Caption Health

Caption Guidance™ Training Handbook

Introduction

This training guide is intended for clinicians learning to scan 2D cardiac ultrasound views using Caption Guidance™ technology. It is intended to supplement a hands-on scanning curriculum.

After completing training, users will:

- Gain a foundation of basic ultrasound principles

- Learn proper ergonomics and probe grip for safe scanning

- Understand how to maneuver the probe specific to prescriptive guidance

- Create a study and effectively scan using software guidance features

- Have the knowledge to prompt breathing and rolling techniques when needed

- Gain an introduction to cardiac anatomy for the system's 10 2D echo view protocol
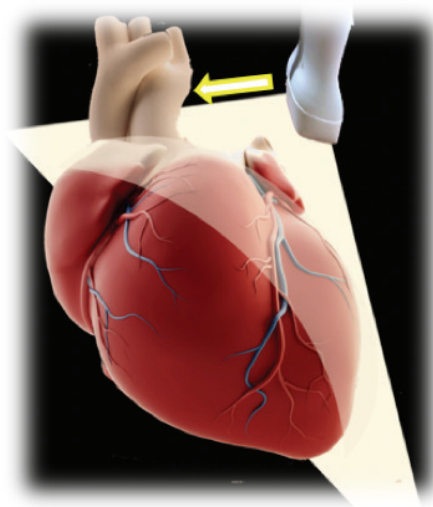
MODULE #1

Ultrasound Basics

Objectives:

- Basic understanding of how an ultrasound image is generated

- Describe techniques to avoid air and bone

- Learn proper probe grip
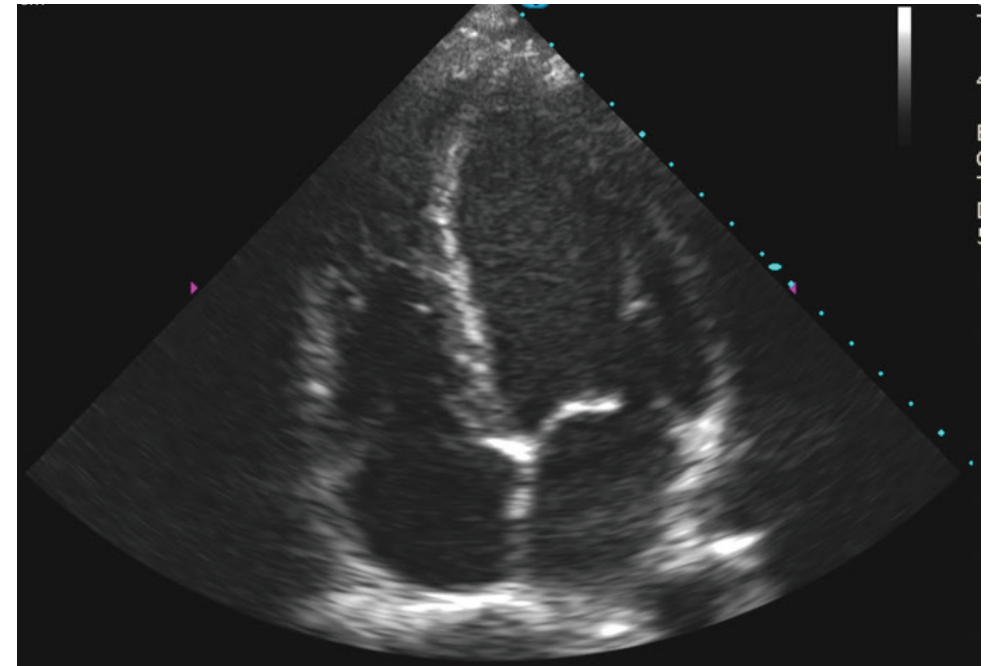
- Demonstrate probe movements

Ultrasound Basics

Ultrasound waves are sent and received by the probe in a fan shape to produce an image.

Think of the **probe like a flashlight** (point the beam towards what you want to see!)

Unlike a flashlight, the ultrasound beam is a paper thin 2D slice emitted in the direction of the grey indicator notch

- Blood is shown as a black pool
- Tissue like the walls of the heart and the moving valves are the bright reflectors

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Ultrasound Basics

- The ultrasound probe needs to be in direct contact with the body without any air in between

- The ultrasound gel provides that direct contact

- Put ultrasound gel on the face of the probe

- If the movement on the patient's skin is not smooth, you may need to apply more gel

- **When all else fails - add more gel!**

- Start every study by asking the patient to **roll on their left side,** with left arm up and right arm down by their side. This rolls the heart away from the lungs.

- **Right-handed scanners:** Ask patient to slide to the far end of bed so you have space to sit, rest your elbow and forearm on patient.

- **Left-handed scanners:** Ask patient to slide close to you so you don't have to extend your scanning arm. Support the elbow and brace the forearm with a pillow.
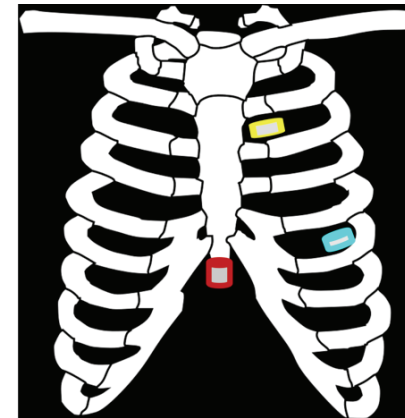
Ultrasound Basics

To image the heart, the ultrasound beams from the probe must be **aimed between rib spaces** in the thorax.

Base of heart

Apex of heart
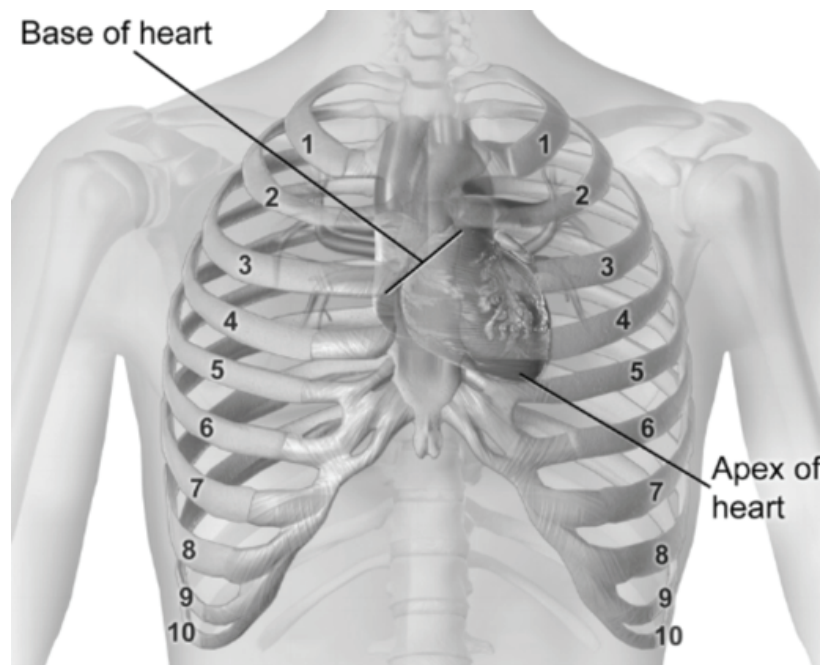
TIP: Try tugging (not sliding) on the skin to find a good view between rib spaces.

You will be learning to scan views within these 3 windows:

1. Parasternal window

2. Apical window

3. Subcostal window

- Hold the probe with your dominant hand like a pencil, with thumb on one side and second/middle fingers together

- Hold the probe close to the face and rest the heel of your hand and little finger on patient to allow comfortable rotation and fine movements of the probe

- Fine motion is done with fingers not hand or wrist

Ultrasound Basics

CORRECT
Fine movement in fingers

INCORRECT

Ultrasound Basics

As we progress into learning how to drive the probe to direct the beam, many angling maneuvers will be in relation to the tail.

The ultrasound beam is emitted from the probe's red face which contain elements. Aim the beam (lens) towards what you want to see.

The ultrasound probe has a "tail" which is connected to the ultrasound machine. To aim the beam one direction, aim the tail the opposite.
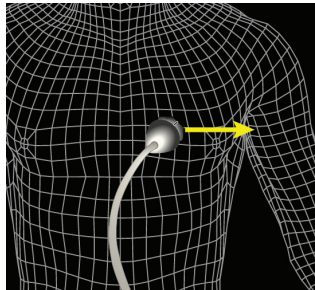
(Ex: Aim up, tail down)

Probe Movements
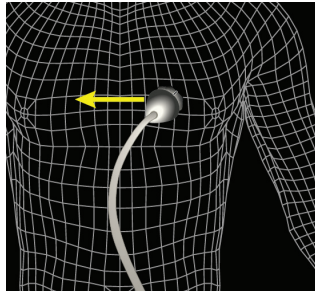
SLIDE MEDIAL

Move probe along rib space towards the patient's midline (right side)

SLIDE LATERAL

Move probe along rib space, towards patient's left side
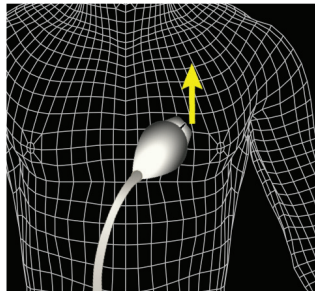
SLIDE UP

Move probe up towards patient's head
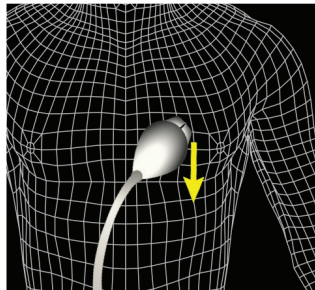
SLIDE DOWN

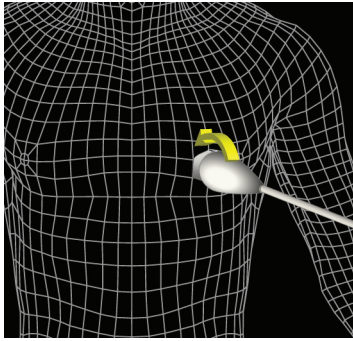Move probe down towards patient's feet
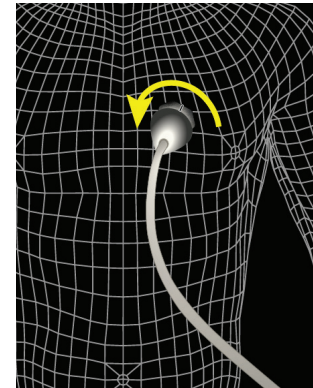
ROTATE COUNTER-CLOCKWISE

Rotate the probe counter-clockwise while maintaining the spot on the patient's chest
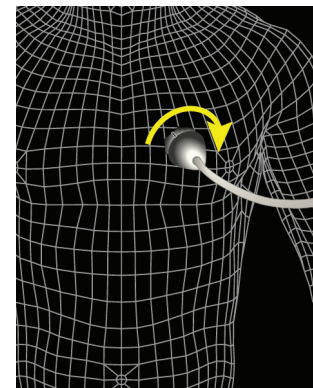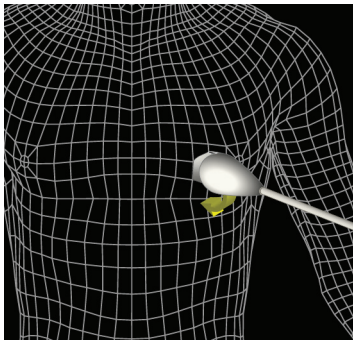
ROTATE CLOCKWISE

Rotate probe clockwise while maintaining the spot on the patient's chest

Remember guidance direction is in relation to the patient, not in relation to you!
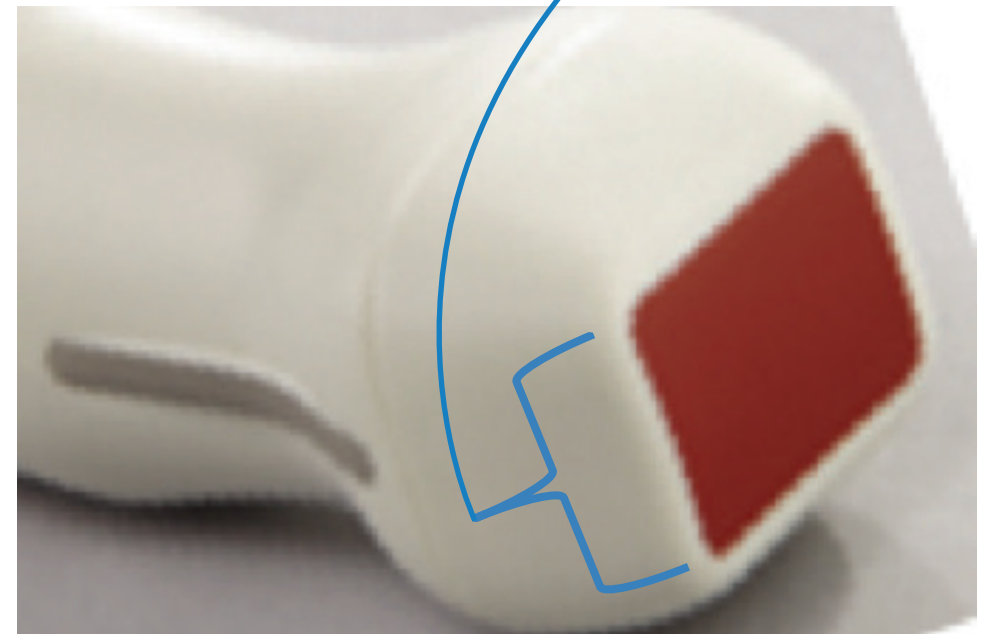
ROCK TOWARDS INDICATOR

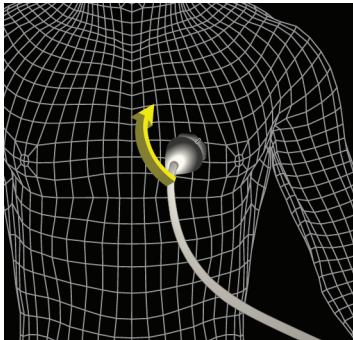Along the indicator axis

ROCK AWAY FROM INDICATOR

Along the indicator axis

Rocking refers to adjustments along the short axis of the rectangular probe face (the indicator axis)
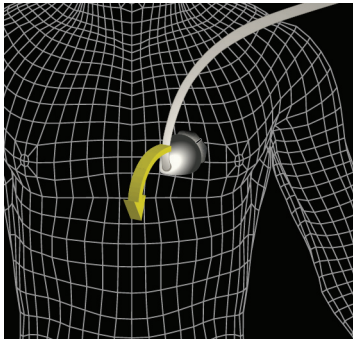

Remember guidance direction is in relation to the patient, not in relation to you!
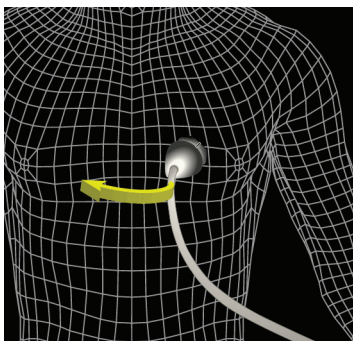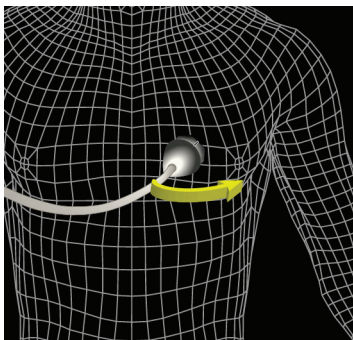
TAIL UP

Adjust tail up towards patient's head

TAIL DOWN

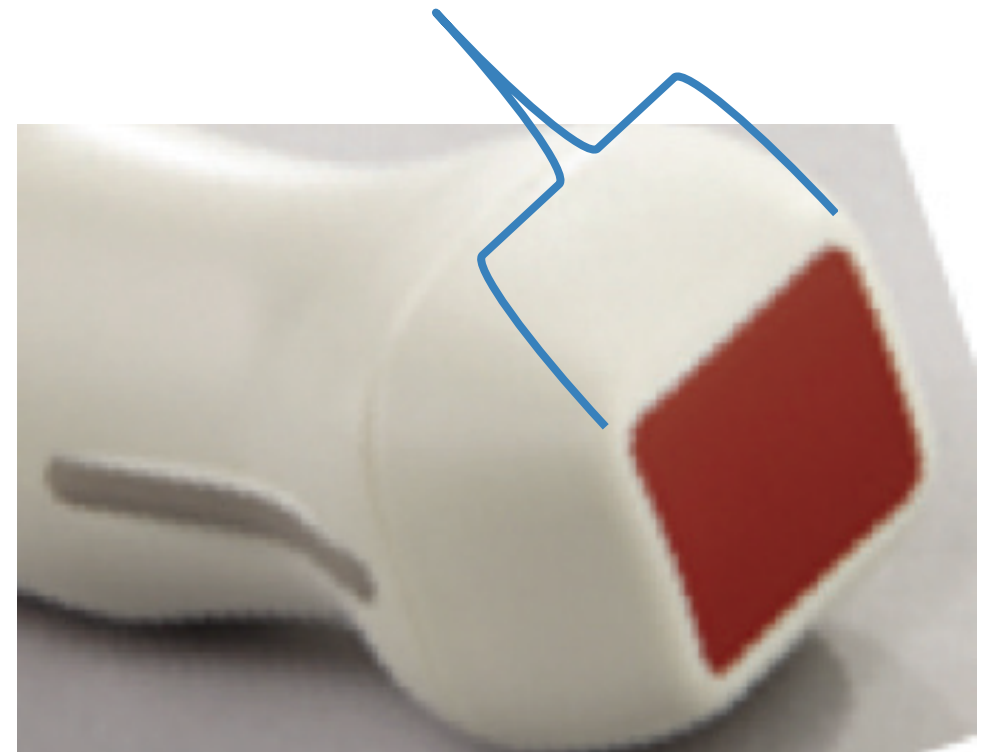Adjust tail down towards patient's feet

TAIL MEDIAL

Adjust tail more medial towards sternum (patient's ride side)

TAIL LATERAL

Adjust tail more lateral towards patient's left side

Tailing refers to adjustments along the long axis of the rectangular probe face (the non-indicator axis)
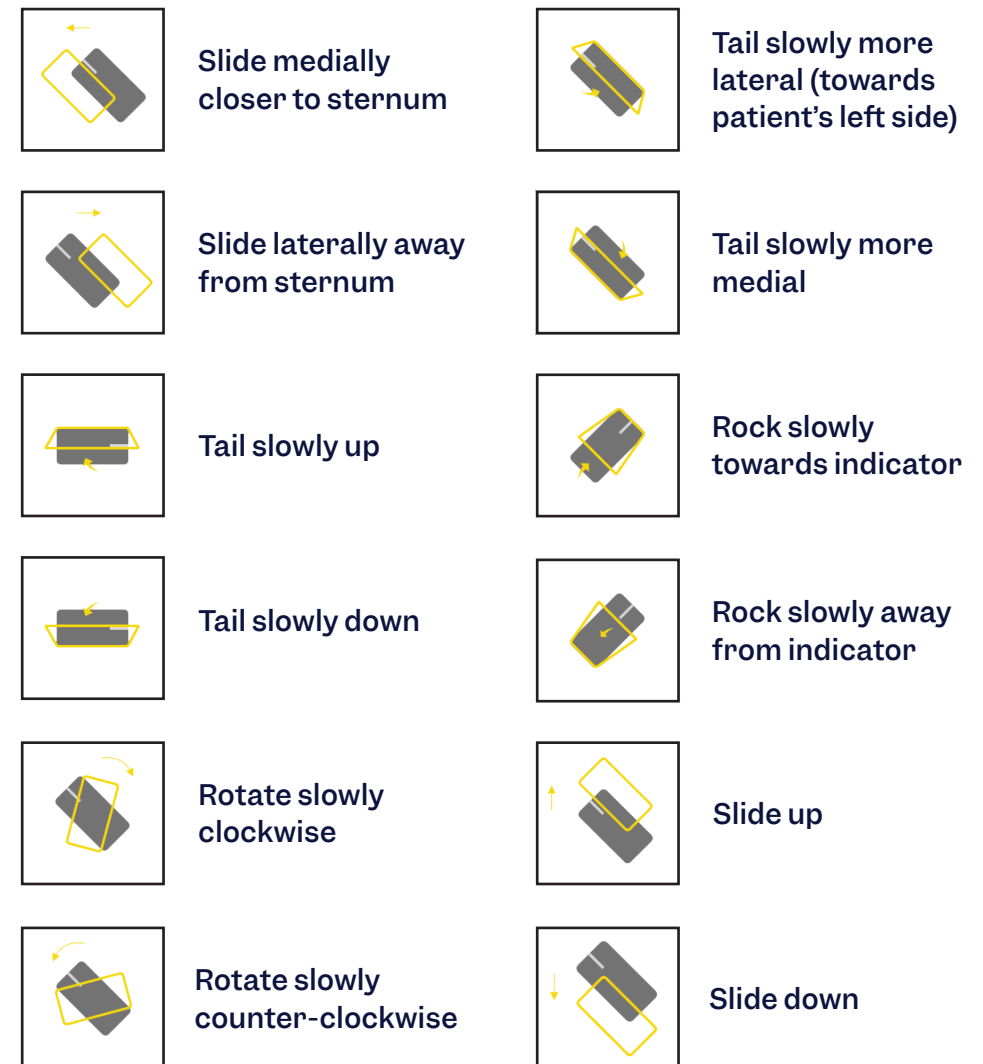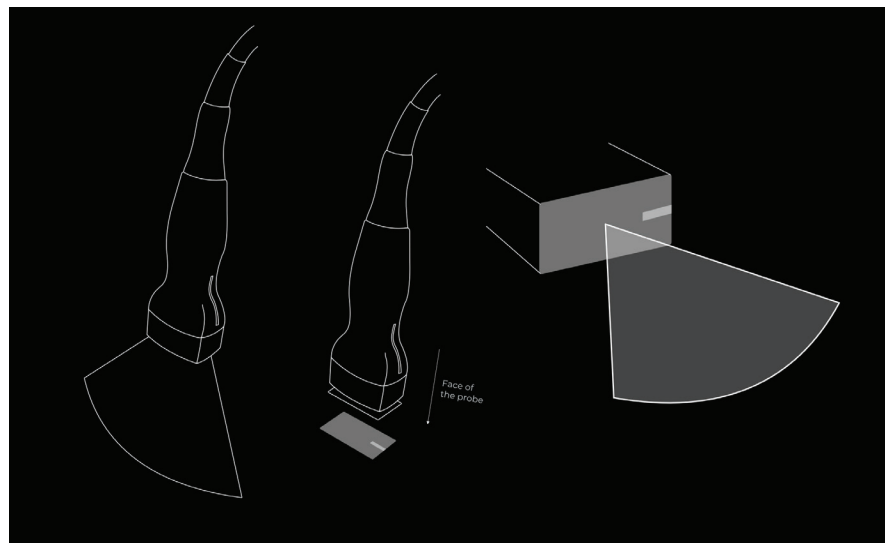

Remember guidance direction is in relation to the patient, not in relation to you!

Test for Understanding

Use a probe and practice what these movements would look like on a manikin or on yourself.

 Slide medially closer to sternum

 Slide laterally away from sternum

 Tail slowly up

 Tail slowly down

 Rotate slowly clockwise

 Rotate slowly counter-clockwise

 Tail slowly more lateral (towards patient's left side)

 Tail slowly more medial

 Rock slowly towards indicator

 Rock slowly away from indicator

 Slide up

 Slide down

MODULE #2

System Guidance

Objectives:

- Describe how to use static system guidance for orientation before scanning

- Be able to effectively use real-time continuous system guidance while scanning

# 3 Steps for Image Acquisition

Caption Guidance provides

|	
Indicator orientation **Chest Window** **Patient Position**	✅
Meter guidance **Prescriptive Guidance**	✅
Remember DRAB!	❌

STEP 1: Orientation

The diagram on the right demonstrates appropriate indicator (grey notch on probe) and Chest Window Orientation for each view. The yellow text at the top of the screen tells you how to have the patient positioned.
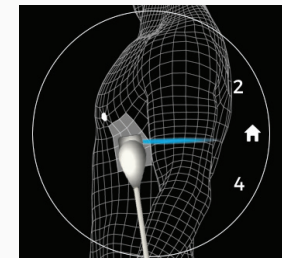
STEP 2: Find the Image

The meter will provide hot/cold guidance to the ideal image-plant your wrist once it reaches 40-50%! The prescriptive guidance will suggest movements to try. Make SLOW movements to effectively use these real time guidance features.
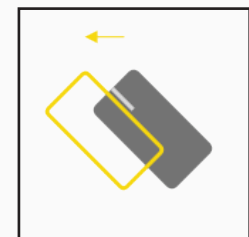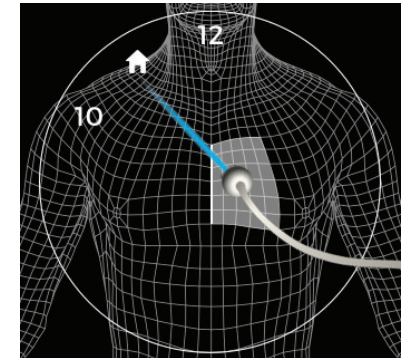
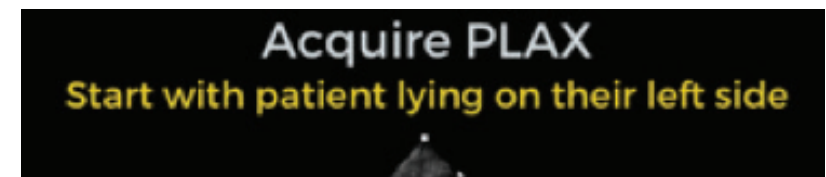**STEP 3:** Optimize the image from "DRAB" to Fab

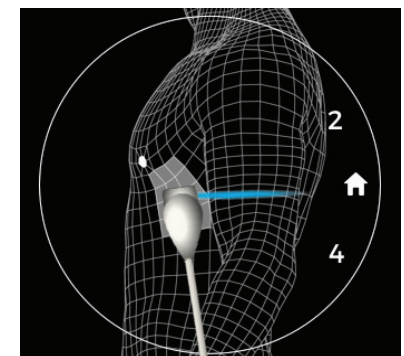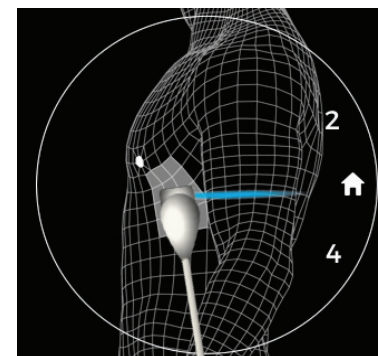# Step 1: Orientation

INDICATOR (GREY NOTCH) ORIENTATION:

The system will provide you with rotation guidance for where indicator direction should be for each view

PATIENT ORIENTATION:

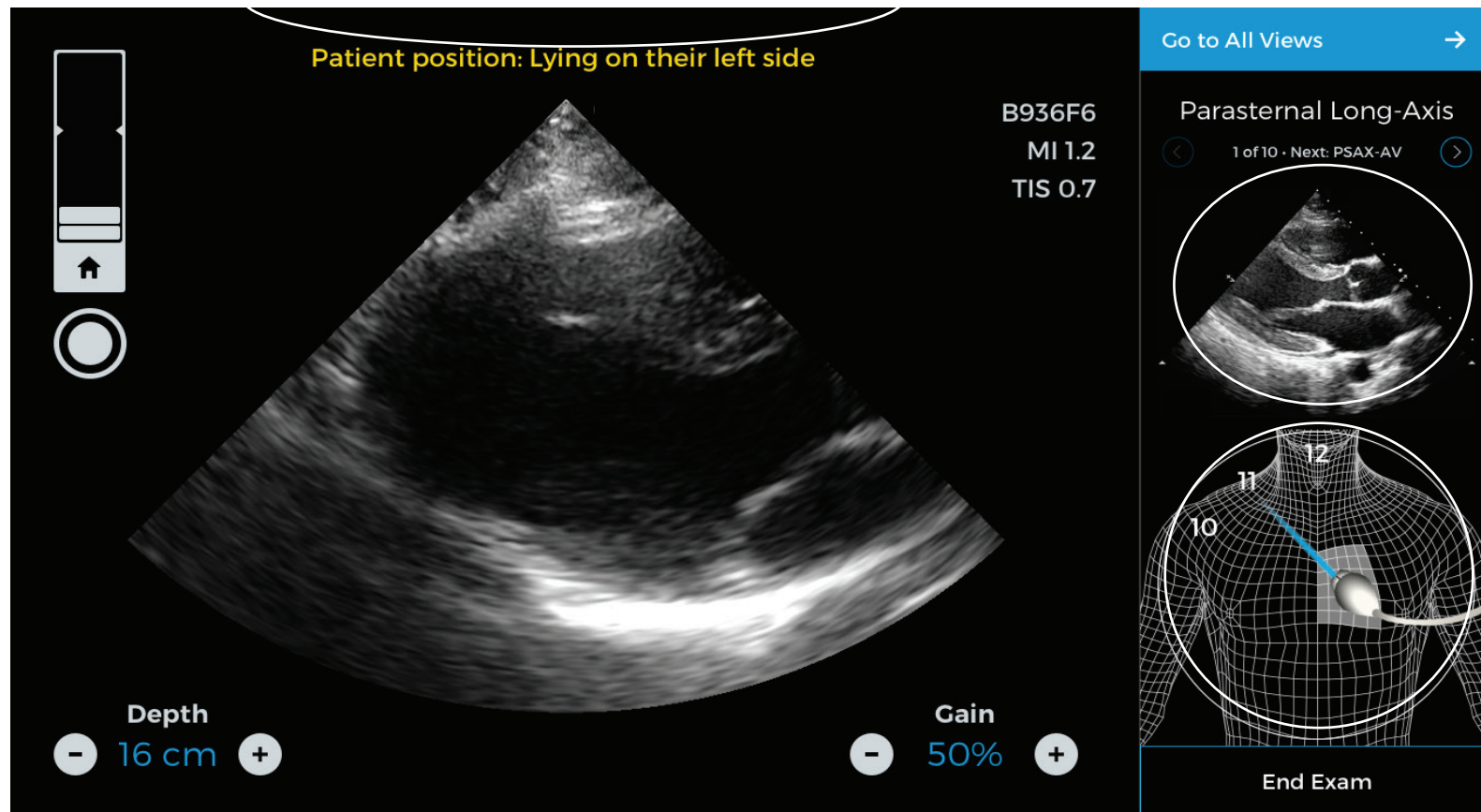System reminds you how patient should be lying

CHEST WINDOW:

System will orient you to the location on the chest to direct you to view window

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Step 1: Orientation

A yellow prompt will appear at the beginning of each new window describing patient position

The reference image in the top right is the ideal appearance of the view you're acquiring.

The diagram shows the o'clock range that the probe indicator points for the view your scanning. The highlighted region on the diagram is where you want to get the view you're looking for.

Review

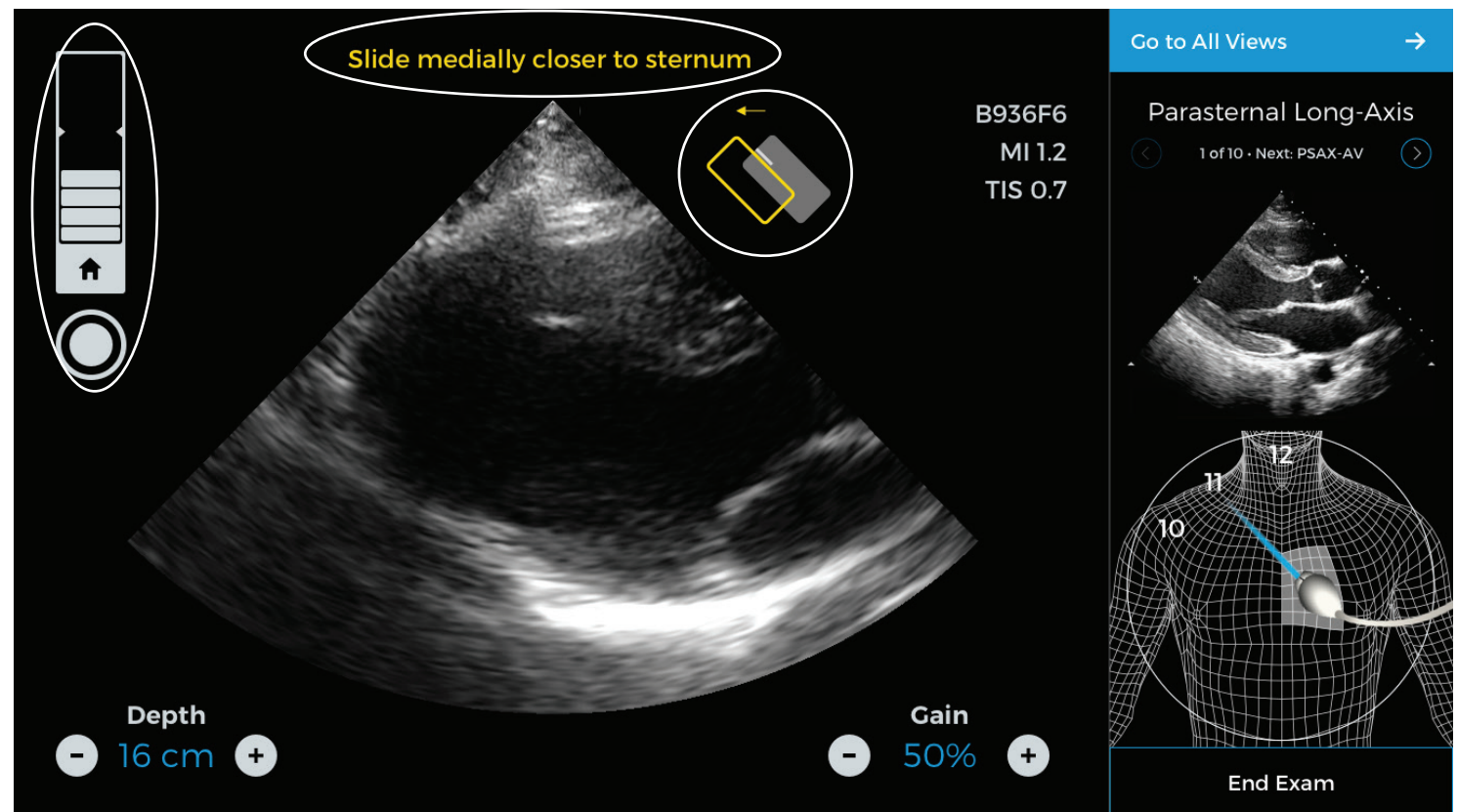Let's review the following steps to take before scanning each view:

1. A yellow prompt will appear at the top of the ultrasound image describing the correct patient positioning for that view - adjust the patient based on that prompt

2. Look at diagram's grey highlighted area of chest to determine where on the patient's body to search to find that view

3. Look at the diagram's o'clock arrows to determine where their indicator should be pointing for that view. Start with the indicator in the direction of the blue arrow. Since all hearts are different you may explore slight rotations of the indicator, but do not rotate beyond the diagrams o'clock range

4. Then look at the ideal image to see what image you are trying to get

Step 2: Find the Image

The prescriptive text/icons guide you to make fine adjustments needed to achieve ideal view. This is updated in real-time as you slowly scan. Follow until guidance disappears.

The guidance meter also provides real-time feedback as to whether you're getting warmer (meter up) or colder (meter down) to the ideal image.

Slide medially closer to sternum

B936F6
MI 1.2
TIS 0.7

Go to All Views →

Parasternal Long-Axis

1 of 10 · Next: PSAX-AV

End Exam

Depth
16 cm

Gain
50%

Step 2: Find the Image

- **SLOW, FINE MOVEMENTS** to effectively use metered guidance as well as text prescriptive guidance

- If movements are too broad, you won't understand which movements are making the meter hotter or cooler

- When prescriptive text guidance appears, slowly perform that movement until the text disappears (if done correctly, this should correspond to improved guidance meter)

- **NOTE:** Often the finest movements can make meter go from 25%-75%
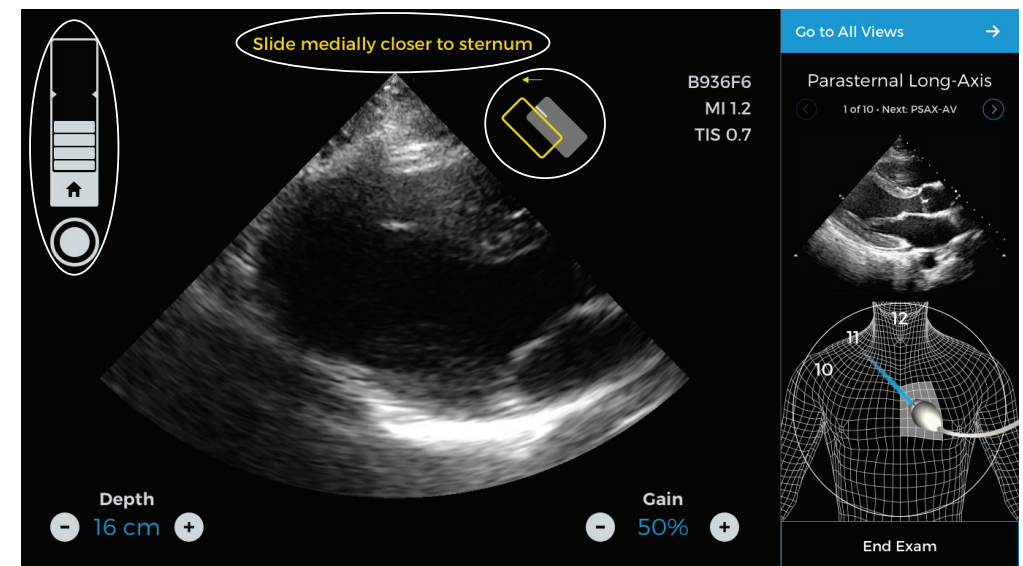
MODULE #3
Image
Optimization

Objectives:

- Be able to remember how and when to use "DRAB"

- Understand how to monitor and adjust Depth, Rolling, Angling and Breathing for fine tune image optimization

Image Optimization

Caption Guidance provides

Indicator orientation Chest Window Patient Position	✅
Meter guidance Prescriptive Guidance	✅
Remember DRAB!	❌

STEP 1: Orientation

STEP 2: Find the image

STEP 3: Optimize the image from "DRAB" to Fab!

Does the image have correct Depth? Did you try Rolling the patient? Are you Aiming the probe correctly? Did you try patient Breathing?

Optimize the Image, <u>DRAB</u> to Fab

"D" DEPTH -

Does it match reference image depth?

"R" ROLL -

Try rolling patient towards and away from you

"A" ANGLE -

Probe angled between rib spaces? Aimed at the heart?

"B" BREATHING -

Get comfortable guiding patient to control respiration

When you can see the heart and need to optimize the image, think about why it may be looking "D.R.A.B" to remember tricks to make it "fab"!

DRAB to Fab

Depth

Rolling

Angle

Breathing

DEPTH:

Does your depth match the reference image?

Use the reference image on the system and compare it to your picture. As an example, what adjustment needs to be made to the picture on the left when comparing it to the AP4 reference image on the right? Depth!
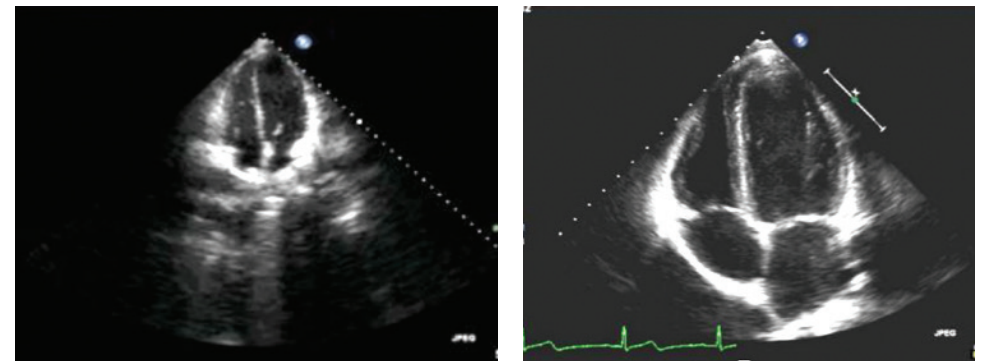
TIP: Look for empty white space under the black blood filled chambers.

DRAB to Fab

Depth

Rolling

Angle

Breathing

DEPTH:

Pay attention to the system when it gives you prescriptive guidance about adjusting depth.
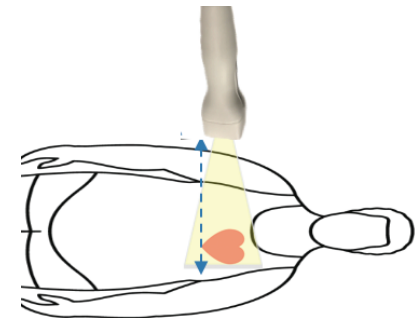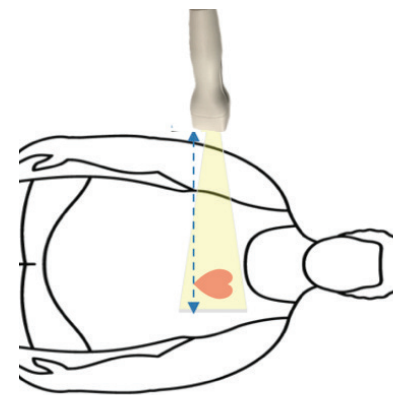
HINT: Larger sized patients need more depth

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DRAB to Fab

Depth

Rolling

Angle

Breathing
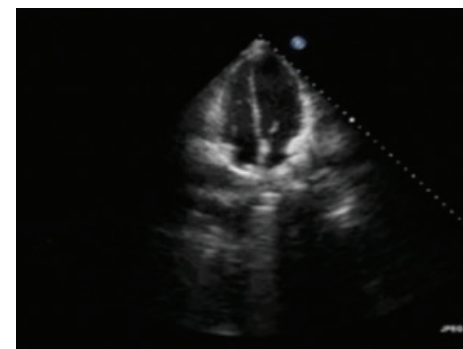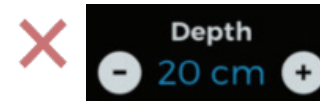
Too Deep
Decrease Depth
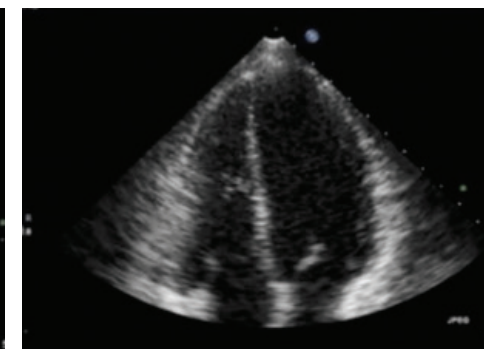
Too Shallow
Increase Depth
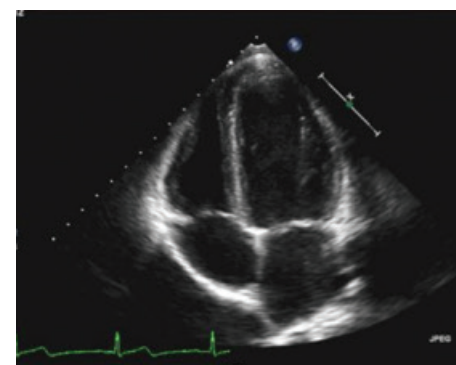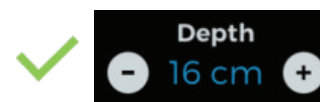
Just Right!

Optimize the Image, <u>DRAB</u> to Fab

When you can see the heart and need to optimize the image, think about why it may be looking "D.R.A.B" to remember tricks to make it "fab"!

"D" DEPTH -

Does it match reference image depth?

"R" ROLL -

Try rolling patient towards and away from you

"A" ANGLE -

Probe angled between rib spaces? Aimed at the heart?

"B" BREATHING -

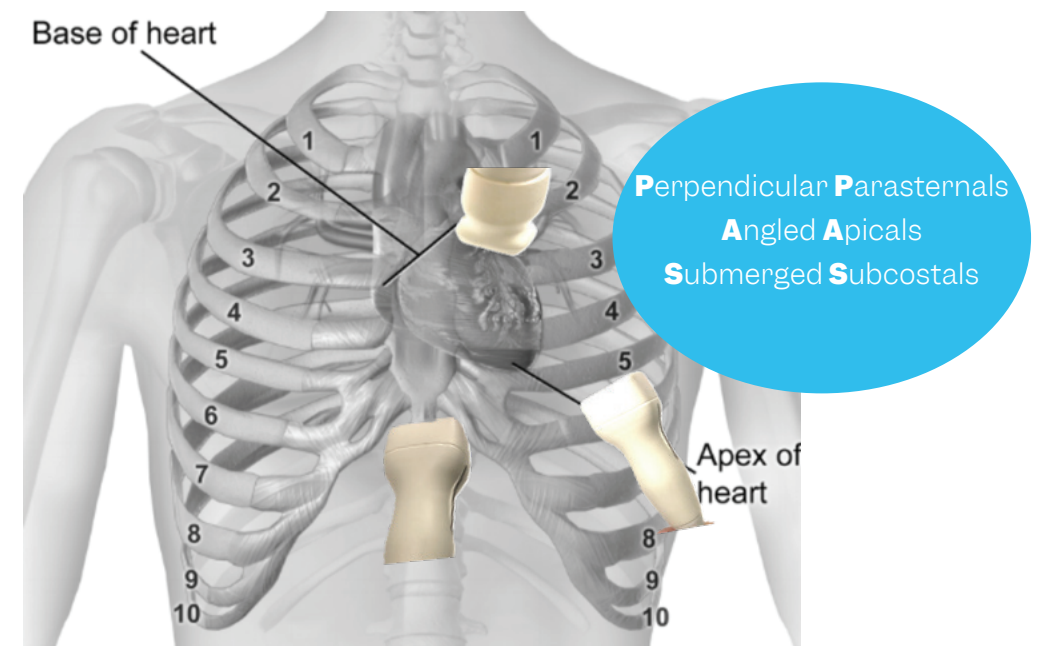Get comfortable guiding patient to control respiration

DRAB to Fab

Depth

Rolling

Angle

Breathing

ROLLING:

Have you tried rolling the patient?

Generally you want the patient rolled all the way on their left for the first window, slightly less so for the apical window, and on their backs for the last window

TIP: All hearts sit differently so remember to play with position throughout the exam, "roll more onto your left side" or "roll slightly more on your back" (return to starting position if a better image is not produced)

Optimize the Image, <u>DRAB</u> to Fab

When you can see the heart and need to optimize the image, think about why it may be looking "D.R.A.B" to remember tricks to make it "fab"!

"D" DEPTH -

Does it match reference image depth?

"R" ROLL -

Try rolling patient towards and away from you

"A" ANGLE -

Probe angled between rib spaces? Aimed at the heart?

"B" BREATHING -

Get comfortable guiding patient to control respiration

DRAB to Fab

Depth

Rolling

Angle

Breathing

'A' PROBE ANGLE

Is your probe angled between rib spaces and aimed at the heart?

Base of heart

Perpendicular **P**arasternals
Angled **A**picals
Submerged **S**ubcostals

Apex of heart

TIP: Remember tugging (not sliding) on the skin to find a good view between rib spaces

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Optimize the Image, <u>DRAB</u> to Fab

"D" DEPTH -

Does it match reference image depth?

"R" ROLL -

Try rolling patient towards and away from you

"A" ANGLE -

Probe angled between rib spaces? Aimed at the heart?

When you can see the heart and need to optimize the image, think about why it may be looking "D.R.A.B" to remember tricks to make it "fab"!

"B" BREATHING -

Get comfortable guiding patient to control respiration

DRAB to Fab

Depth

Rolling

Angle

Breathing

'B' PATIENT BREATHING

Respiration controls air from lungs

- **Parasternal window:** Gentle exhale and hold air out or maintain shallow breaths

- **Apical window:** Deep breath in and slowly breathe out — watch guidance meter — repeat and "hold your breath there as long as you can"

- **Subcostals:** Deep breath in and hold
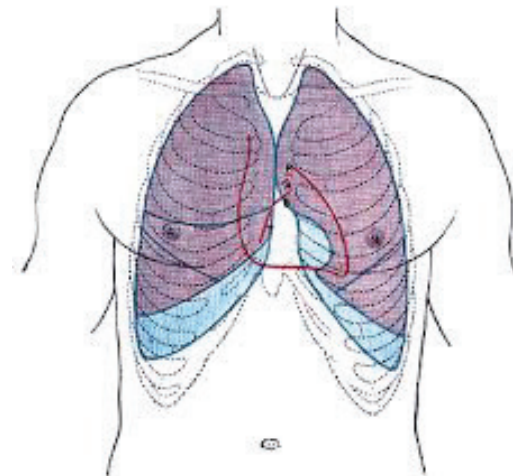
TIP: While the above are general guidelines, best practice is to test how respiration effects the guidance meter on (at least) the first view in each window

Test for Understanding

Practice scanning the three home views using DRAB techniques.

What does DRAB stand for?

MODULE #4

10 Views

Objectives:

- From the 3 home views you now know, demonstrate ability to scan all other views (10 views total)

Acquiring 10 Views
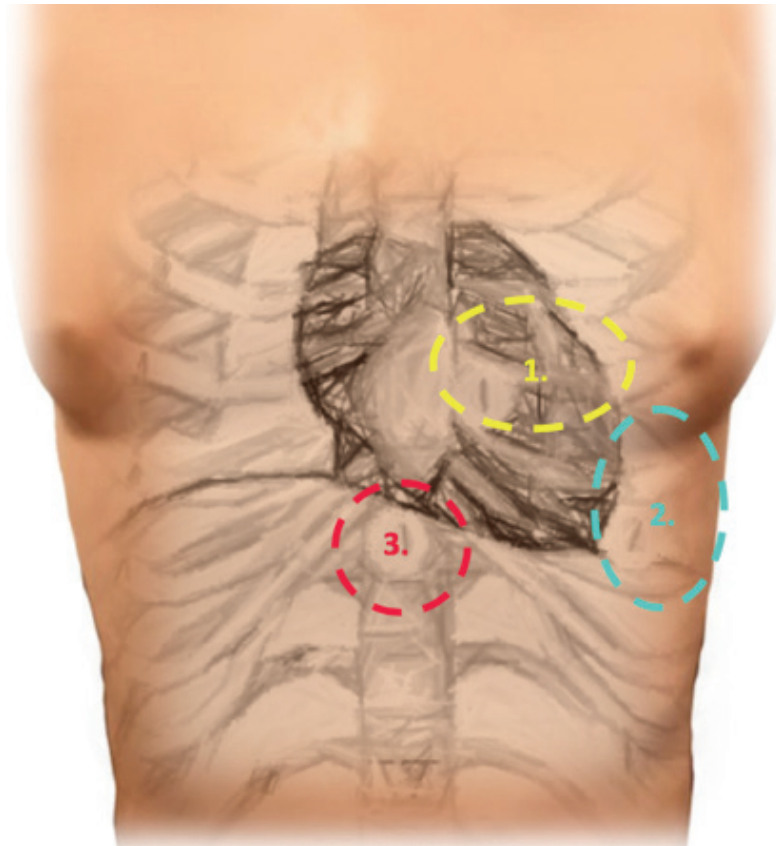
You will be scanning TEN total views from THREE windows:
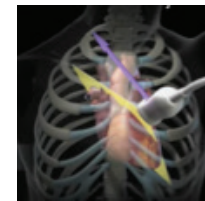
PARASTERNAL (WINDOW #1)

1. PLAX: Parasternal Long Axis 🏠
2. PSAX: Parasternal Short Axis-Aorta
3. PSAX: Parasternal Short Axis-Mitral
4. PSAX: Parasternal Short Axis-Pap Muscles
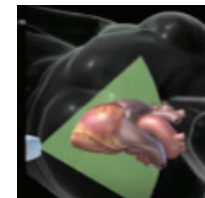
APICAL (WINDOW #2)

5. Apical 4 Chamber 🏠
6. Apical 5 Chamber
7. Apical 2 Chamber
8. Apical 3 (Long)
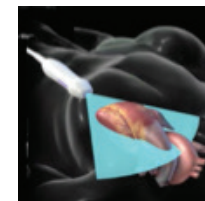
SUBCOSTAL (WINDOW #3)

9. Subcostal 4 🏠
10. IVC at Subcostal

Anatomy of Parasternal Long Axis (PLAX)

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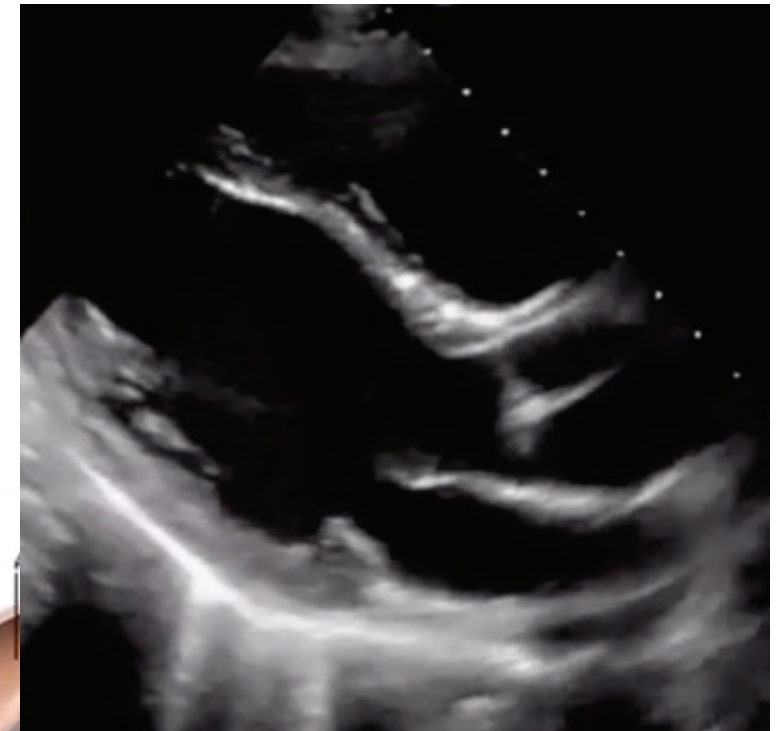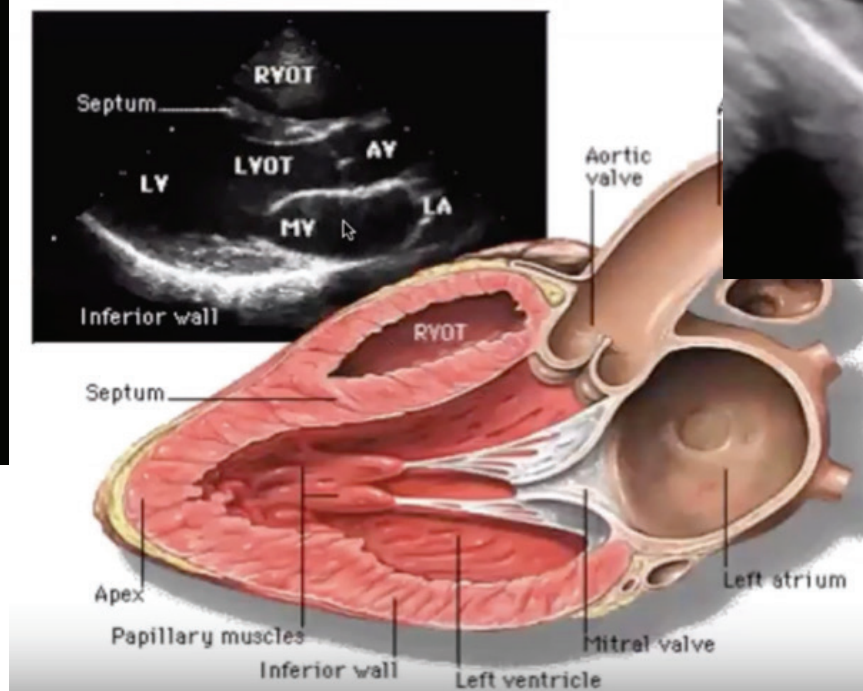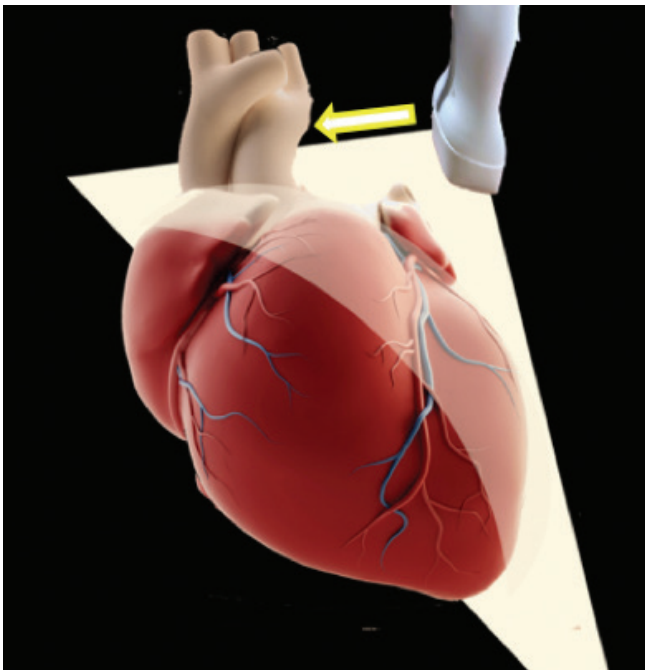
Parasternal Short Axis (PSAX) Views
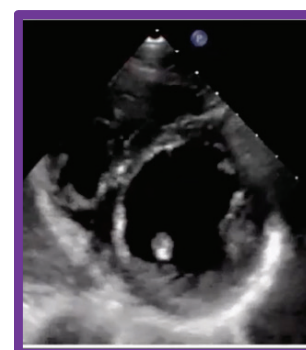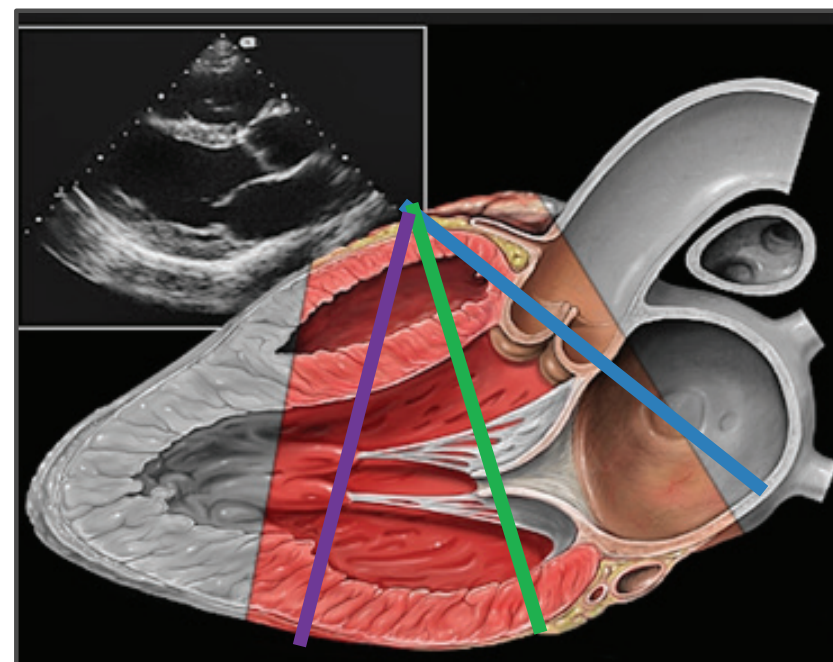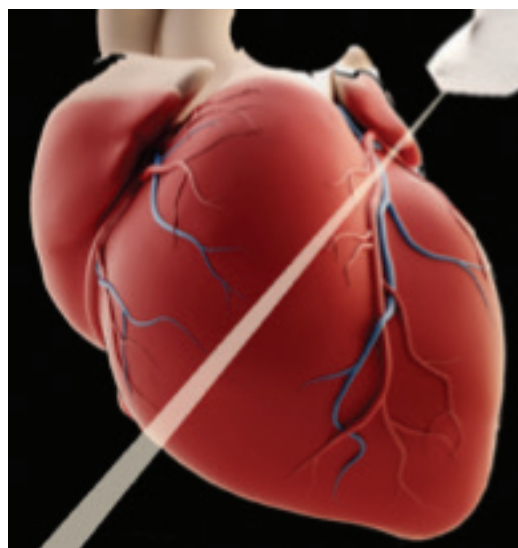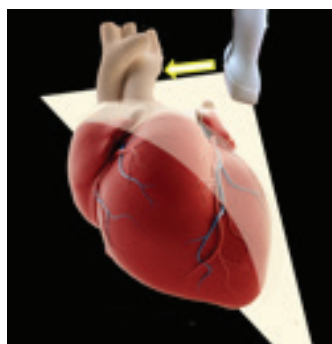
PSAX-PM   PSAX-MV   PSAX-AV
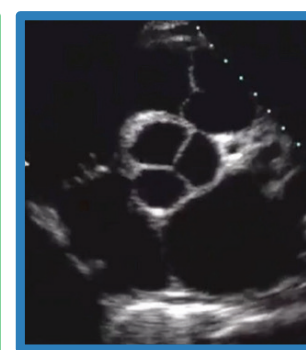
Window #2: Apicals

APICAL
(WINDOW #2)

1. PLAX: Parasternal Long Axis

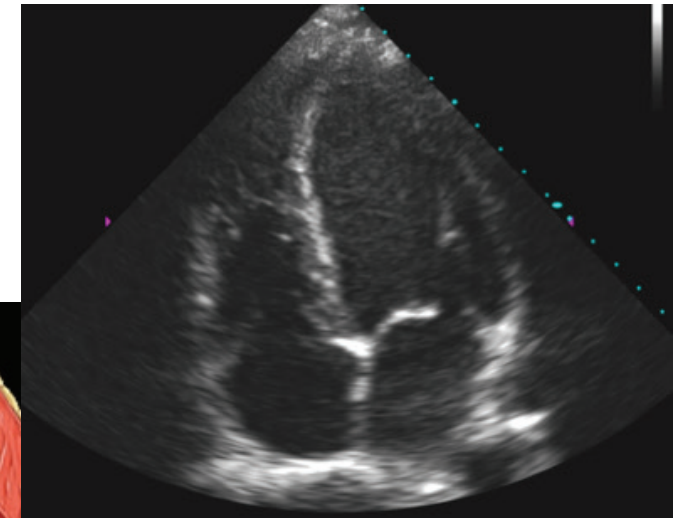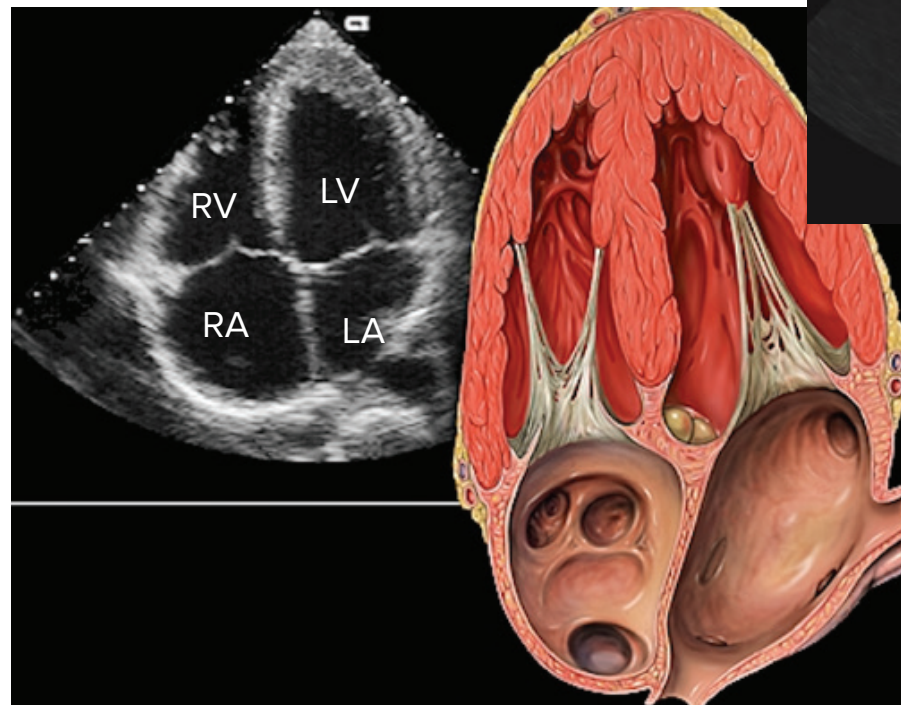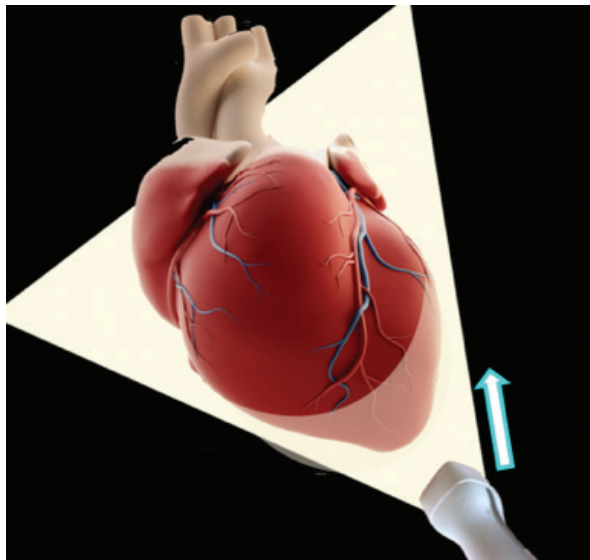2. **PSAX: Parasternal Short Axis-Aorta**

3. PSAX: Parasternal Short
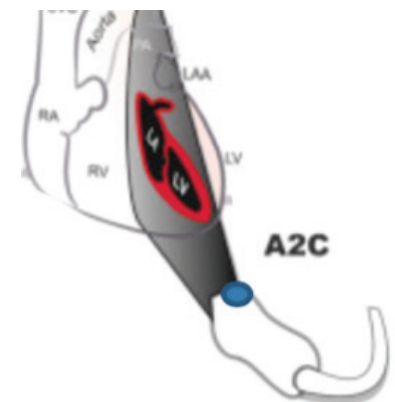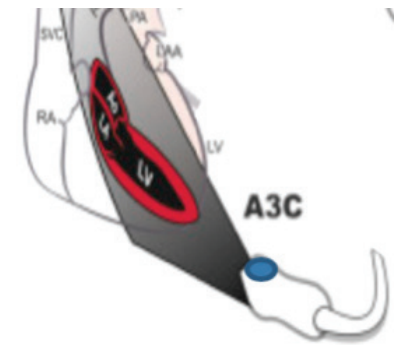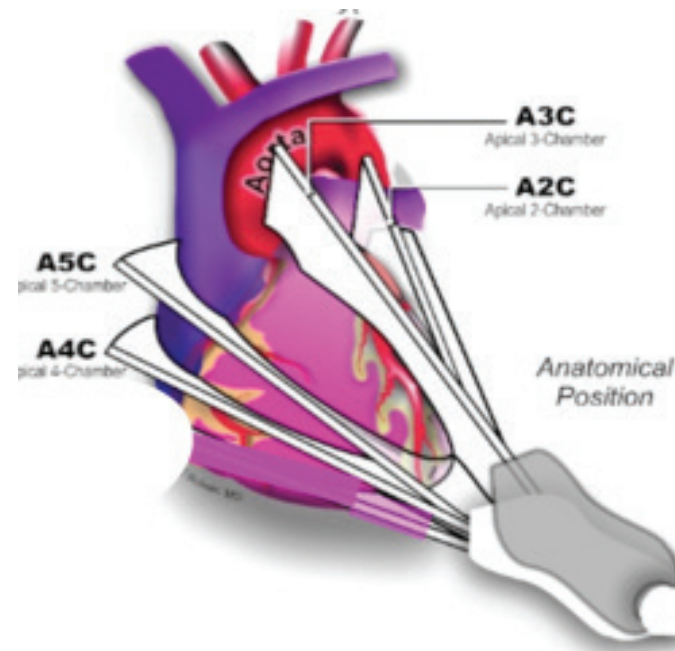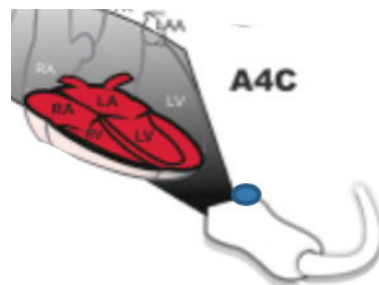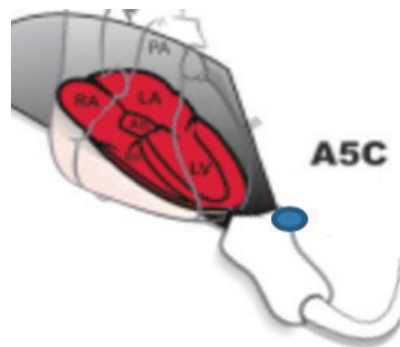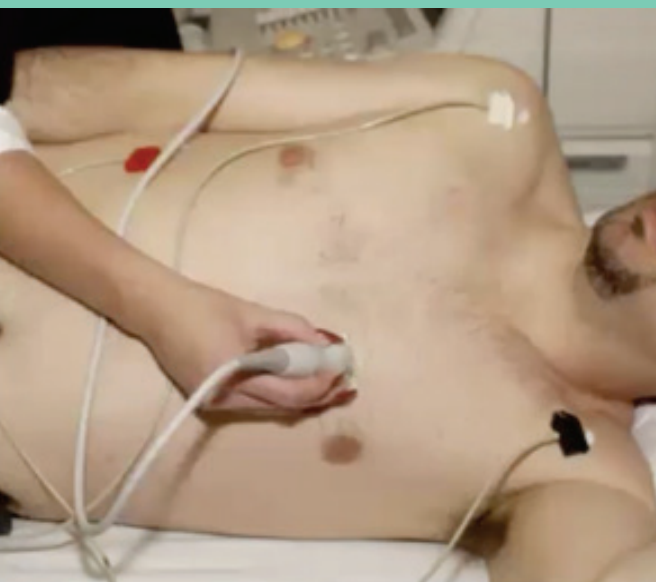
STARTING POSITION:

At the apex of the heart-Laterally below left breast, 5th-6th intercostal space.

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Anatomy of Apical 4 Chamber (AP4)
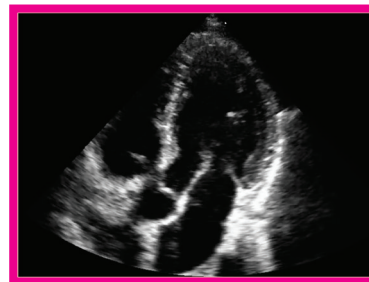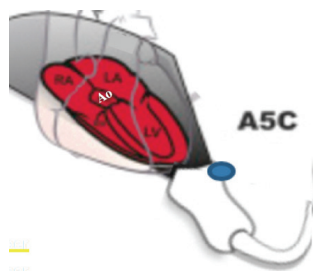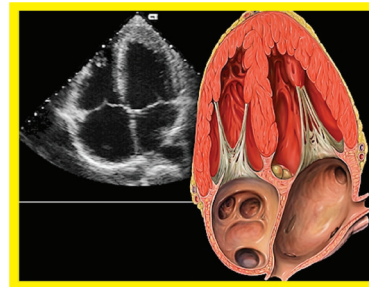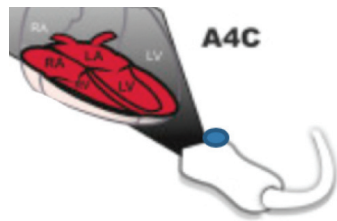

LV

RV

RA

LA

APEX

The apical home view you scanned earlier slices the heart to see all four chambers. Since the apex of the left ventricle is closest in distance to the probe from this chest window, it is displayed at the top of the sector next to the right ventricle with the left/right atrias below.

All Apical Views

 = Probe indicator

A4C

A5C
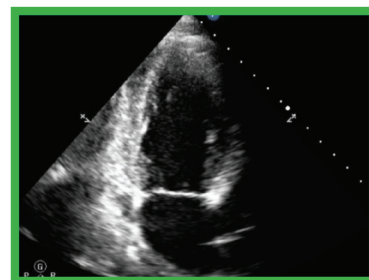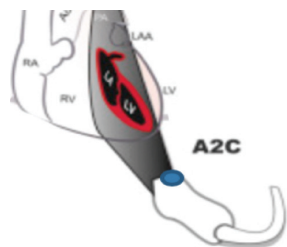
From the AP4 home view you've already scanned, the following 3 apical views will be found from the same spot on the chest. The AP5 continues to slice through all 4 chambers of the heart bringing the aorta into view by tailing down directing the beam anteriorly. To image the AP2, focus on centering the LV/LA as you are guided to rotate counterclockwise until the beam is only slicing through 2 chambers of left heart from anterior-inferior. Rotating slightly more will include the aorta in the slice plane for the final apical view, the AP3.

A2C

A3C
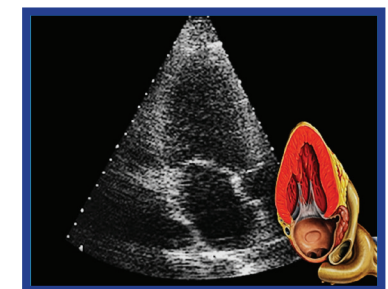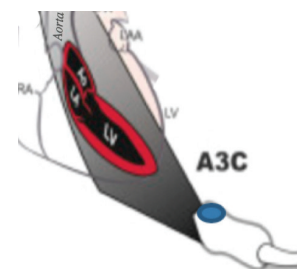
Apical 4 Chamber

Apical 5 Chamber

Apical 2 Chamber

Apical 3 (Long)

Window #3: Subcostals

SUBCOSTALS
(WINDOW #3)
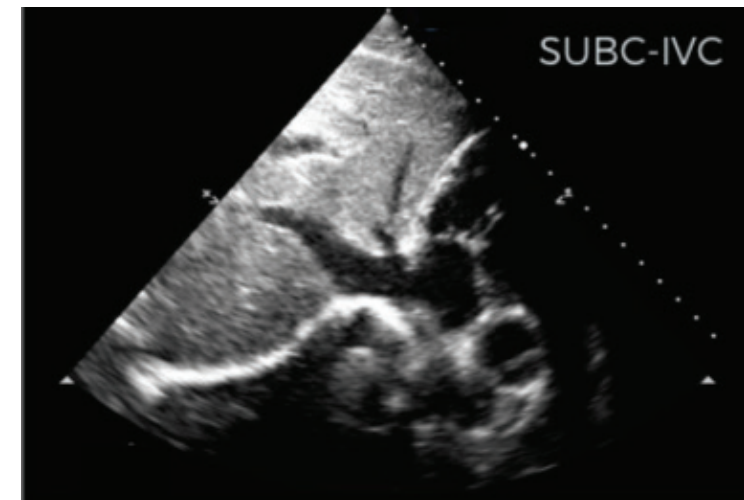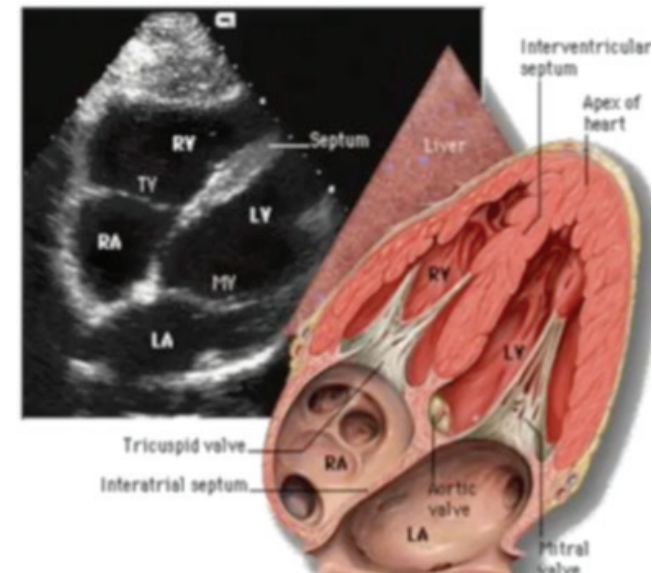

Axis-Mitral

4. PSAX: Parasternal Short Axis-Pap

You've scanned the subcostal home view (SubC4) which includes similar anatomy to the AP4. Focus on the RA as you rotate counterclockwise to open up the IVC which looks like a black tail. Within this window remember to try prompting the patient to take a deep breath in as this will pull the heart closer to the probe
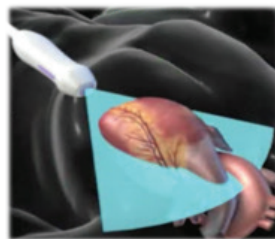
STARTING POSITION:

Just below the xiphoid process

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Caption Health