

American College of Physicians

POCUS: Advanced Skills for Outpatient Practice

Ultrasound PEARLS: a brief review

Janice Boughton MD FACP RDMS
Consulting Internal Medicine CHAS Health



Jean Francois Portaels
circa 1850

What is PEARLS?

- The PEARLS Exam is a framework for an ultrasound enhanced physical exam, allowing us to identify conditions where traditional H&P is insensitive or nonspecific.



P.E.A.R.L.S.



Probe position:

- Parasternal
- Epigastric
- Apical/Anterior lung
- Right upper quadrant
- Left upper quadrant
- Suprapubic

68 year old man admitted with abdominal pain and tachycardia



Previously healthy, avoided doctors until increasing fatigue, dyspnea and abdominal pain caused him to go to the emergency room. He is also concerned about poor urine output. He is admitted quickly due to crowded ER. BP 100/60, HR 110, afebrile, CBC OK, mildly elevated BUN/Cr, BNP.

What do you want to know?

- Cardiac function and physiology—heart failure? Pulmonary hypertension? Filling pressures?
- Pulmonary edema or interstitial syndrome?
- Pleural effusion?
- Ascites?
- Hydronephrosis?
- Abdominal pathology?
- Bladder distension?

Which transducer?

Phased array



Or

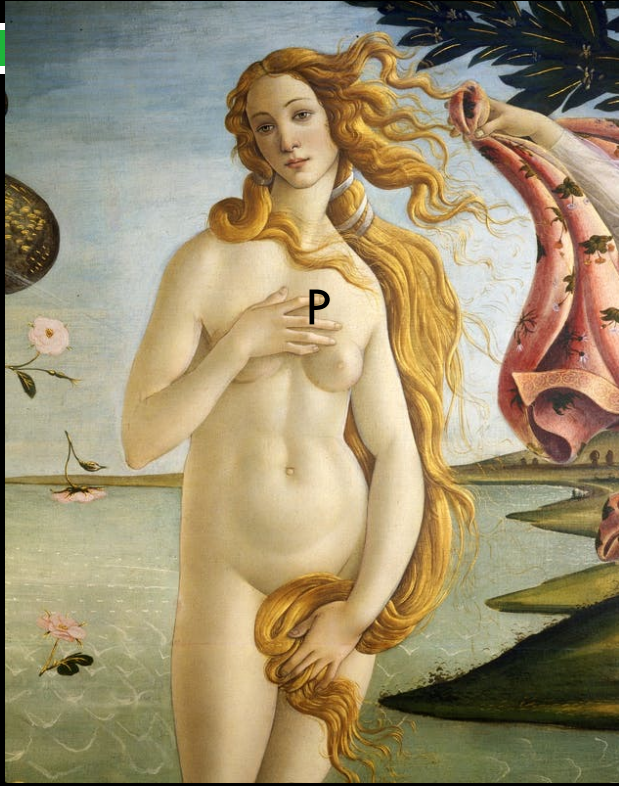
Cardiac/abdominal
setting if single
probe



Curvilinear



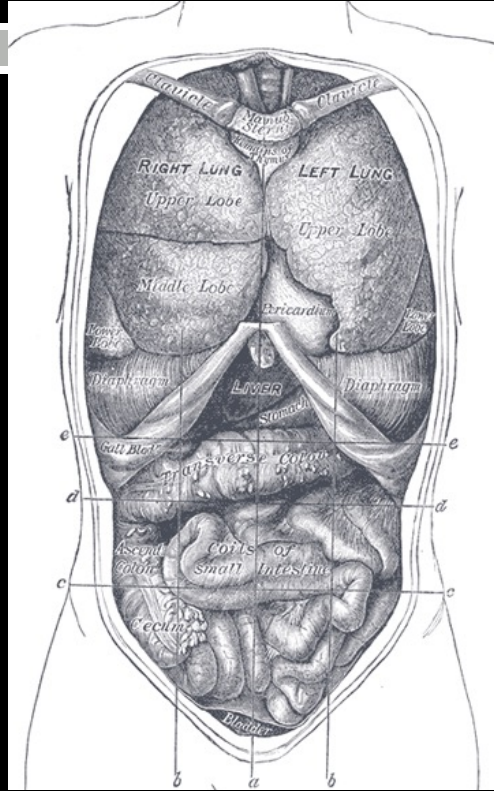
P.E.A.R.L.S

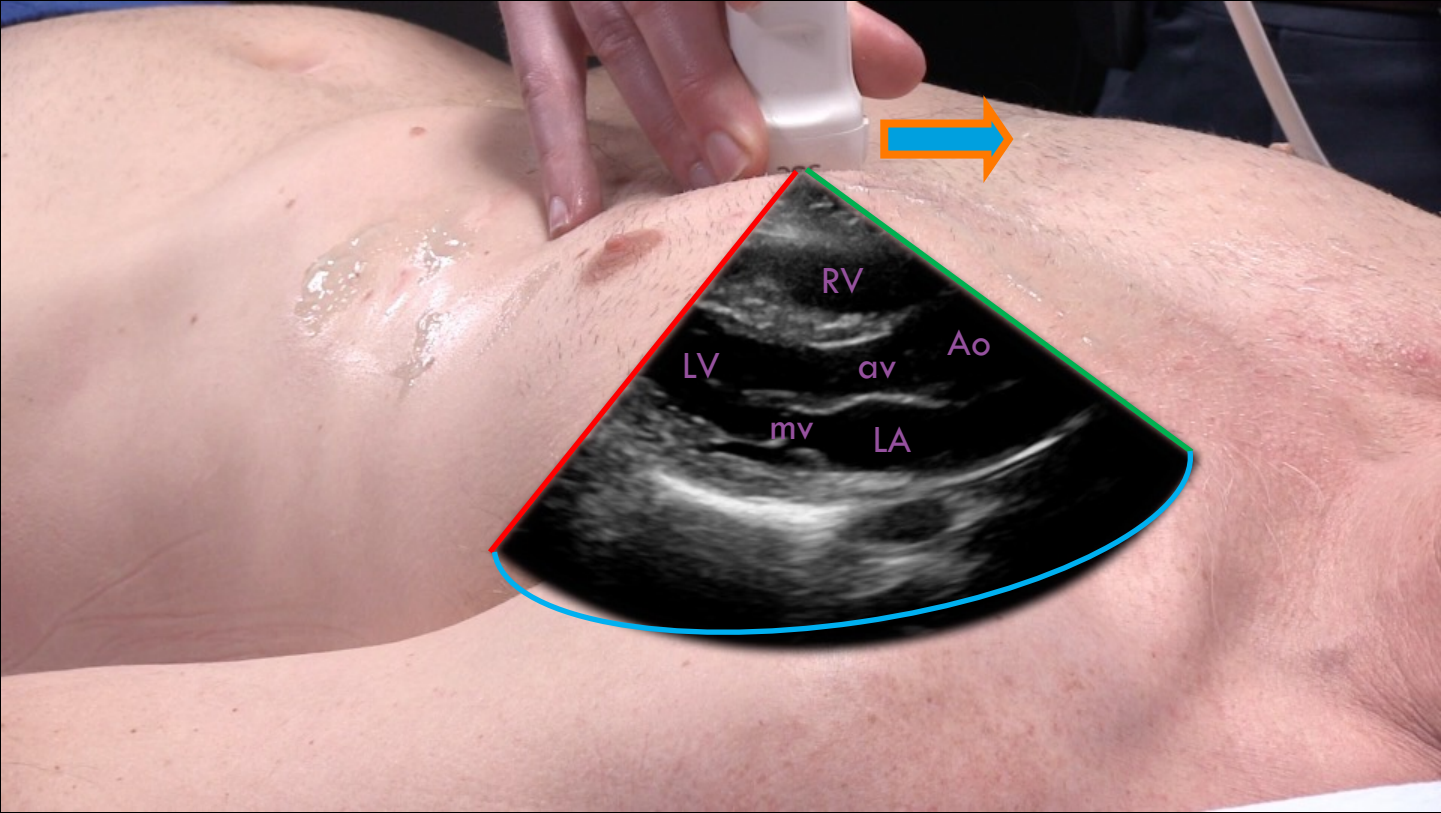


Probe position:

- Parasternal
- Epigastric
- Apical/Anterior lung
- Right upper quadrant
- Left upper quadrant
- Suprapubic

Find the parasternal window!





RV

LV

av

Ao

mv

LA

Parasternal- Left Ventricular Dysfunction

EF = Normal



EF = Severely Reduced

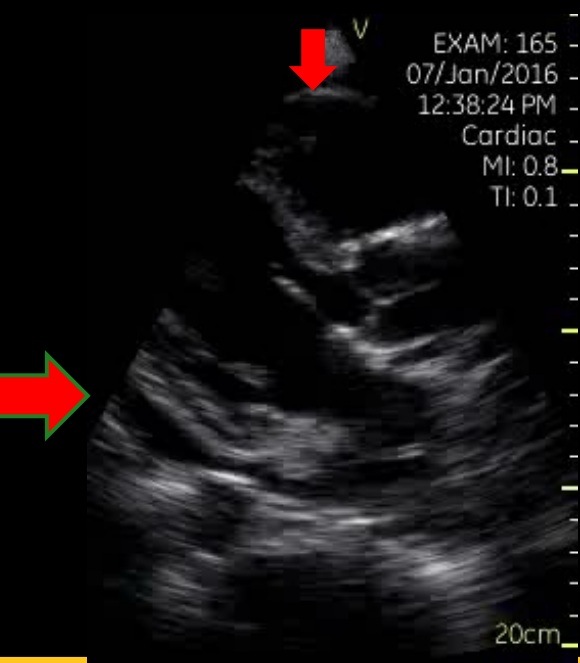


Parasternal- Pericardial Effusion

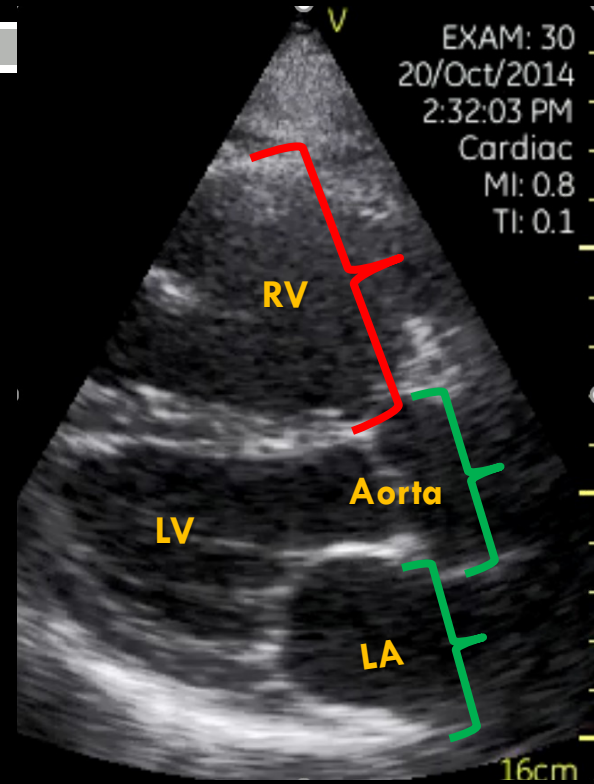
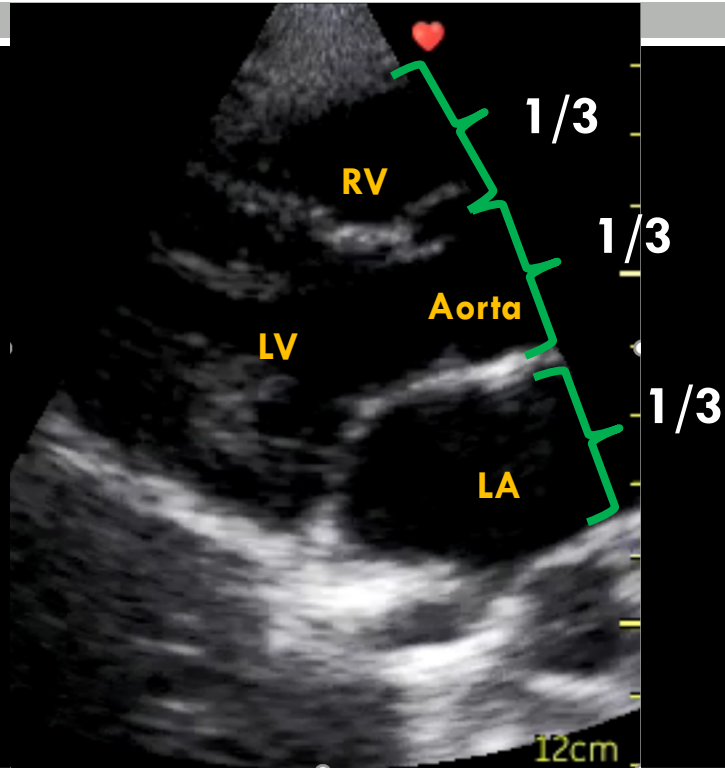
Normal

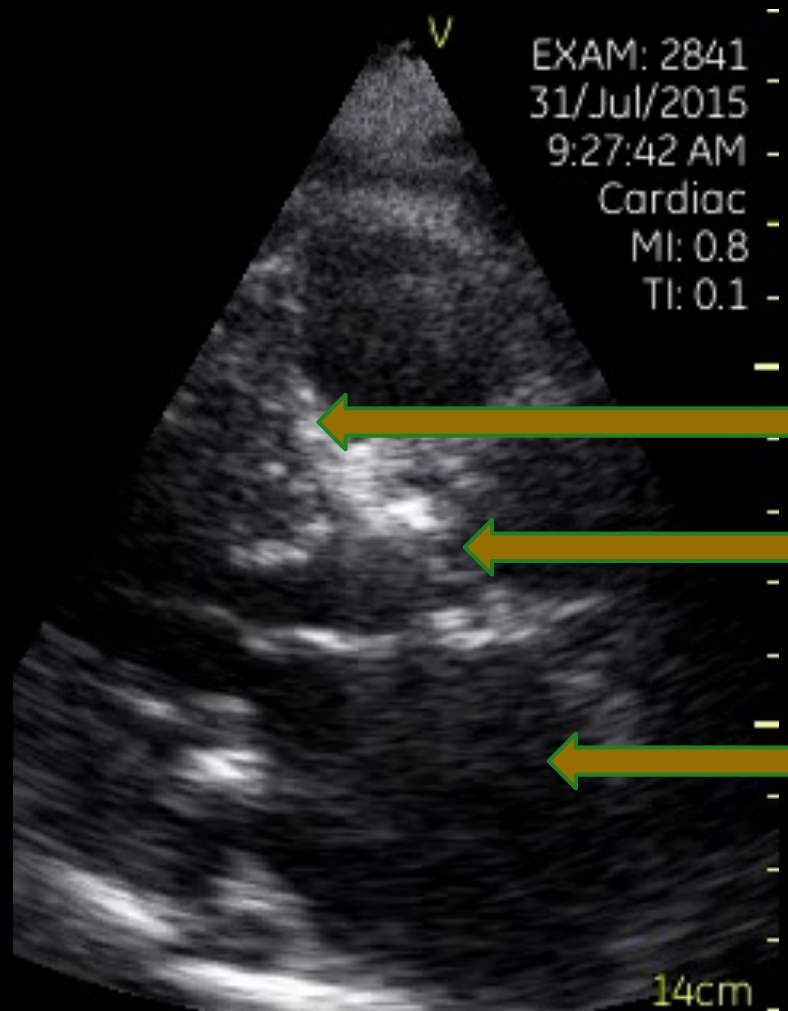


Pericardial Effusion



Parasternal- Right Ventricular Enlargement





EXAM: 2841
31/Jul/2015
9:27:42 AM
Cardiac
MI: 0.8
TI: 0.1

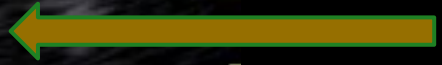
Just look!"



Very thick septum



Abnormal aortic valve

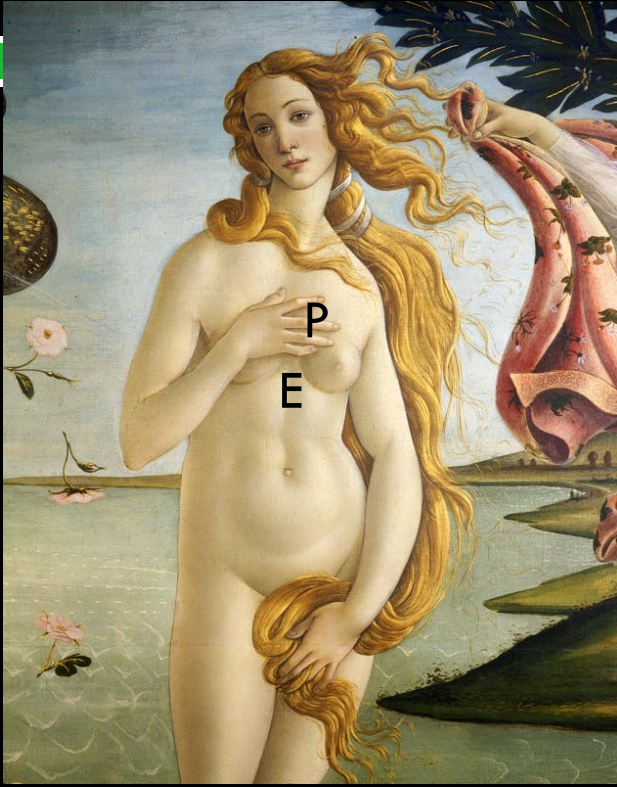


Huge left atrium

Probably aortic stenosis

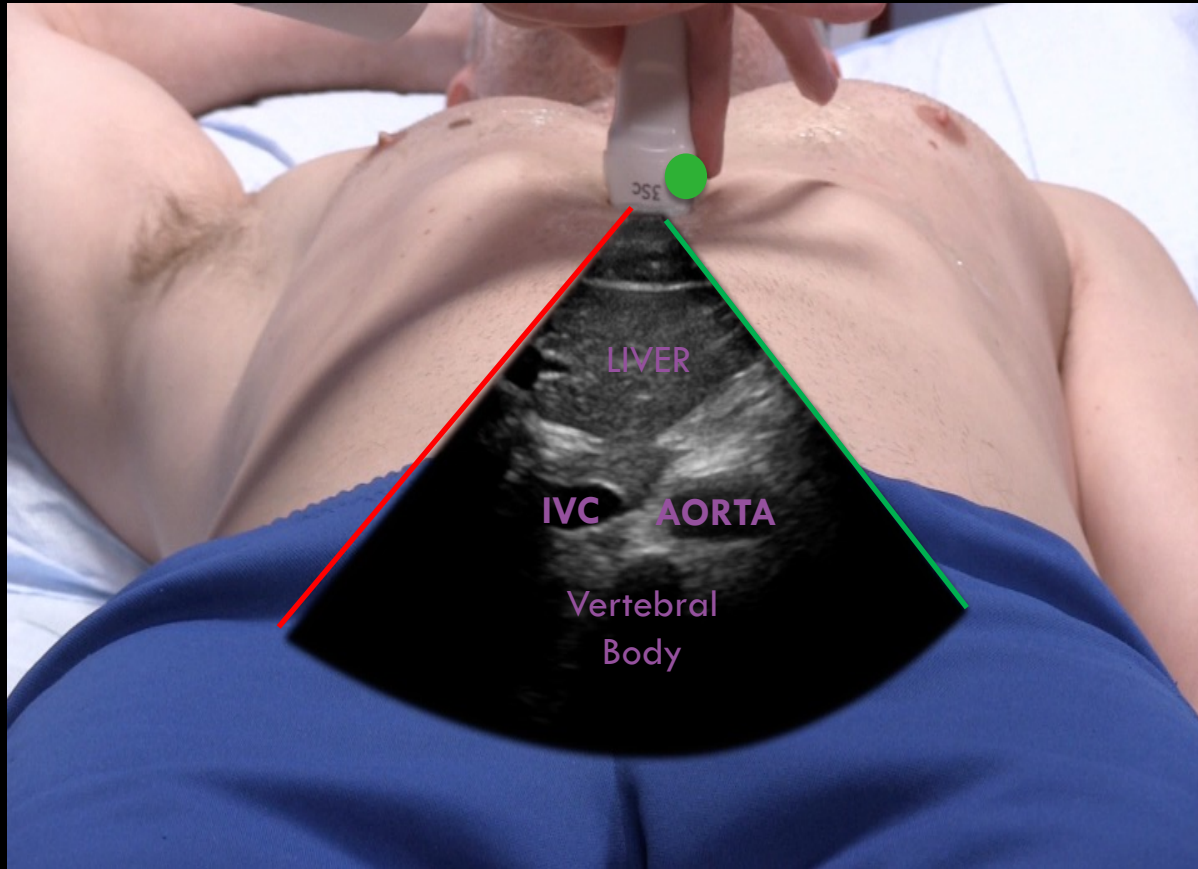
14cm

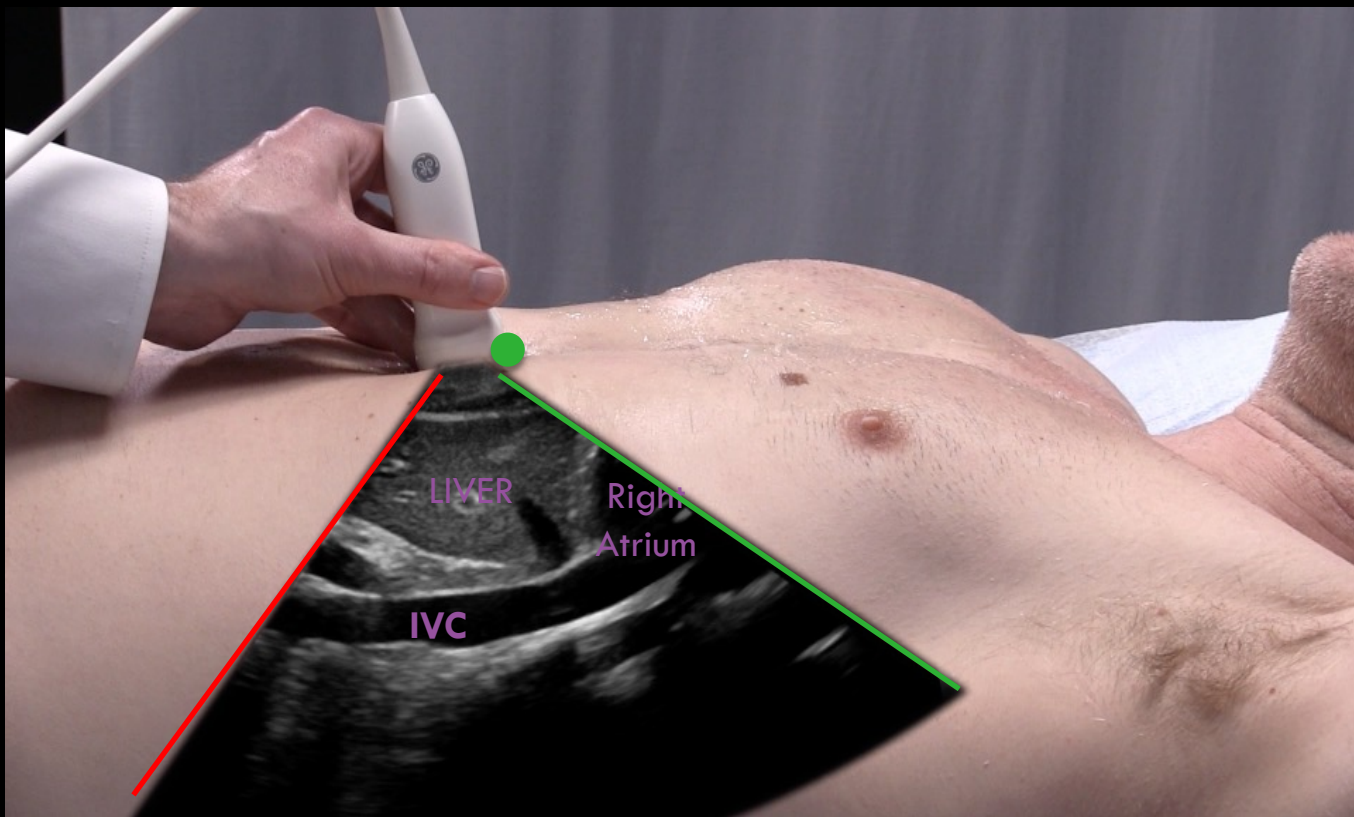
P.E.A.R.L.S



Probe position:

- Parasternal
- Epigastric
- Apical/Anterior lung
- Right upper quadrant
- Left upper quadrant
- Suprapubic



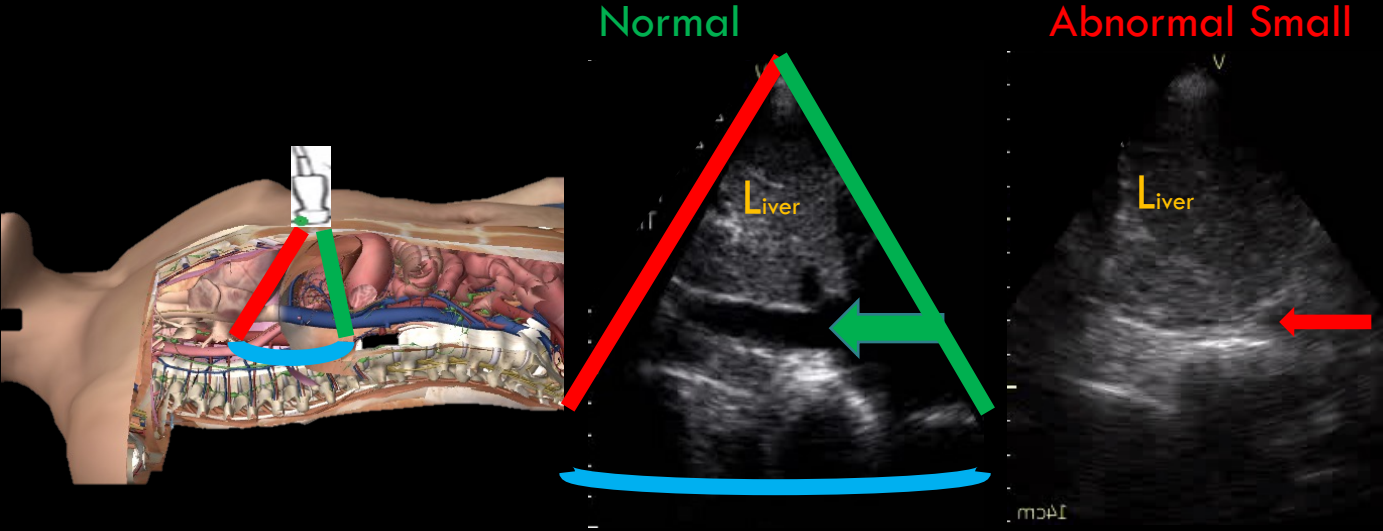


LIVER

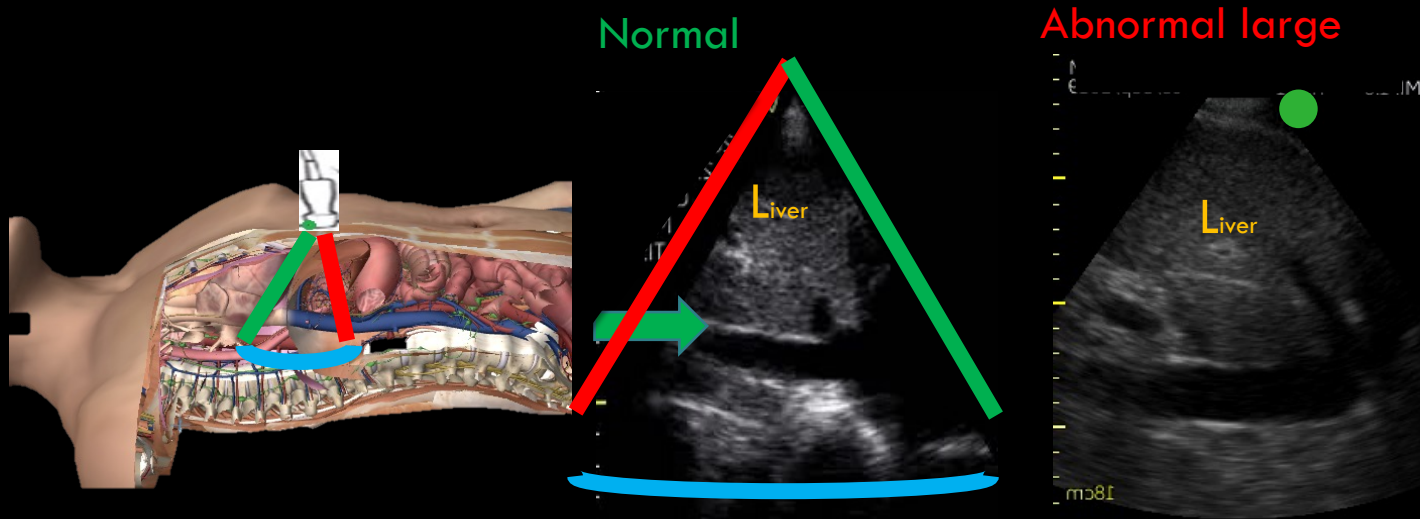
Right
Atrium

IVC

IVC Size and Collapsibility

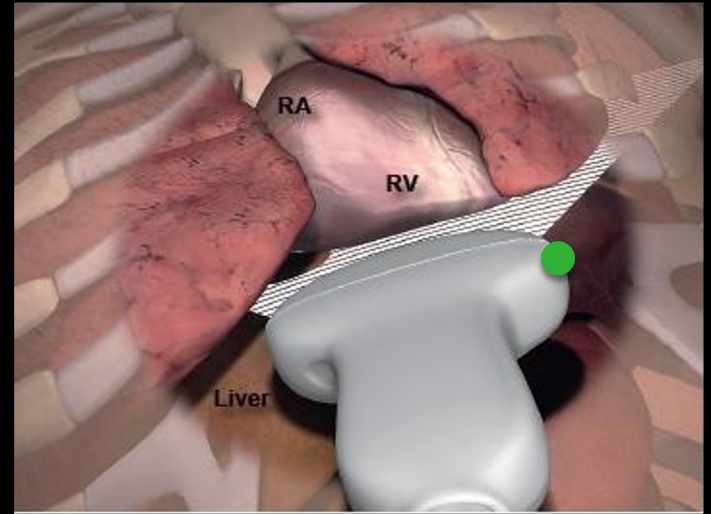
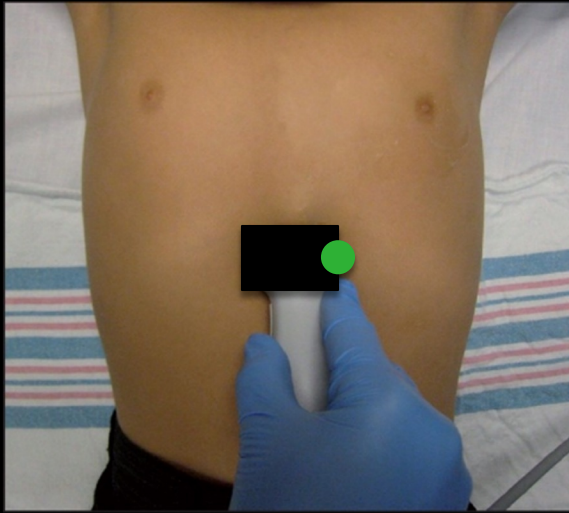


IVC Size and Collapsibility



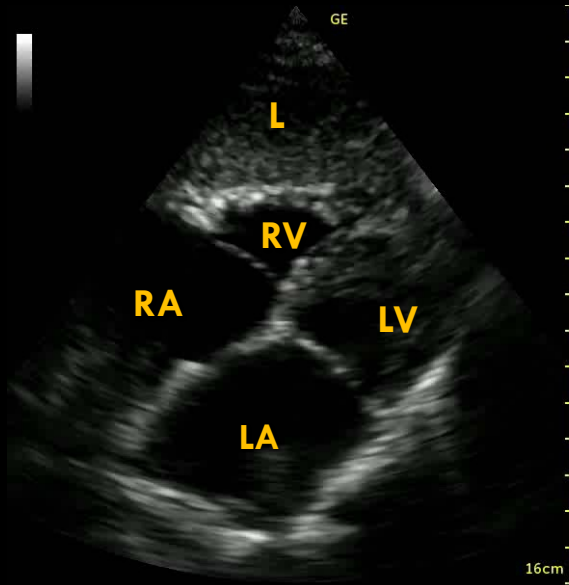
Subcostal or Subxiphoid

- Indicator should be pointing to patients' left
- Probe should be positioned just under the xiphoid process



E.pigastric- Pericardial Effusion

Normal



Pericardial Effusion



Other epigastric findings.

- Aorta sweep
- Pancreas
- Retroperitoneal adenopathy
- Subxiphoid heart in cardiac arrest: only access for visualizing heart with pads

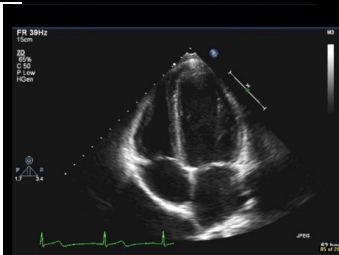
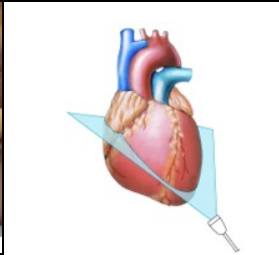
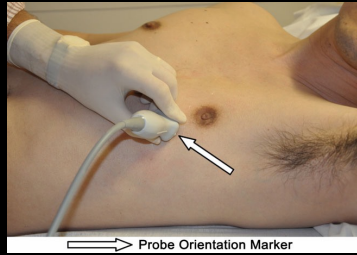
P.E.A.R.L.S



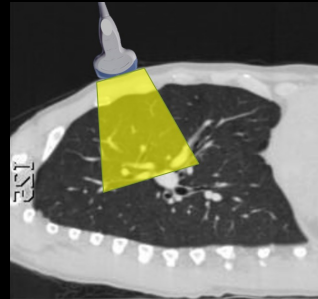
Probe position:

- Parasternal
- Epigastric
- Apical/Anterior lung
- Right upper quadrant
- Left upper quadrant
- Suprapubic

Apical: heart



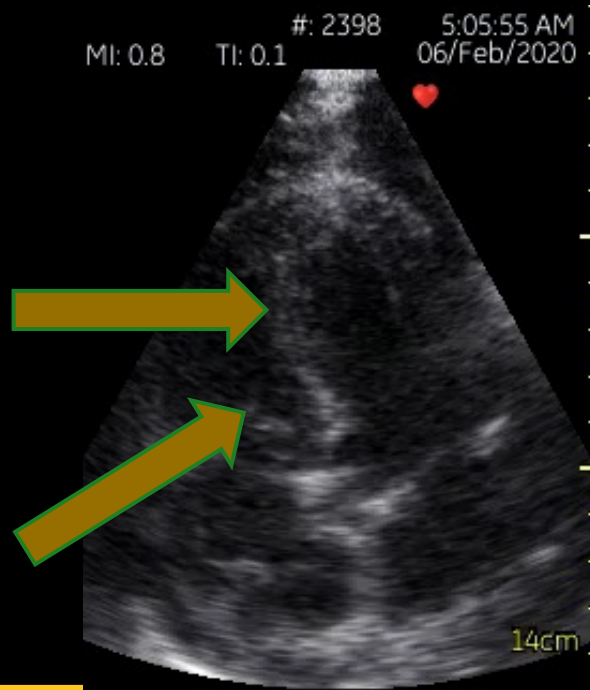
Anterior lung



Right ventricular overload with pulmonary hypertension

Septum pushes from the Right ventricle into left Ventricle due to high RV pressures

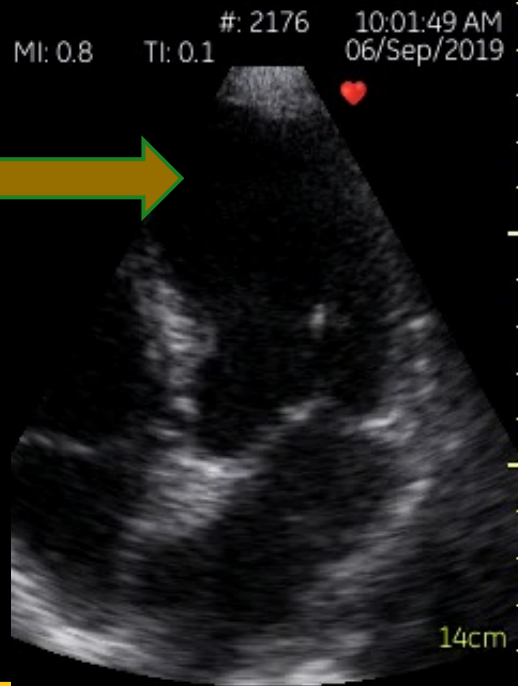
Right ventricle should be significantly smaller than Left ventricle (1/3: 2/3) but appears the same or larger



Apical location particularly useful for seeing septal deviation and right vs left ventricle, indicating acute or chronic pulmonary hypertension

Takotsubo Cardiomyopathy

Apex is hypokinetic, “balloons” in patients with stress induced cardiomyopathy



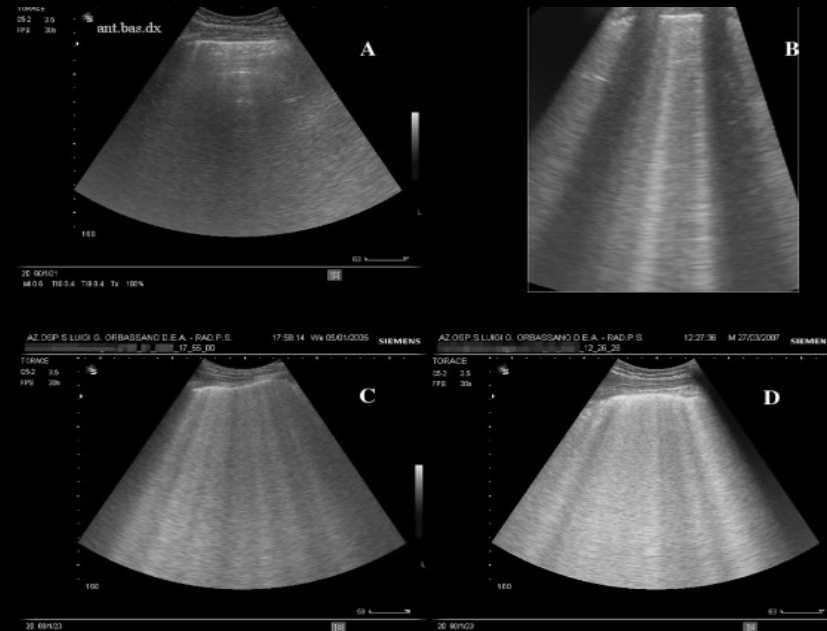
We are seeing more stress related cardiomyopathy clinically. Apical view is excellent for looking at the distal left ventricle.

Anterior lung

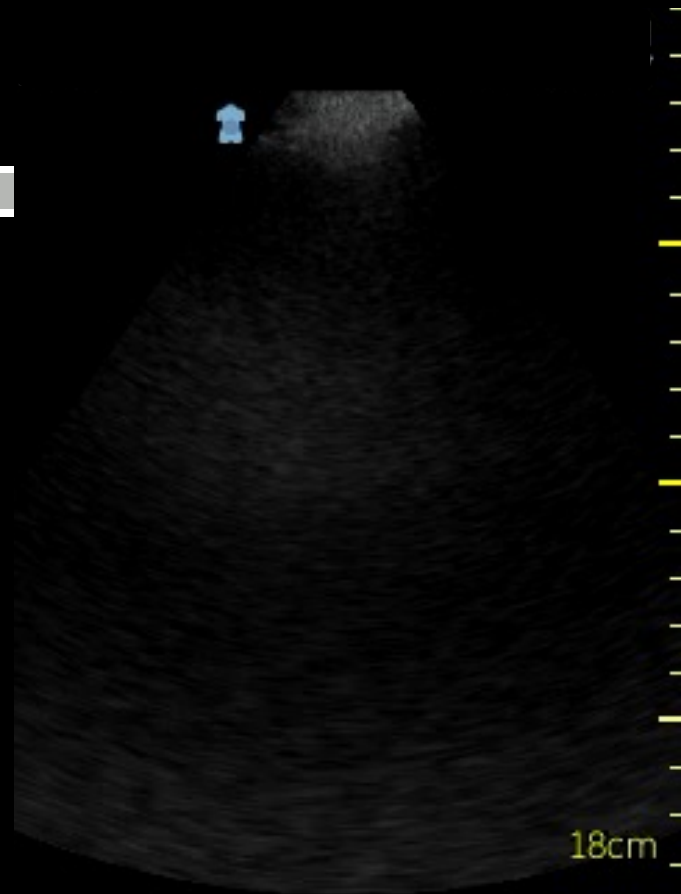
Progression of B lines: none (presence of A lines), few, many, nearly confluent



This location is particularly helpful for visualizing interstitial syndrome and pneumothorax.

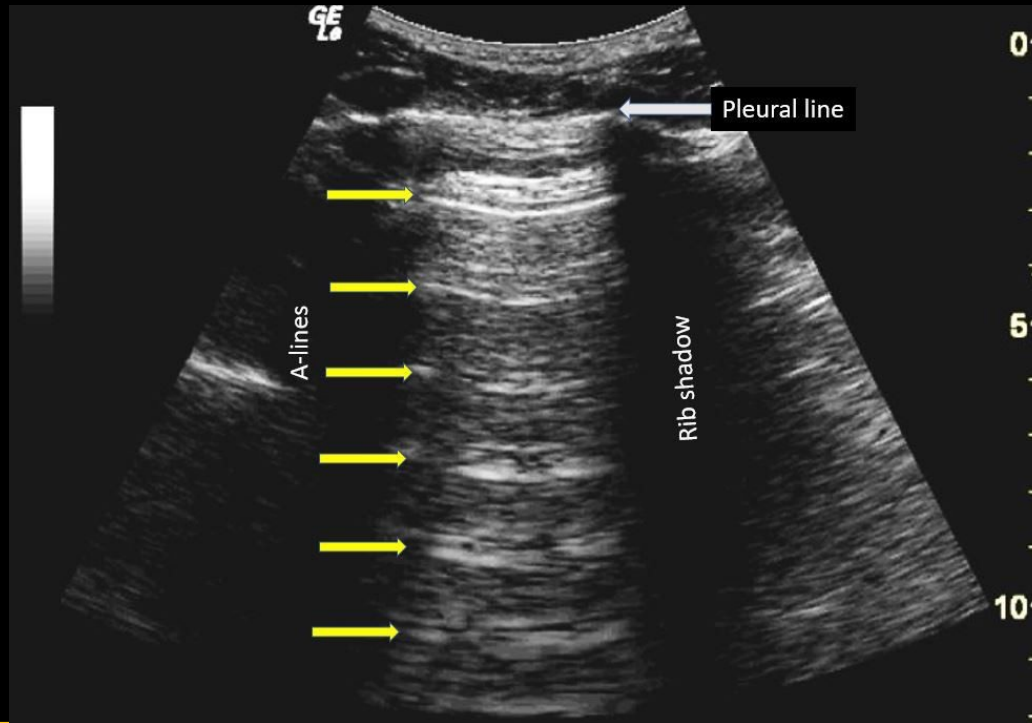


Patchy B lines

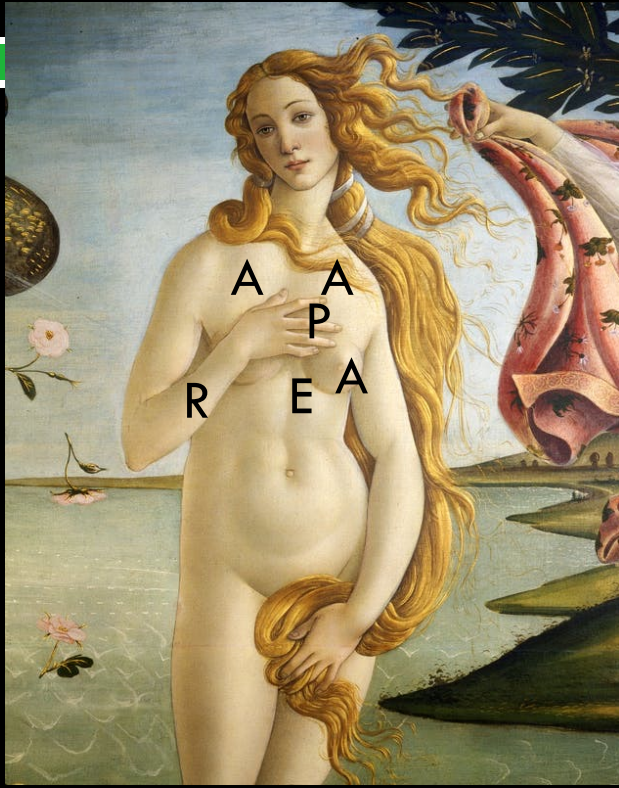


What do you expect to see anterior lung?

A Lines



P.E.A.R.L.S



Probe position:

- Parasternal
- Epigastric
- Apical/Anterior lung
- Right upper quadrant
- Left upper quadrant
- Suprapubic

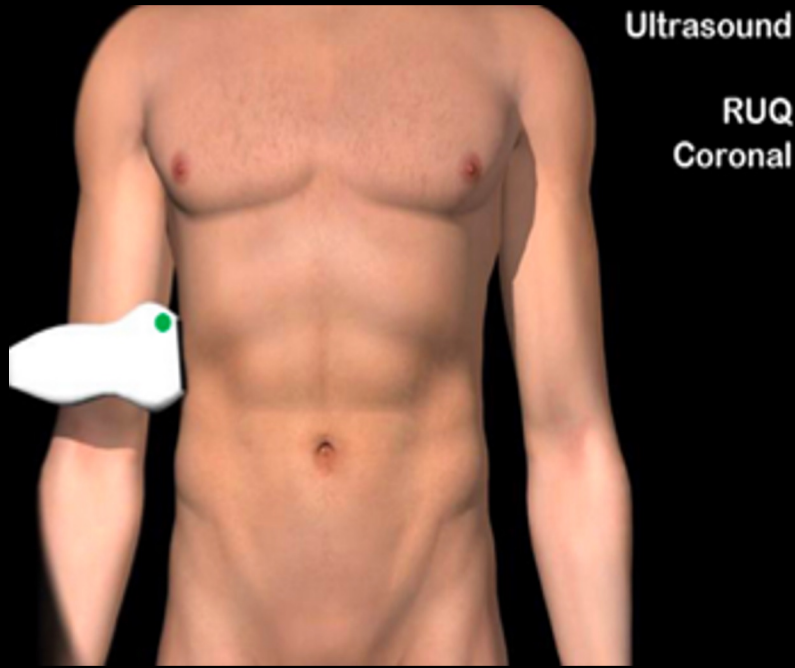
Views are now in abdominal mode!

Switch to abdominal or FAST preset

Probe marker will move to left side of screen

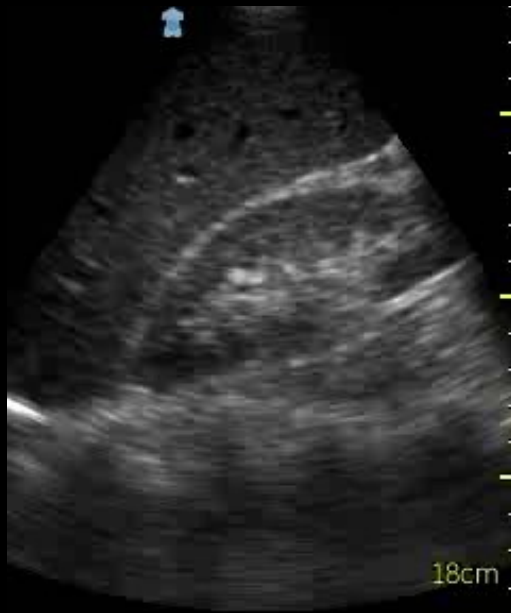
Because of a change in pulse repetition frequency
abdominal structures will be more crisply visualized

Probe position: coronal, mid axillary line, may angle slightly to avoid ribs



R.UQ Pleural Effusion

Normal

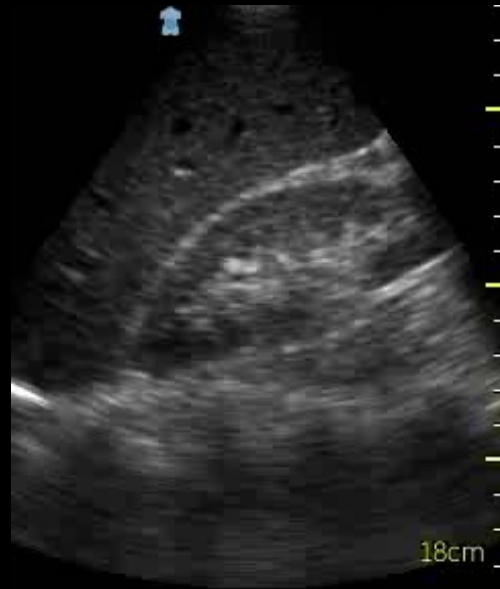


Abnormal

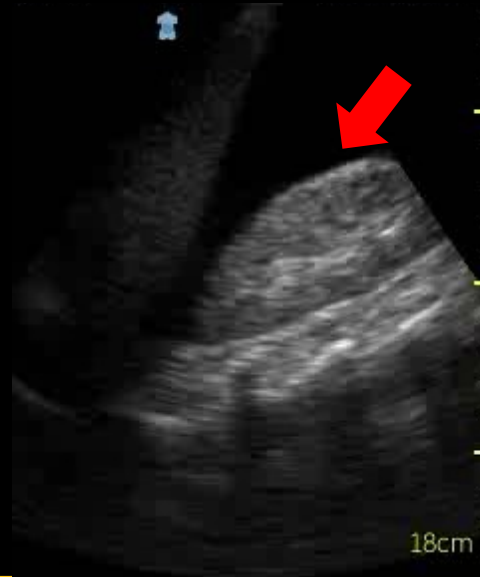


R.UQ and L.UQ- Ascites

Normal

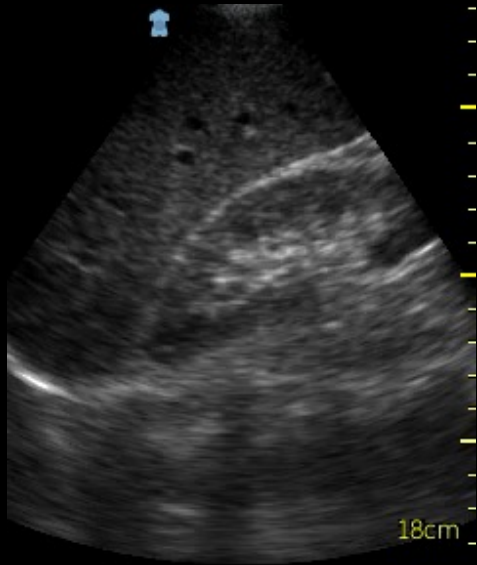


Abnormal



R.UQ -- Organomegaly

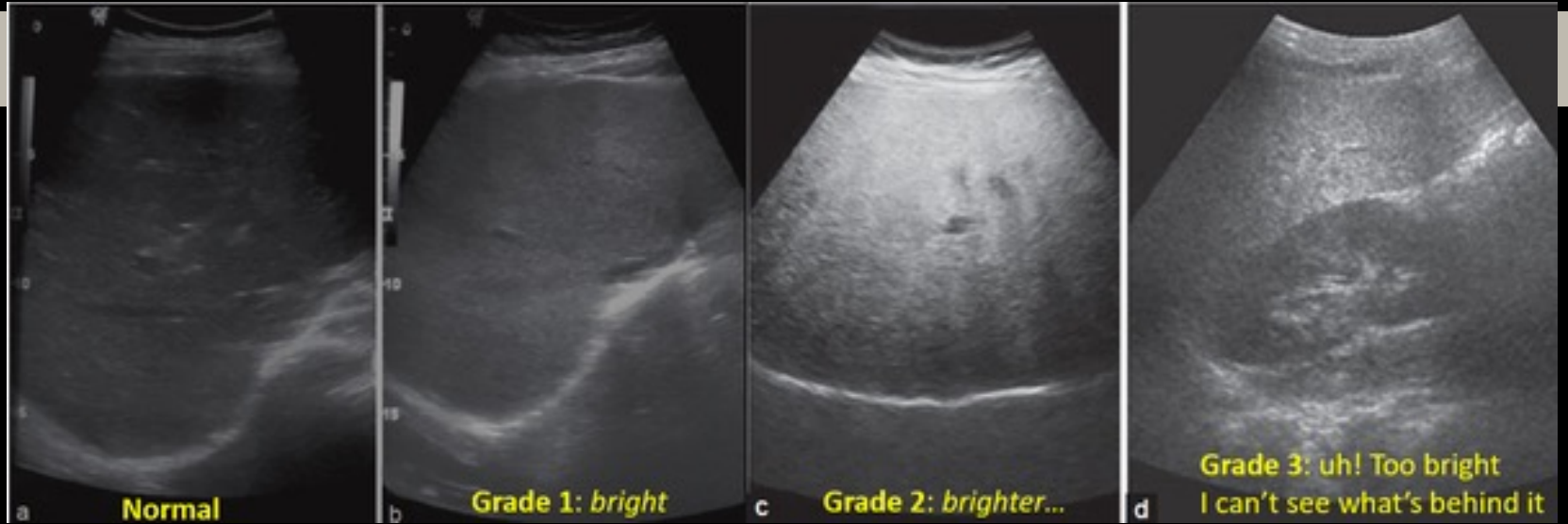
Normal Liver



Hepatomegaly

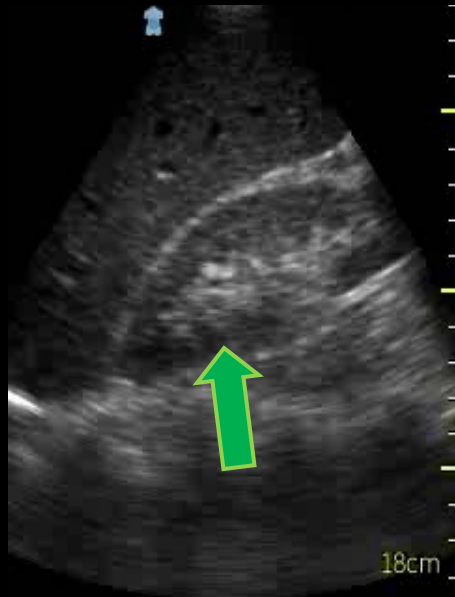


Fatty Liver

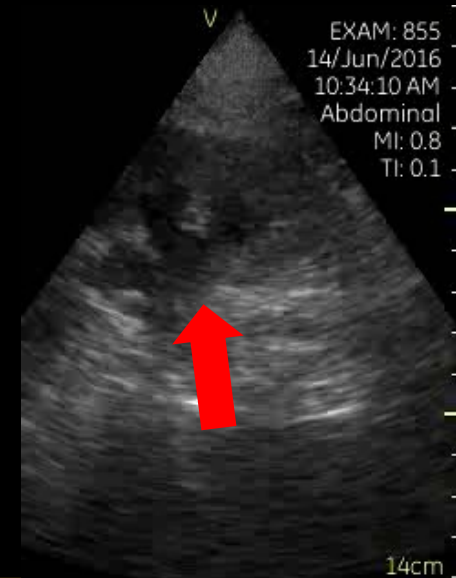
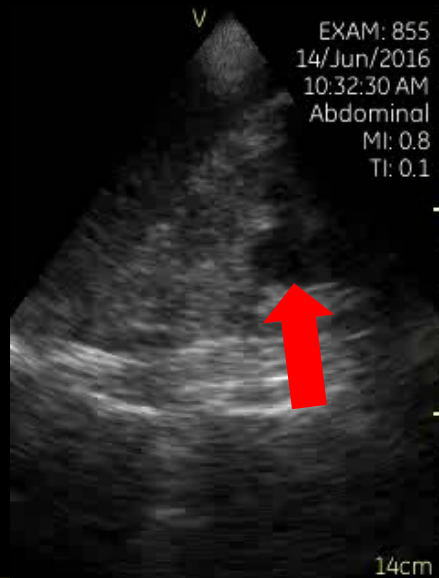


R.UQ and L.UQ- Hydronephrosis

Normal

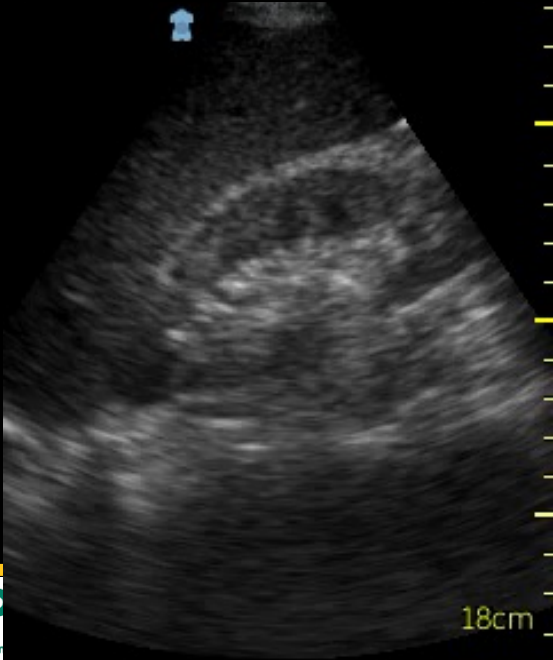


Abnormal Hydronephrosis

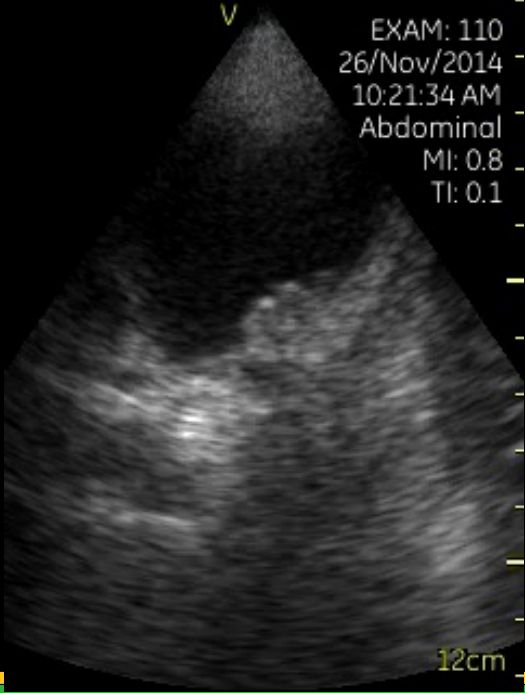


RUQ- Gallbladder

Normal Gallbladder



Gallstones



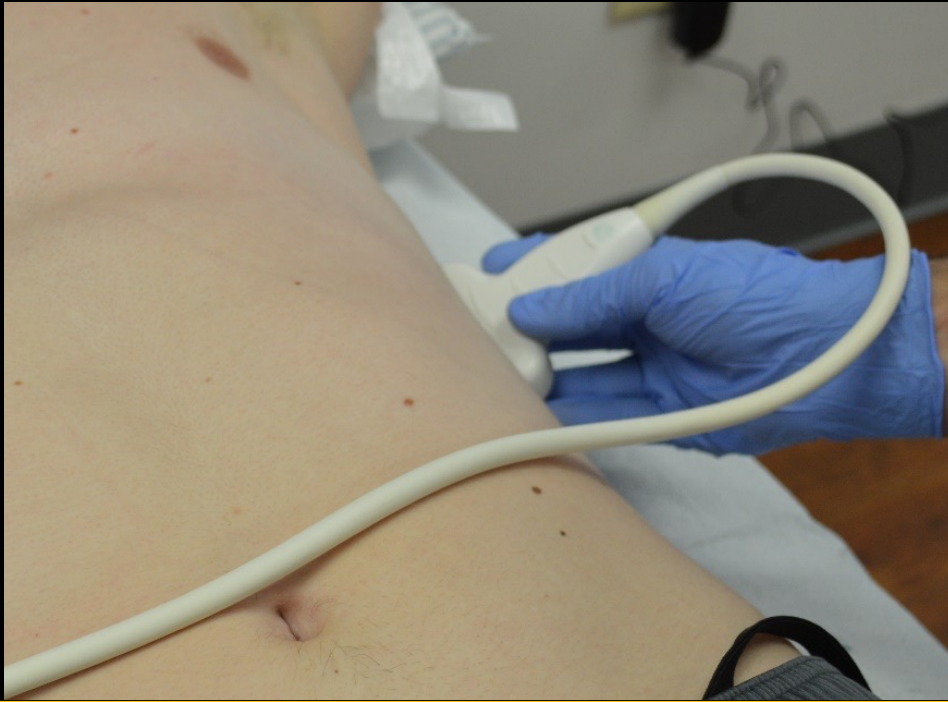
P.E.A.R.L.S



Probe position:

- Parasternal
- Epigastric
- Apical/Anterior lung
- Right upper quadrant
- Left upper quadrant
- Suprapubic

Left upper quadrant

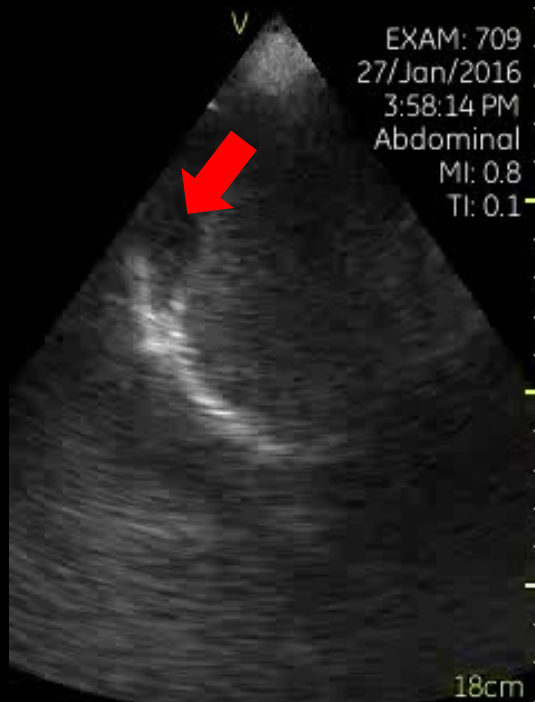


Ascites in the left upper quadrant

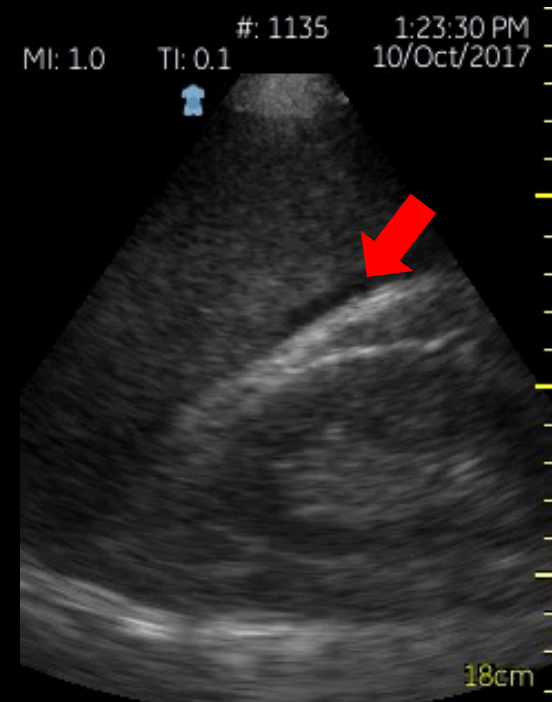
Normal



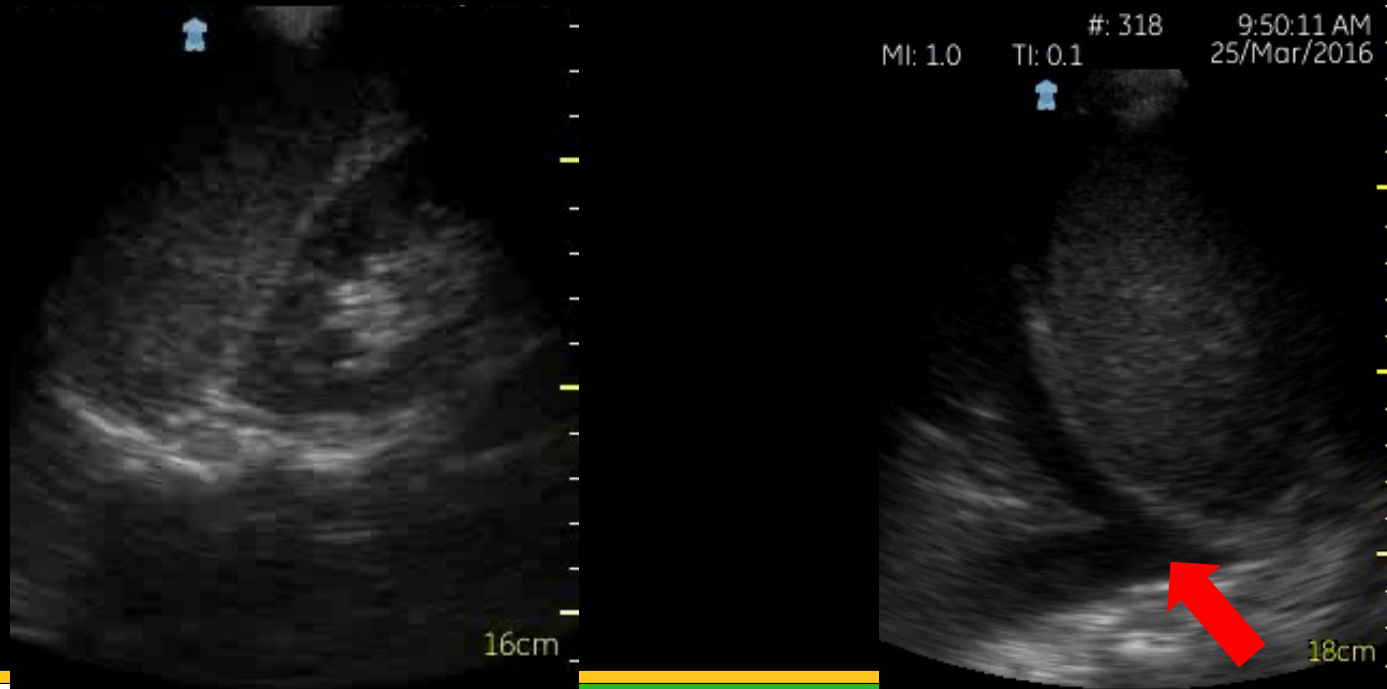
Abnormal



Abnormal



L. UQ – Pleural Effusion



Organomegaly

Normal



P.E.A.R.L.S



Probe position:

- Parasternal
- Epigastric
- Apical/Anterior lung
- Right upper quadrant
- Left upper quadrant
- Suprapubic

Orientation of probe



. Transverse

Indicator to patient's right
Fan inferiorly



Ultrasound
Suprapubic
Long Axis

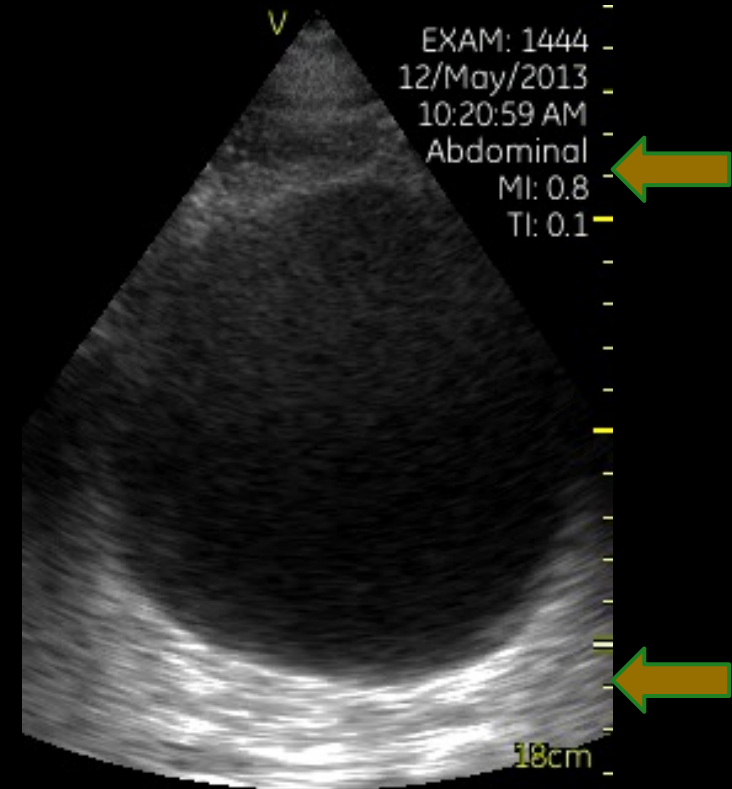
fpnotebook.com

Sagittal

Indicator to patient's head
Fan left and right

Globular, distended bladder

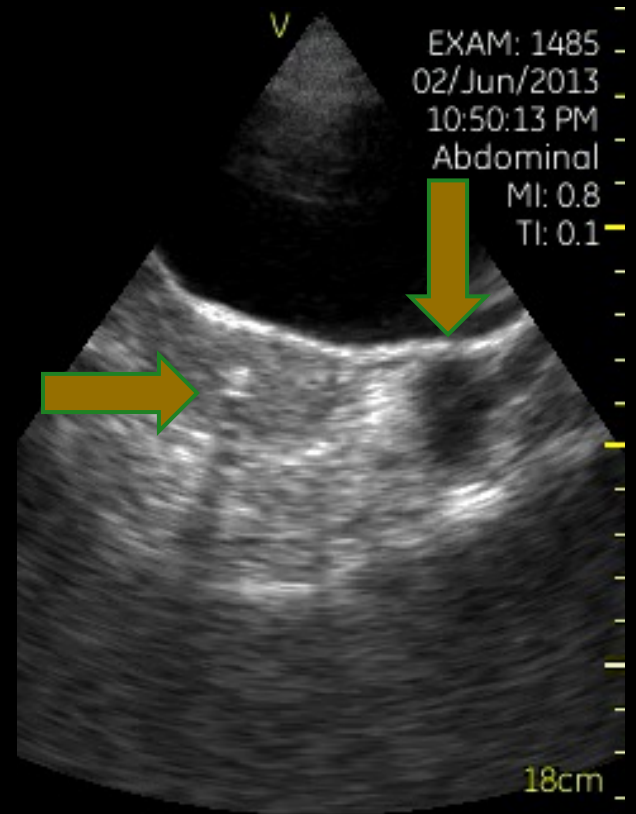
=urinary retention
(note 12 cm AP
diameter)



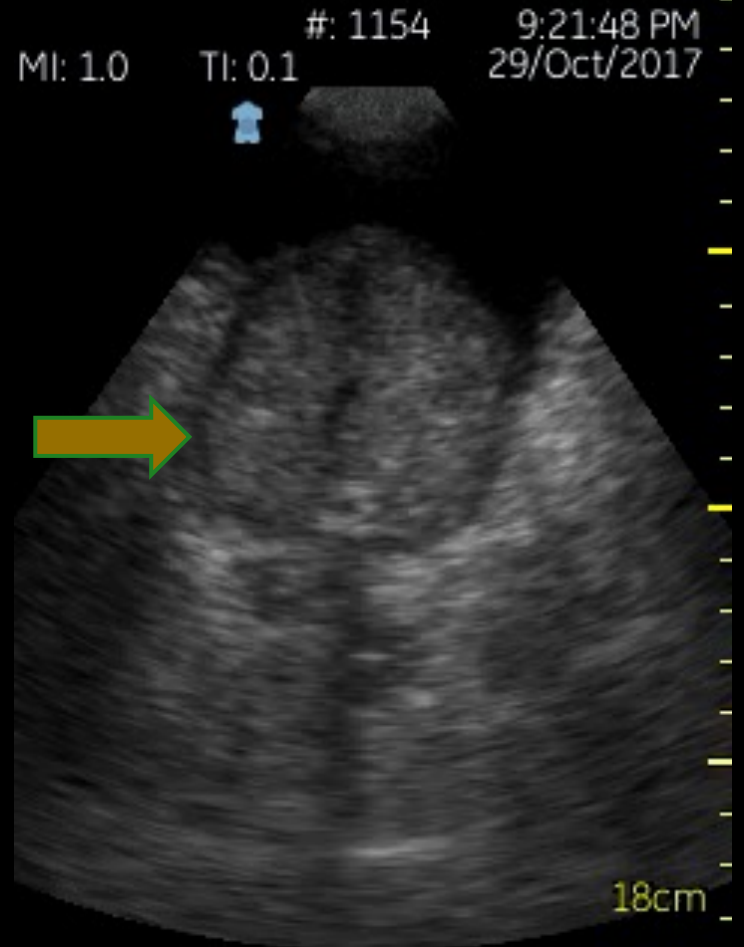
From transverse bladder
view you see:

IUD

Ovarian Cyst



Enlarged
prostate gland



Our patient—another look

What's going on?



Adam Elsheimer (1598)

After reviewing labs and records and in combination with our physical exam we see the following ultrasound images.

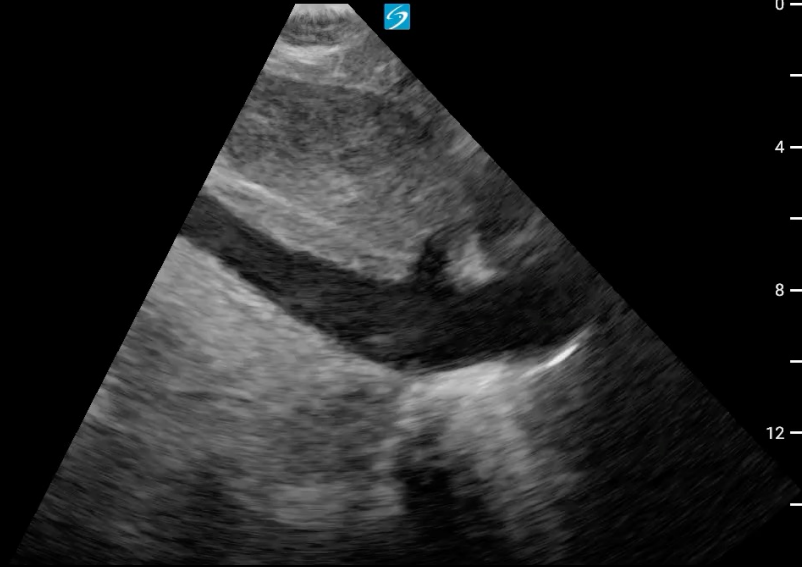


What view is this?

- a. Apical
- ➔ b. Parasternal long
- c. Subxiphoid

What do we see?

- ➔ a. Poor LV function
- b. Pericardial effusion
- c. Normal LV

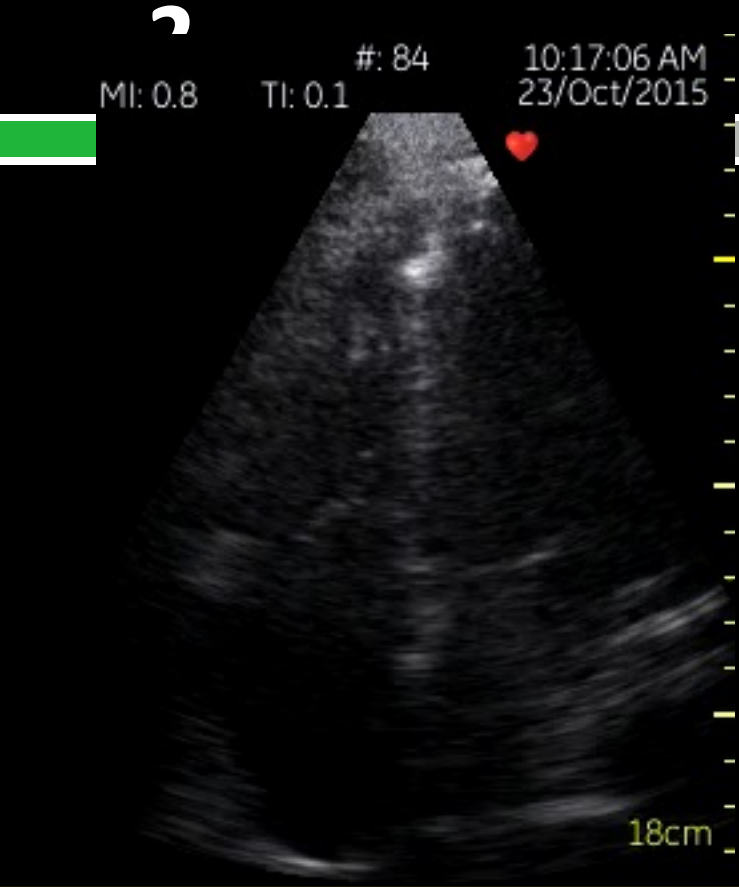


What view is this

- 0 -
-
- 4 -
- c. Subxiphoid sagittal

What do we see?

-
- 8 -
-
- 12 -
- c. Enlarged non-collapsing IVC

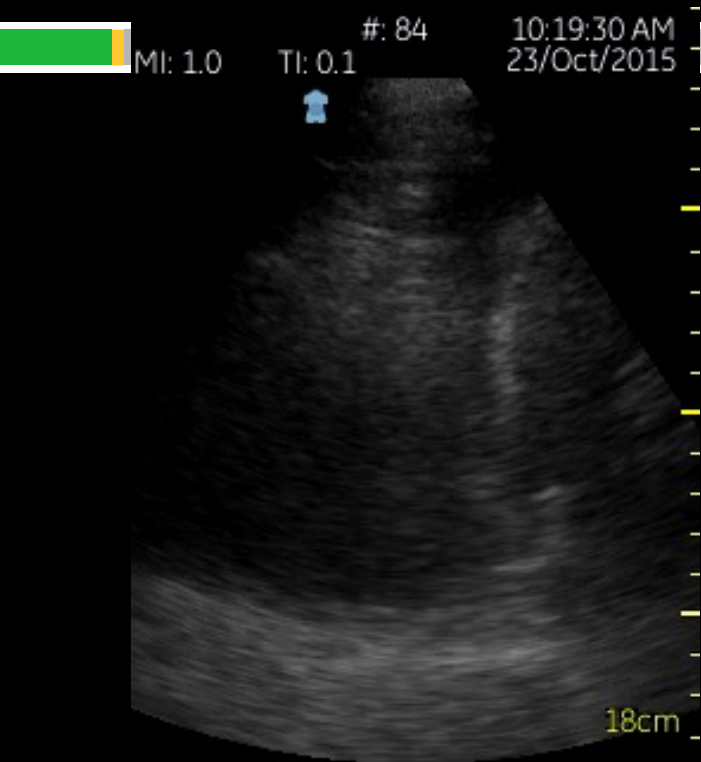


What view is this?

- ➔ a. Apical
- b. Parasternal2 long
- c. Subxiphoid

What do we see?

- ➔ a. Poor LV function
- b. Pericardial effusion
- c. Normal



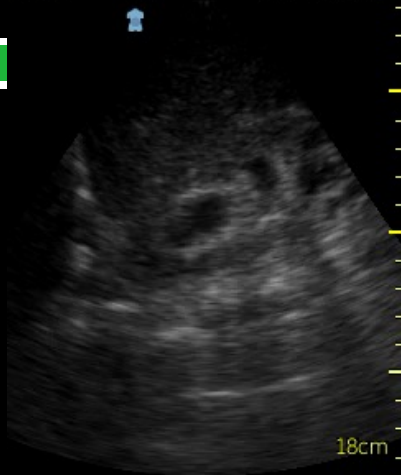
What view is this

- a. Suprapubic
- ➔ b. Left upper quadrant
- c. Subxiphoid

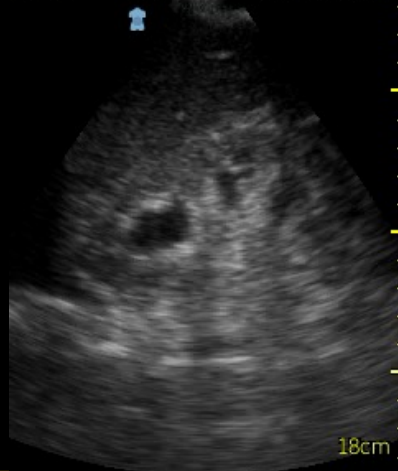
What do we see?

- a. Full bladder
- ➔ b. Pleural effusion
- c. Normal lung

MI: 1.0 TI: 0.1 #. 132 4:41:30 PM 25/Nov/2015



MI: 1.0 TI: 0.1 #. 151 1:00:25 PM 29/Nov/2015

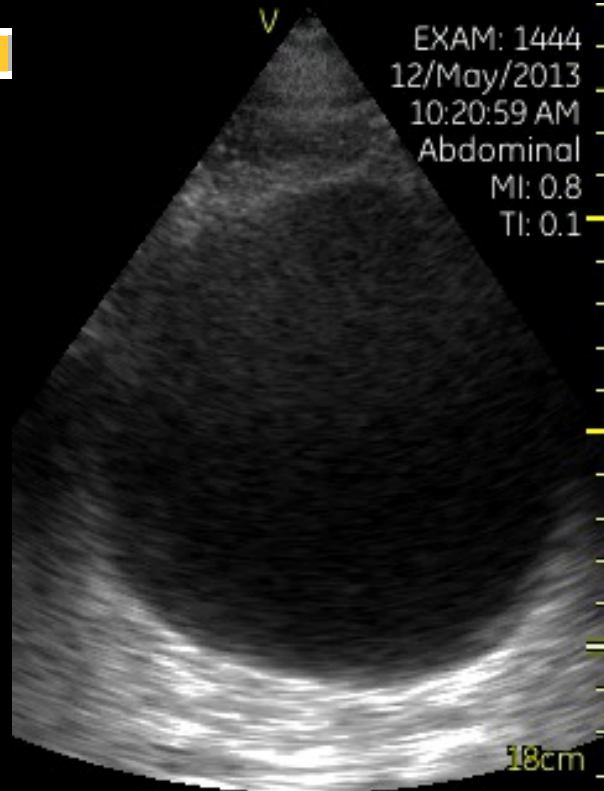


What view is this

- ➔ a. Right and left upper quadrant
- b. Anterior lung
- c. Subxiphoid

What do we see?

- a. Full bladder
- ➔ b. Bilateral hydronephrosis
- c. Normal lung



What view is this

- ➔ a. Suprapubic
- b. Left upper quadrant
- c. Subxiphoid

What do we see?

- ➔ a. Full bladder (distended)
- b. Pleural effusion
- c. Normal

What do we know about our patient?

- His dyspnea is due heart failure, etiology unclear
- You may not want to hydrate vigorously.
- He has bilateral pleural effusions, probably due to CHF.
- He has a distended urinary bladder, probably responsible for bilateral hydronephrosis, a likely cause of urinary difficulties.

We have identified how to move forward with further testing and appropriate treatment.

Final thoughts:

Don't stop!

When there are abnormalities **FINISH THE EXAM**

Work through all of the views frequently in practice

IT WILL GET EASY AND FAST

Let's practice scanning!



