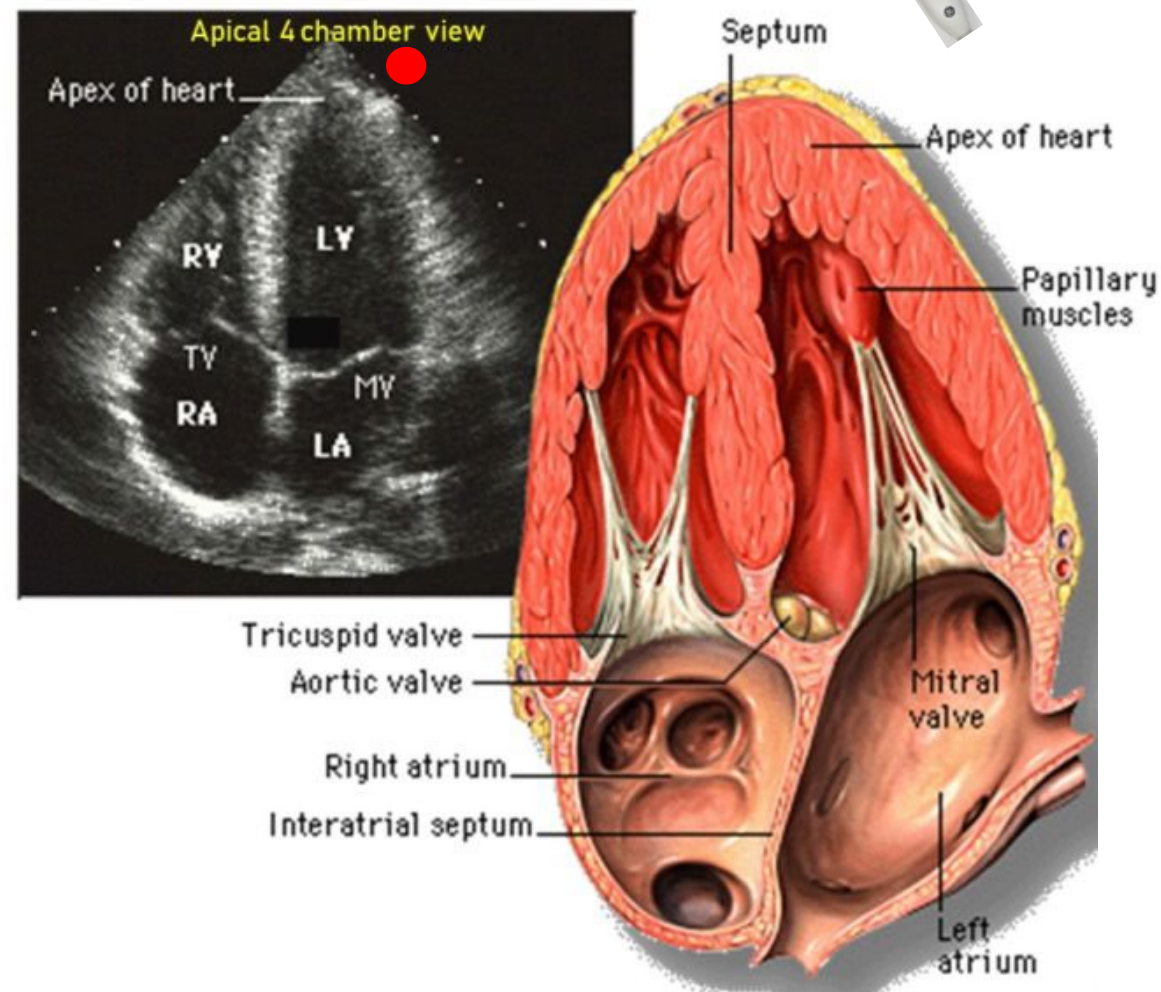


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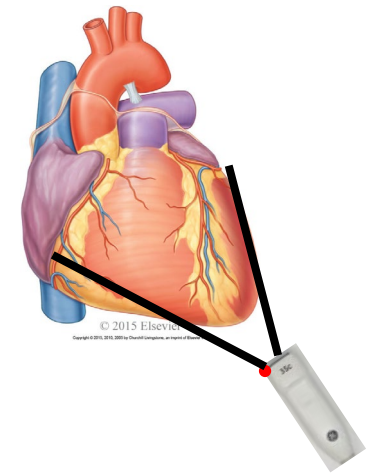
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Move probe just inferior to nipple (T4), or breast tissue if present, in the 5th intercostal space with probe marker pointed toward patient's right side.

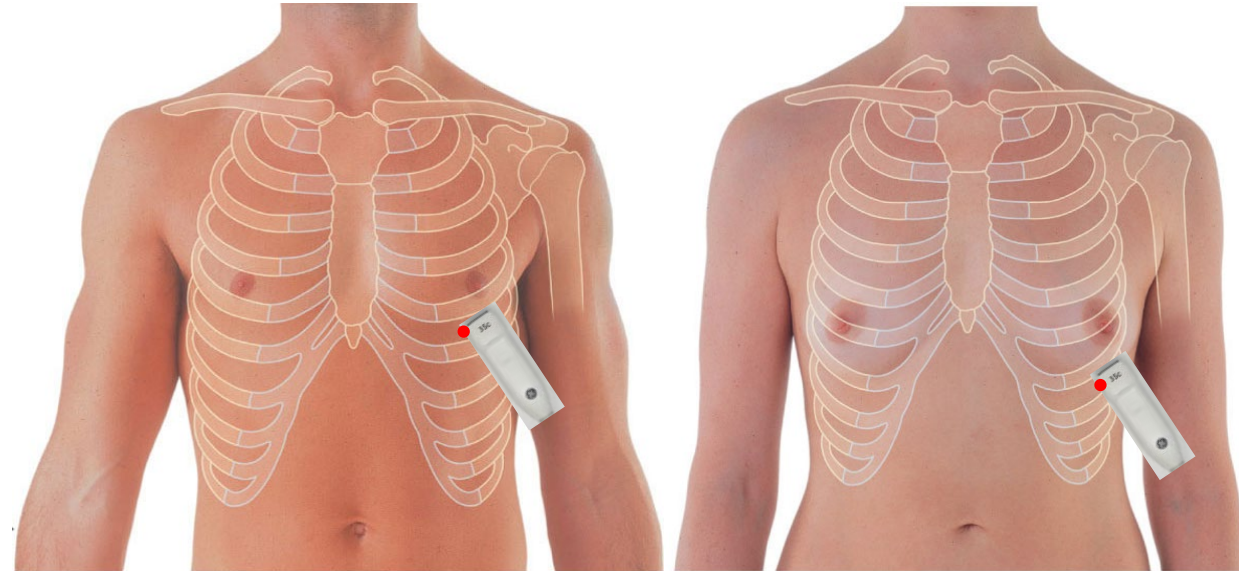
(Coronal cut of heart)



3. Apical (Five Chamber) View



Probe Placement

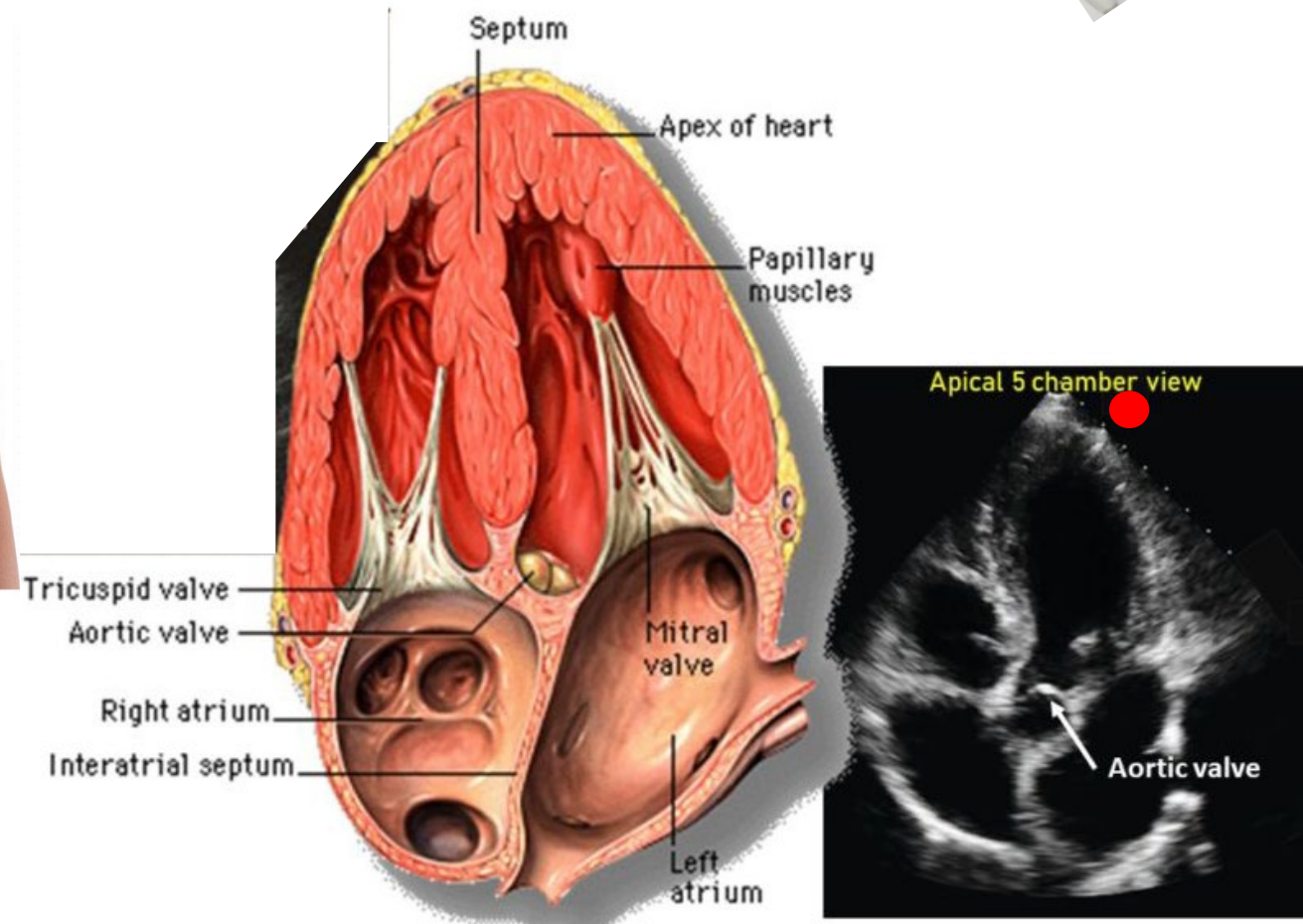


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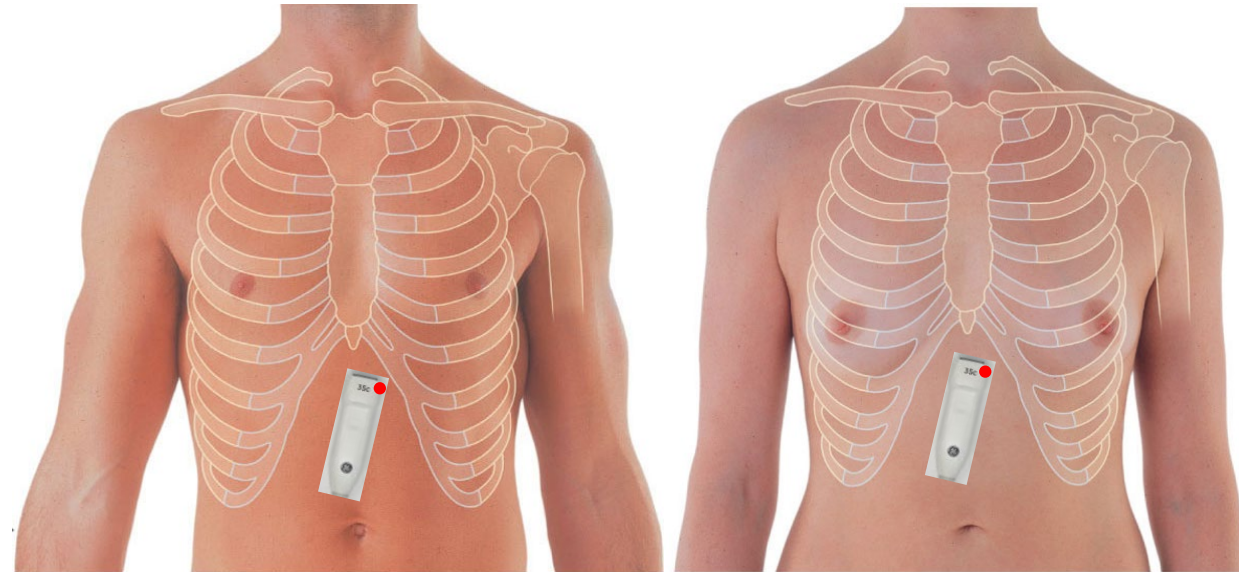
Move probe just inferior to nipple (T4), or breast tissue if present, in the 5th intercostal space with probe marker pointed toward patient's right side.

(Coronal cut of heart)



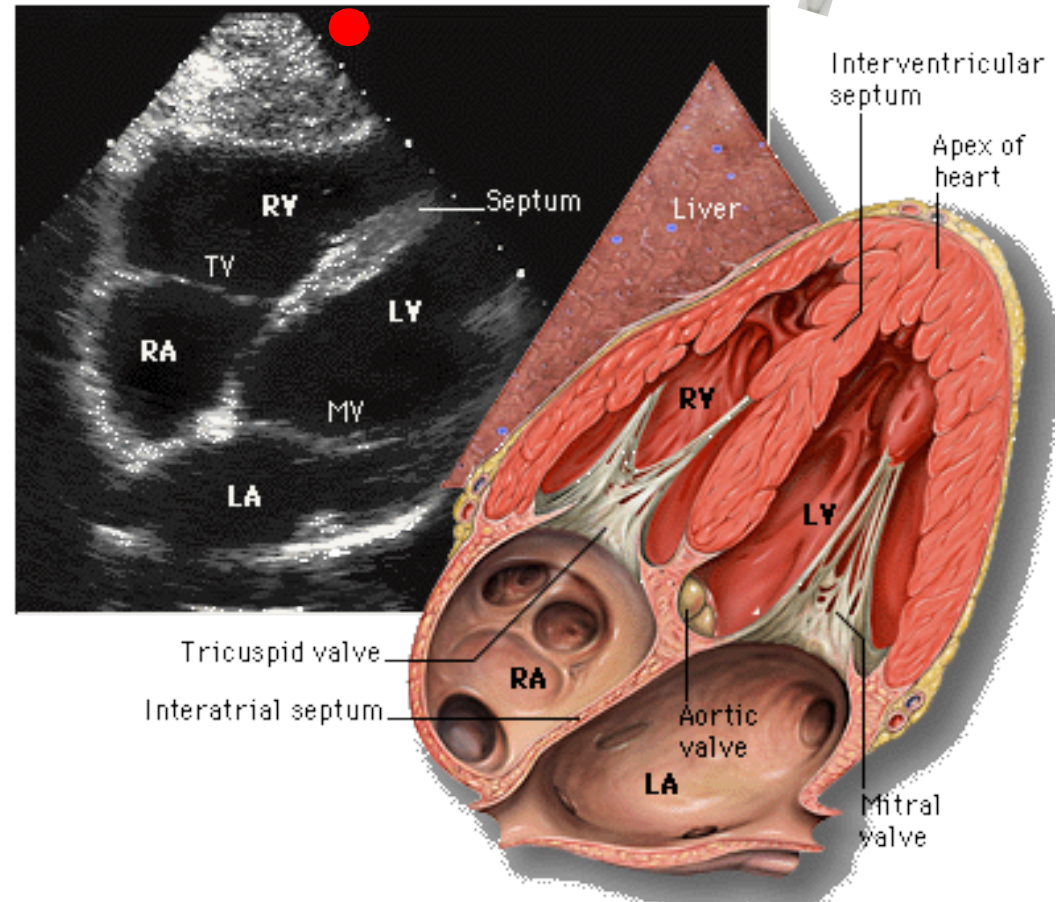
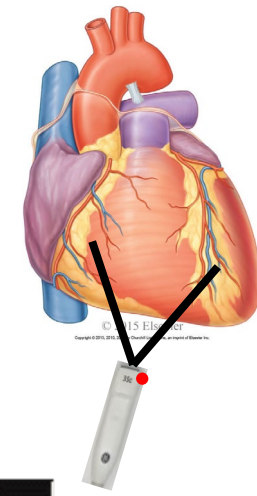
4. Subcostal (Subxiphoid) View

Probe Placement



Hold the probe with an overhand grip, press the probe into the abdomen just inferior to the xiphoid process and angle the probe towards the model's left side with the probe marker toward patient's left hip.

(Different Coronal cut of heart)



Checklists

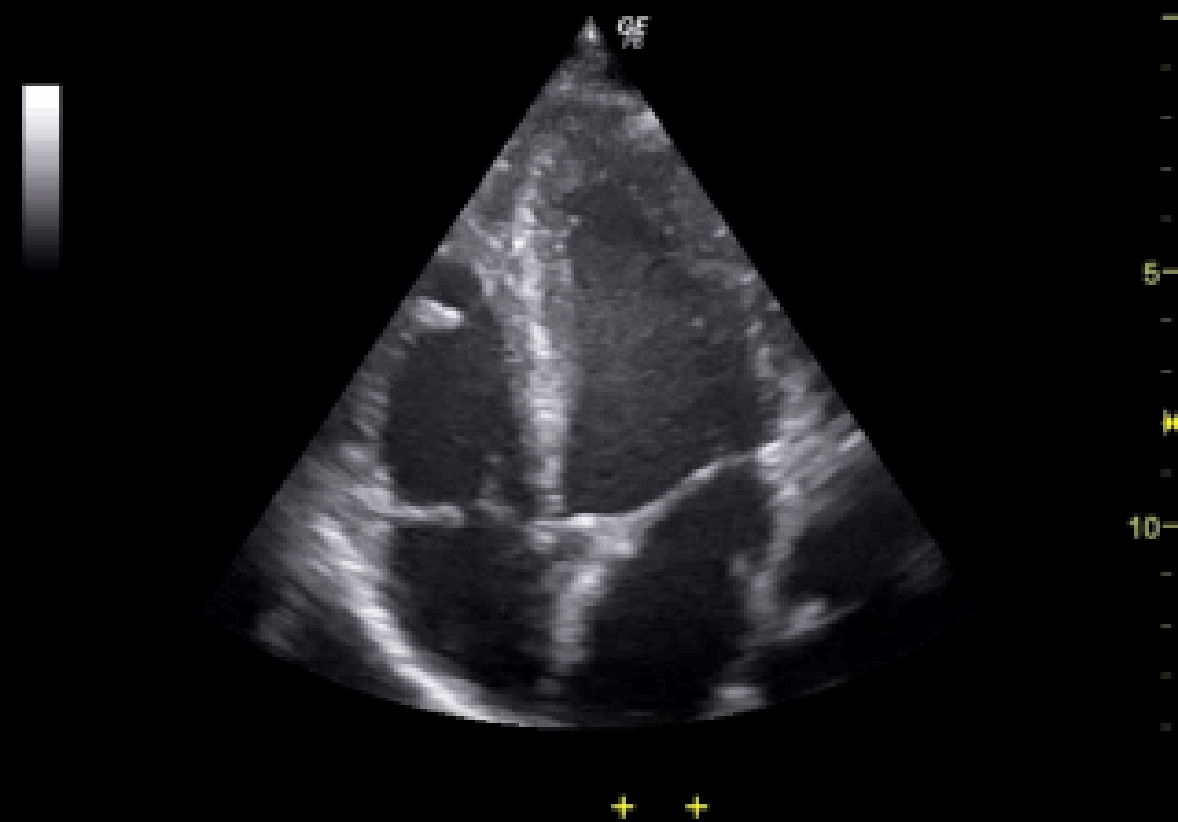
(Soni et al., 2022)

Table 1 Cardiac POCUS checklist for basic competency in image acquisition and anatomy identification

Cardiac parasternal	Cardiac subxiphoid
Selects PHASED-ARRAY transducer	Selects PHASED-ARRAY transducer
Selects CARDIAC EXAM	Selects CARDIAC EXAM
Correct probe LOCATION	Correct Probe LOCATION
Correct probe ORIENTATION	Correct Probe ORIENTATION
Probe CONTROL	Probe CONTROL
Obtains a quality Parasternal Long Axis view <i>(Required structures = RV, LV, LA, AV, MV, LVOT, aortic root, descending thoracic aorta)</i>	Obtains quality subxiphoid 4-chamber VIEW <i>(Required structures = Liver, RV, RA, TV, LV, LA, MV)</i>
Points to RIGHT VENTRICLE	Points to PERICARDIUM
Points to LEFT VENTRICLE	Points to LIVER
Points to LEFT ATRIUM	Points to RIGHT VENTRICLE
Points to AORTIC VALVE	Points to RIGHT ATRIUM
Points to MITRAL VALVE	Points to LEFT VENTRICLE
Points to LEFT VENTRICULAR OUTFLOW TRACK	Points to LEFT ATRIUM
Points to DESCENDING THORACIC AORTA	Points to MITRAL VALVE
Points to PERICARDIUM	Points to TRICUSPID VALVE
Image DEPTH optimized appropriately	Image DEPTH optimized appropriately
Image GAIN optimized appropriately	Image GAIN optimized appropriately
Cardiac apical	Inferior vena cava
Selects PHASED-ARRAY transducer	Selects PHASED-ARRAY or CURVILINEAR transducer
Selects CARDIAC EXAM	Selects CARDIAC or ABDOMINAL EXAM preset
Correct Probe LOCATION	Correct Probe LOCATION
Correct Probe ORIENTATION	Correct Probe ORIENTATION
Probe CONTROL	Probe CONTROL
Obtains a quality 4-chamber cardiac VIEW (a 5-chamber view is acceptable) <i>(Required structures = RV, LV, RA, LA, TV, MV)</i>	Obtains quality IVC VIEW <i>(Required structures = RA, IVC, a hepatic vein, liver)</i>
Points to RIGHT VENTRICLE	Points to LIVER
Points to LEFT VENTRICLE	Points to IVC
Points to RIGHT ATRIUM	Points to HEPATIC VEIN
Points to LEFT ATRIUM	Points to RIGHT ATRIUM
Points to MITRAL VALVE	Points to site to assess for RESPIRATORY VARIATION
Points to TRICUSPID VALVE	–
Image DEPTH optimized appropriately	Image DEPTH optimized appropriately
Image GAIN optimized appropriately	Image GAIN optimized appropriately
Based on the overall performance of this learner through all the views obtained and identification of anatomic structures during this hands-on skills evaluation, do you consider this learner to have the minimum skills to be considered <u>COMPETENT</u> in image acquisition and anatomy identification to perform <u>CARDIAC</u> POCUS exams of patients?	

AV aortic valve, IVC inferior vena cava, LA left atrium, LV left ventricle, LVOT left ventricular outflow tract, MV mitral valve, POCUS point-of-care ultrasound, RA right atrium, RV right ventricle, TV tricuspid valve

Questions?



References:

Soni NJ, Nathanson R, Andreae M, Khosla R, Vadamalai K, Kode K, Boyd JS, Lopresti CM, Resop D, Basrai Z, Williams J, Bales B, Sauthoff H, Wetherbee E, Haro EK, Smith N, Mader MJ, Pugh J, Finley EP, Schott CK. 2022. Development of a multisystem point of care ultrasound skills assessment checklist. *The Ultrasound Journal* 14.

Kirkpatrick JN, Grimm R, Johri AM, Kimura BJ, Kort S, Labovitz AJ, Lanspa M, Phillip S, Raza S, Thorson K, Turner J. 2020. Recommendations for Echocardiography Laboratories Participating in Cardiac Point of Care Cardiac Ultrasound (POCUS) and Critical Care Echocardiography Training: Report from the American Society of Echocardiography. *Journal of the American Society of Echocardiography* 33:409-422.e404.

Mitchell C, Rahko PS, Blauwet LA, Canaday B, Finstuen JA, Foster MC, Horton K, Ogunyankin KO, Palma RA, Velazquez EJ. 2019. Guidelines for Performing a Comprehensive Transthoracic Echocardiographic Examination in Adults: Recommendations from the American Society of Echocardiography. *Journal of the American Society of Echocardiography* 32:1-64.

Where to Learn More:

Organizations:

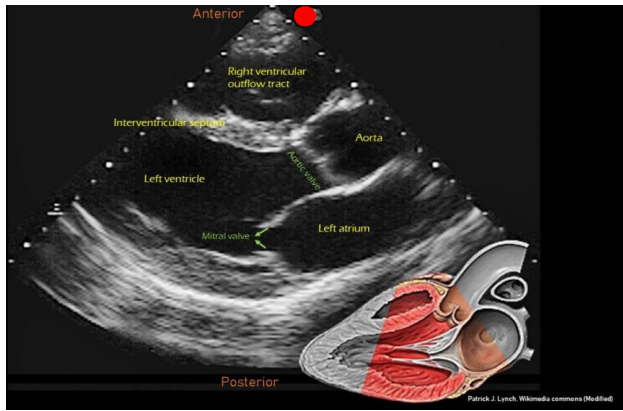
- <https://www.asecho.org/> American Society of Echocardiography
- <https://www.aium.org/> The Association for Medical Ultrasound
- <https://www.susme.org/> Society for Ultrasound in Medical Education

Conferences:

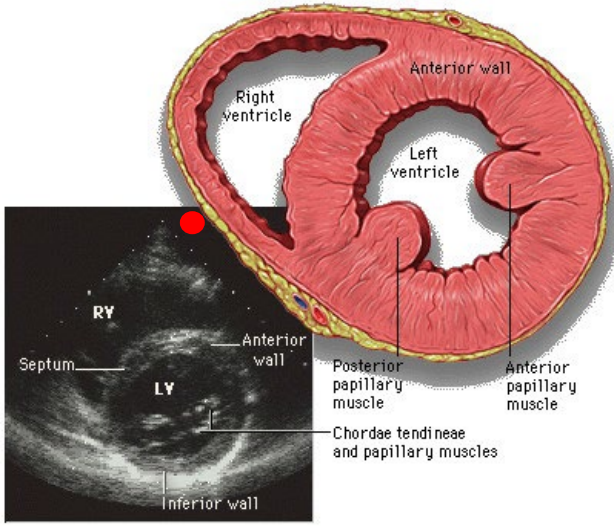
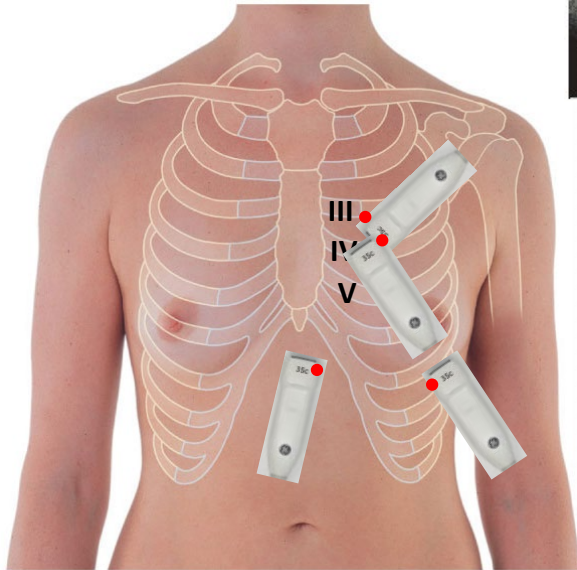
- <https://www.wcume2023.org/> World Congress of Ultrasound in Medical Education

Journals:

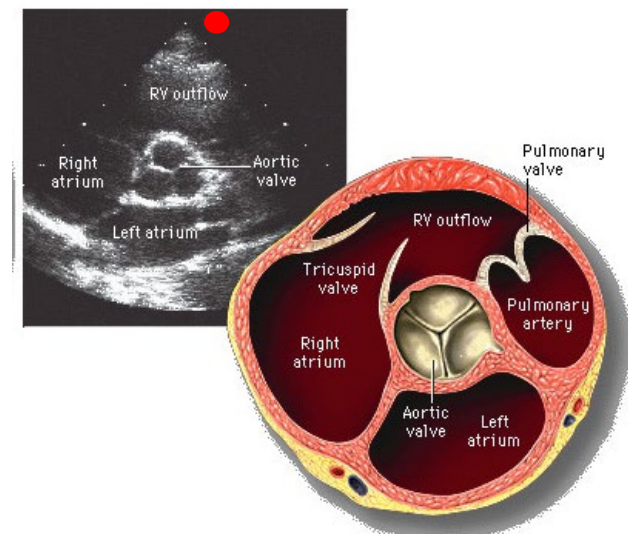
Journal of Ultrasound in Medicine



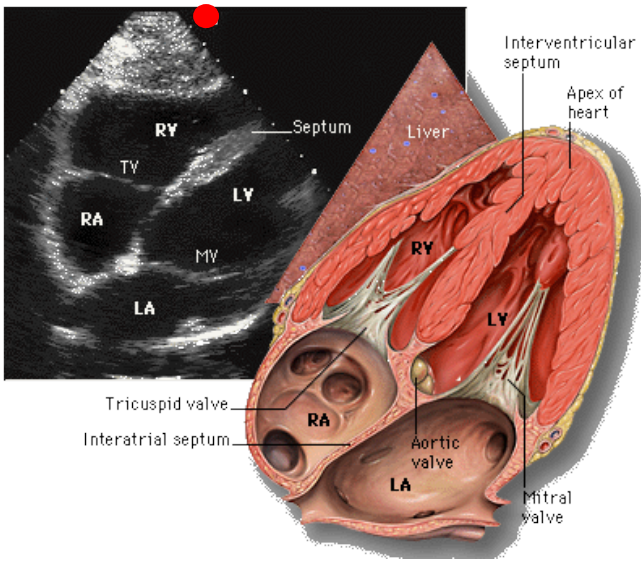
Position the probe toward the left of the sternum in the space between ribs 3 and 4 or 4 and 5 with the probe marker toward the model's right shoulder.
(Midsagittal cut of heart)



From PLAX probe position, rotate the probe 90 degrees clockwise so that the probe marker is pointed toward the patient's left shoulder.
(Transverse cut of heart)



Tilt or slide toward great vessels of heart to view a more superior PSAX view.
(Transverse cut of heart)



Hold the probe with an overhand grip, press the probe into the abdomen just inferior to the xiphoid process and angle the probe towards the model's left side with the probe marker toward patient's left hip.
(Different Coronal cut of heart)

Move probe just inferior to nipple (T4), or breast tissue if present, in the 5th intercostal space with probe marker pointed toward patient's right side.
(Coronal cut of heart)

