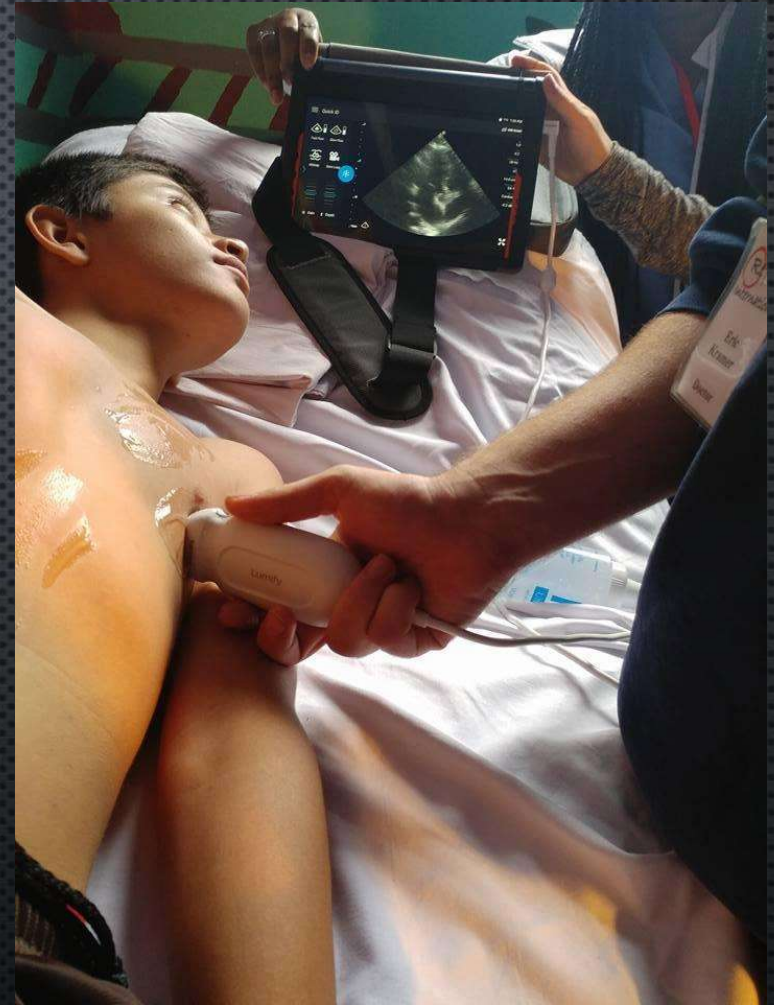


# POINT OF CARE ULTRASOUND UPDATE 2025: GOING BEYOND REGIONAL ANESTHESIA

ERIC KRAMER, DNAP, CRNA, FNP-C



# OBJECTIVES

- LEARN BASIC ULTRASOUND DIAGNOSTIC TECHNIQUES TO EVALUATE PATIENTS IN THE PERIOPERATIVE SETTING
- LEARN HOW TO APPLY ULTRASOUND DIAGNOSTIC FINDINGS TO A CLINICAL SITUATION, TO GUIDE CARE OR THERAPY
- DISCUSS TRENDS IN POCUS PRACTICE IN ANESTHESIA AROUND THE WORLD

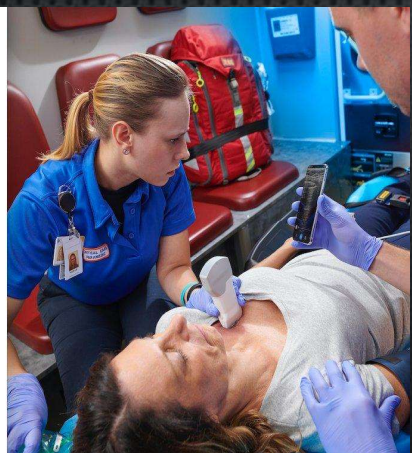
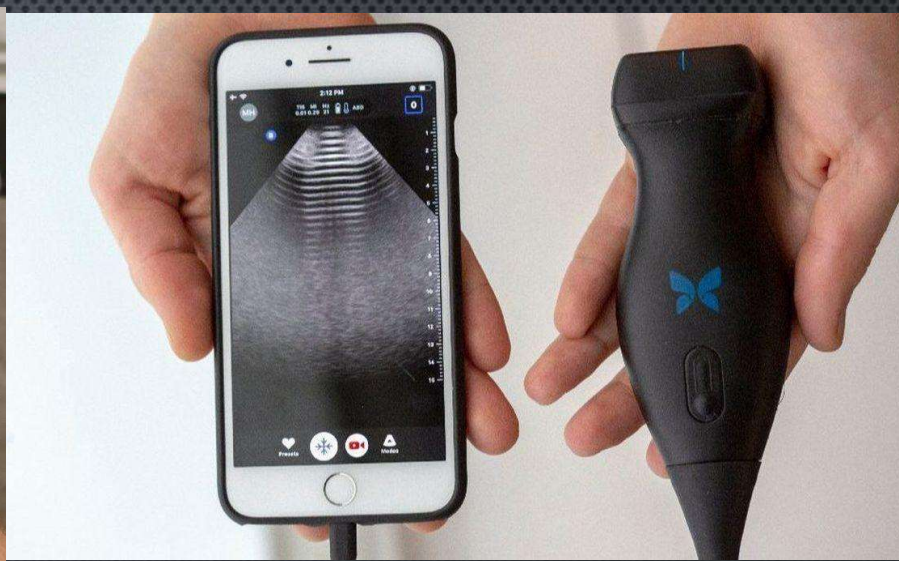


# WHAT IS POCUS?

- POINT OF CARE ULTRASOUND
  - USING ULTRASOUND FOR DIAGNOSTIC AND THERAPEUTIC PURPOSES, AT A PATIENT'S BEDSIDE
    - USUALLY LIMITED
    - OFTEN DOESN'T REPLACE FORMAL IMAGING
    - ENCOMPASSES MANY DIFFERENT SYSTEMS, DEPENDING ON A PROVIDER'S SPECIALTY
    - POPULAR IN ER, ICU, AND GAINING TRACTION WITH INTERNAL MEDICINE AND ANESTHESIA
- \*\*IT'S USUALLY USED TO ANSWER A SINGLE QUESTION, AND THE IMAGING IS INTERPRETED AT THE BEDSIDE\*\*



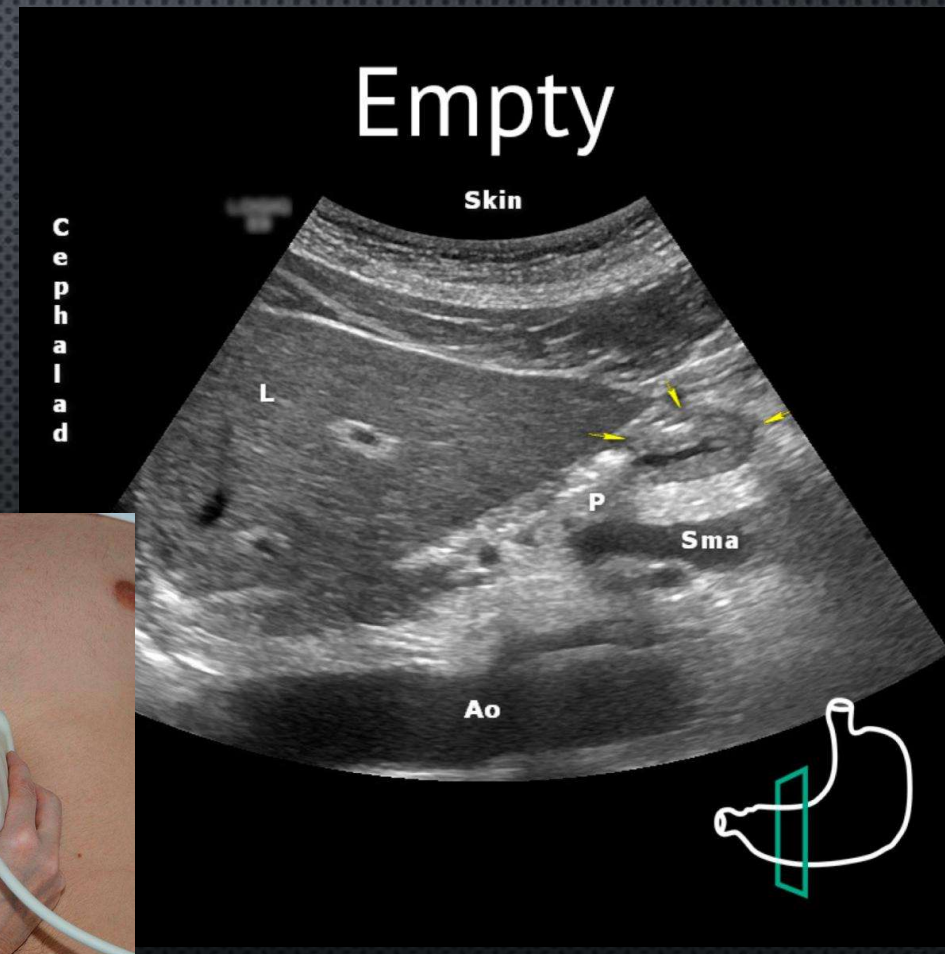
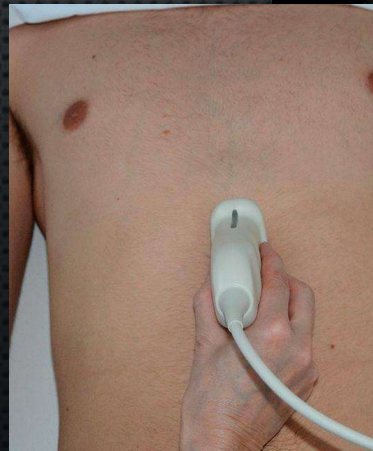




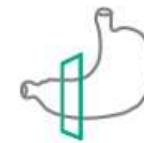
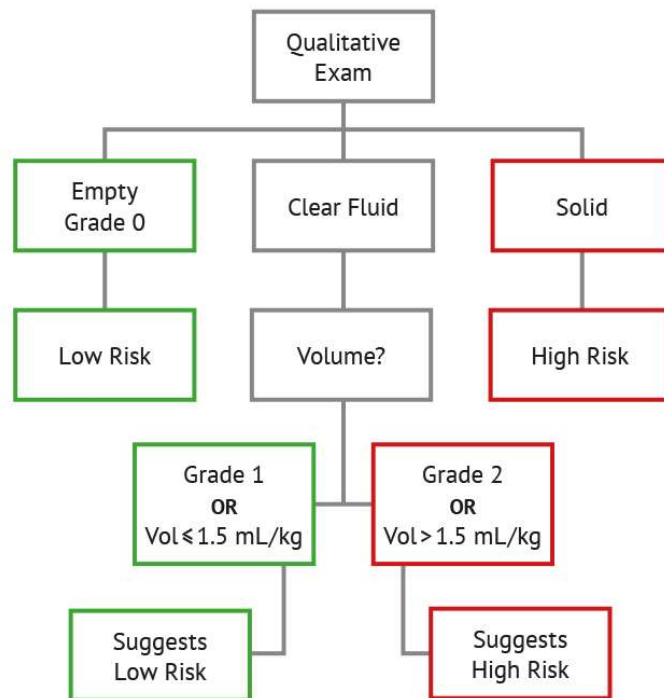


# HOW TO GET STARTED IN POCUS: GASTRIC

- DETECTS GASTRIC CONTENTS AT THE GASTRIC ANTRUM
  - UNRELIABLE WITH PREGNANCY, GASTRIC BYPASS, CAUTION WITH SEVERE GERD
  - WHO TO TEST: WHEN THERE'S QUESTIONS ABOUT AN EMPTY GASTRUM
    - \*\*NOT EVERYONE NEEDS TO BE TESTED\*\*
- POSITION: SUPINE AND RLD
- PROBE CHOICE: CURVILINEAR OR PHASED ARRAY
- PROBE POSITION: SUBXIPHOID, SAGITTAL VIEW, INDICATOR CEPHALAD, SLIGHT CEPHALAD TILT
- LANDMARKS:
  - TIP OF THE LEFT LOBE OF THE LIVER
  - SUPERIOR MESENTERIC ARTERY
  - AORTA
  - RECTUS ABDOMINUS
- MEASURE AREA OF ANTRUM, APPLY TO CHART



# GASTRICULTRASOUND.ORG



## Gastric UltraSound

A Point-of-care tool for aspiration risk assessment

Right lat CSA	Age(y)						
	20	30	40	50	60	70	80
2	31	18	5	0	0	0	0
3	45	32	20	7	0	0	0
4	60	47	34	21	9	0	0
5	74	62	49	36	23	10	0
6	89	76	63	51	38	25	12
7	103	91	78	65	52	40	27
8	118	105	93	80	67	54	41
9	133	120	107	94	82	69	56
10	147	135	122	109	96	83	71
11	162	149	136	123	111	98	85
12	177	164	151	138	125	113	100
13	191	178	165	153	140	127	114
14	206	193	180	167	155	142	129
15	220	207	194	182	169	156	143
16	235	222	209	200	184	171	158
17	249	236	224	211	198	185	173
18	264	251	239	226	213	200	187
19	278	266	253	240	227	214	202
20	293	281	268	255	242	229	217
21	307	295	282	269	256	244	231
22	323	310	297	284	271	259	246
23	337	324	311	298	285	273	260
24	352	339	326	313	301	288	275
25	366	353	340	327	315	302	289
26	381	368	355	343	330	317	304
27	395	382	369	357	344	331	318
28	410	397	385	372	359	346	333
29	424	411	398	386	373	360	347
30	439	427	414	401	388	375	363



0

P

5

10

15

17cm

MI  
0.5

TIS  
0.1

Frame Rate  
30 Hz

Gain  
50

Depth  
17.0 cm

Transducer  
S4-1

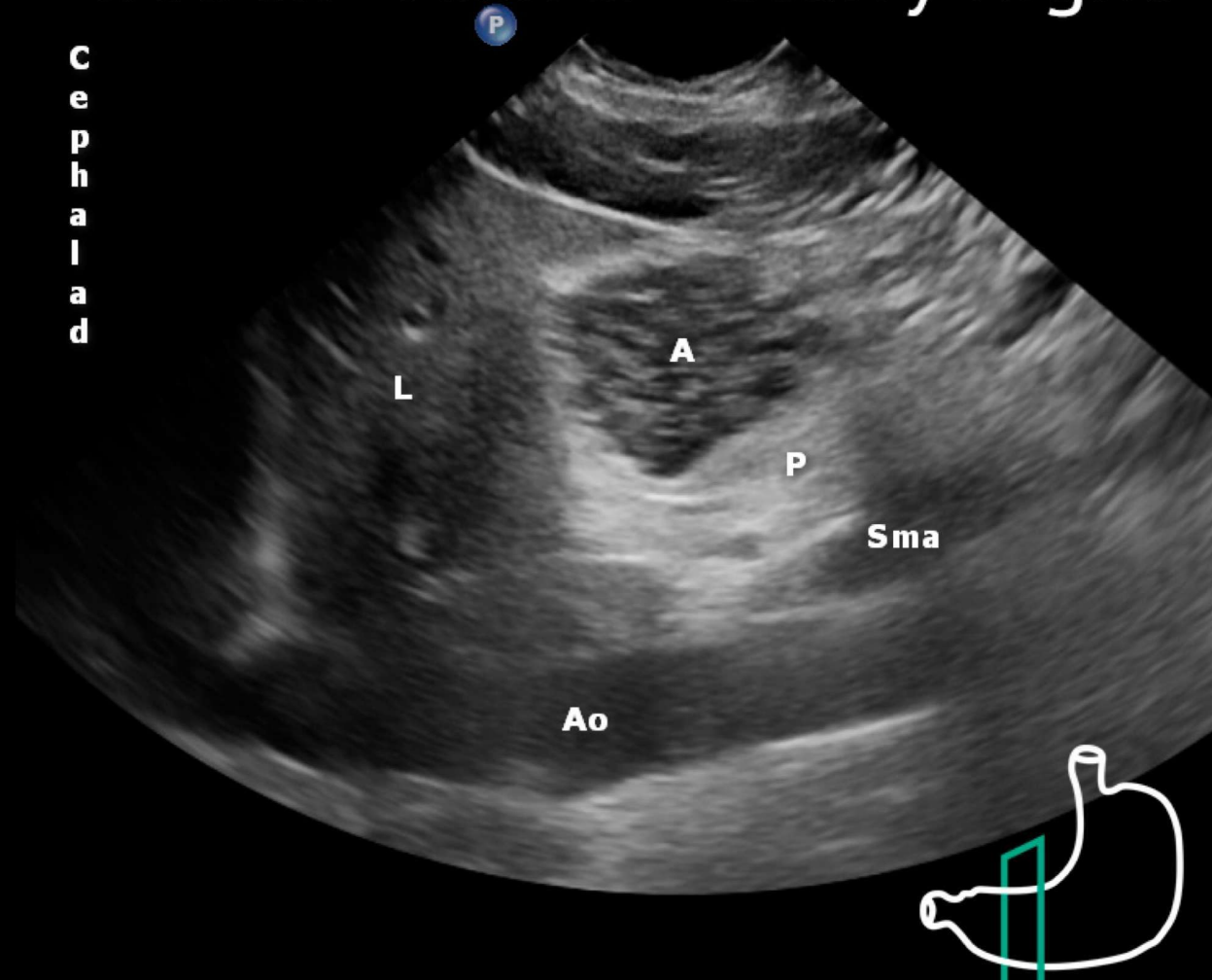
Preset  
Abdomen

Power  
-0.3 dB



# Clear fluid - starry night

C  
e  
p  
h  
a  
l  
a  
d

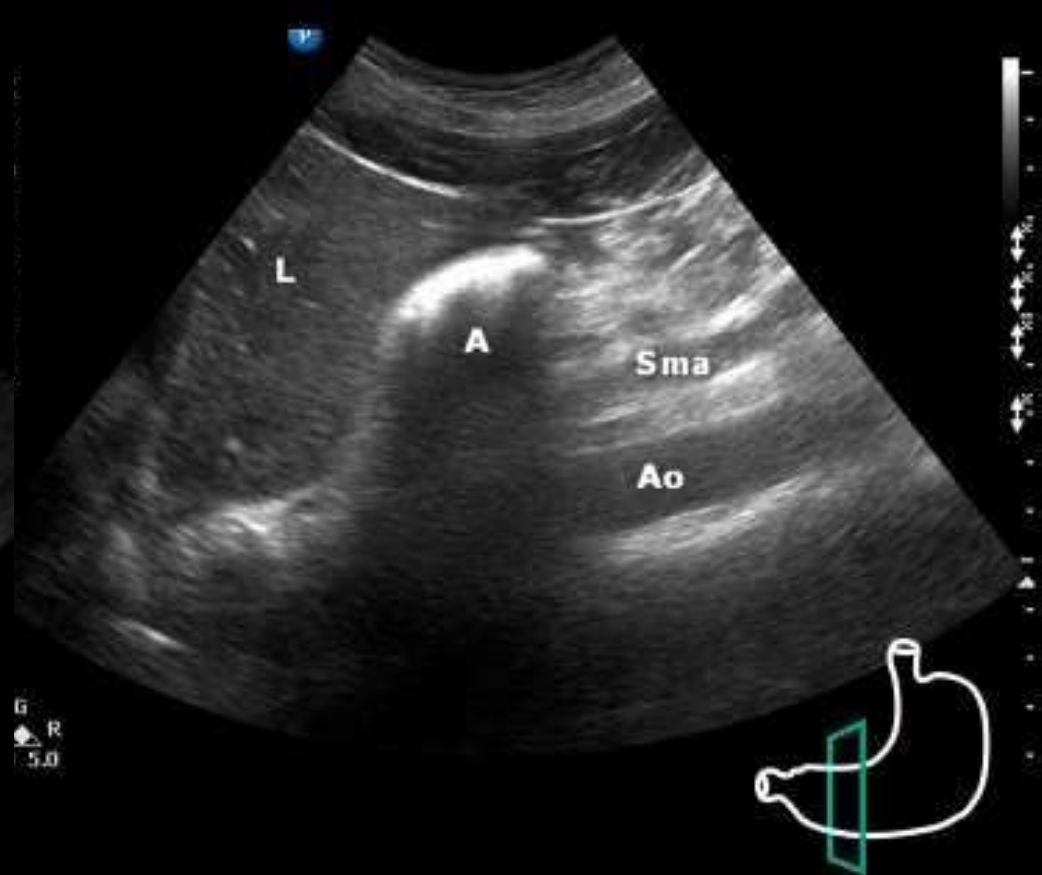


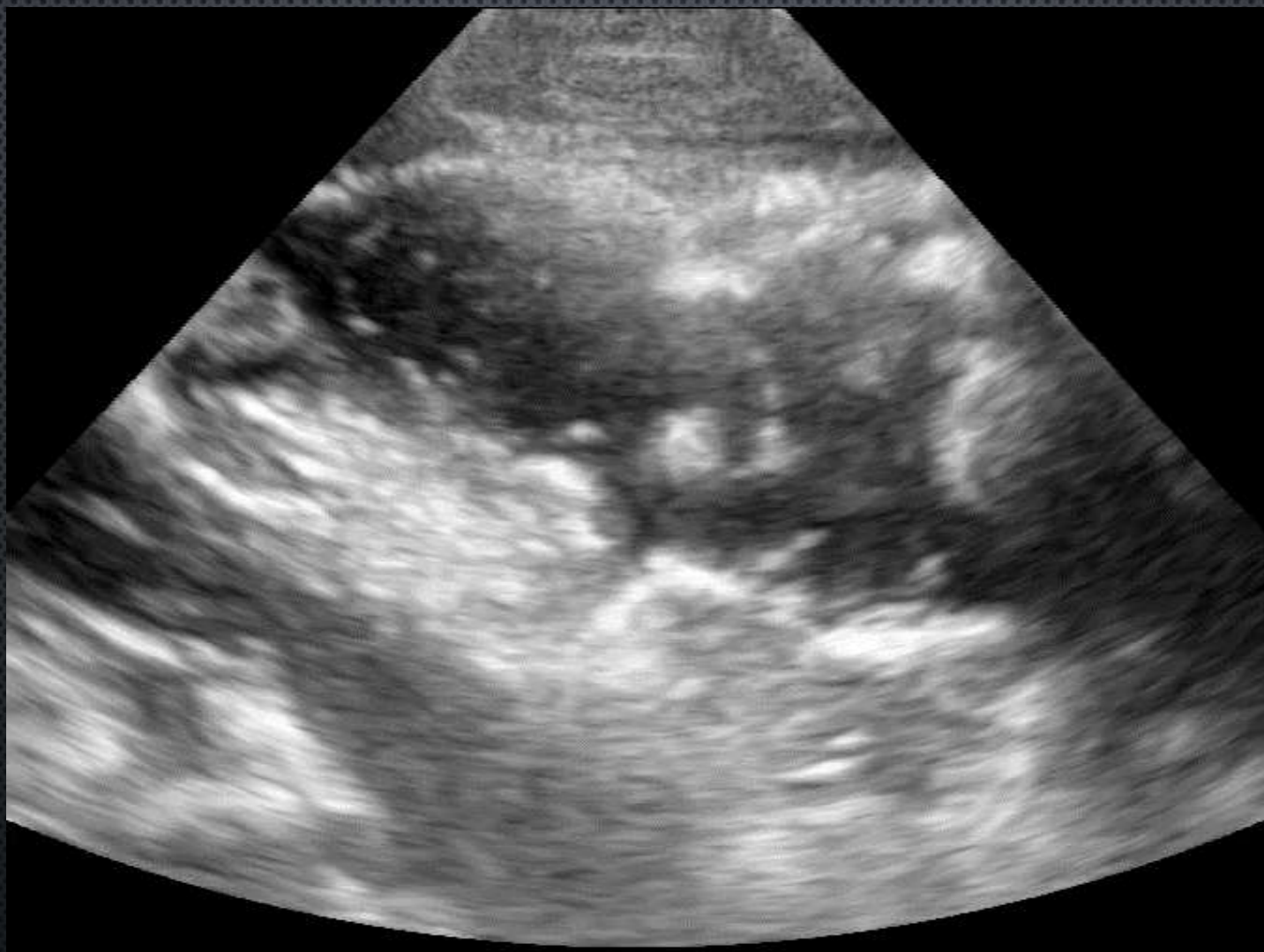


## Solid - late stage



## Solid - early stage

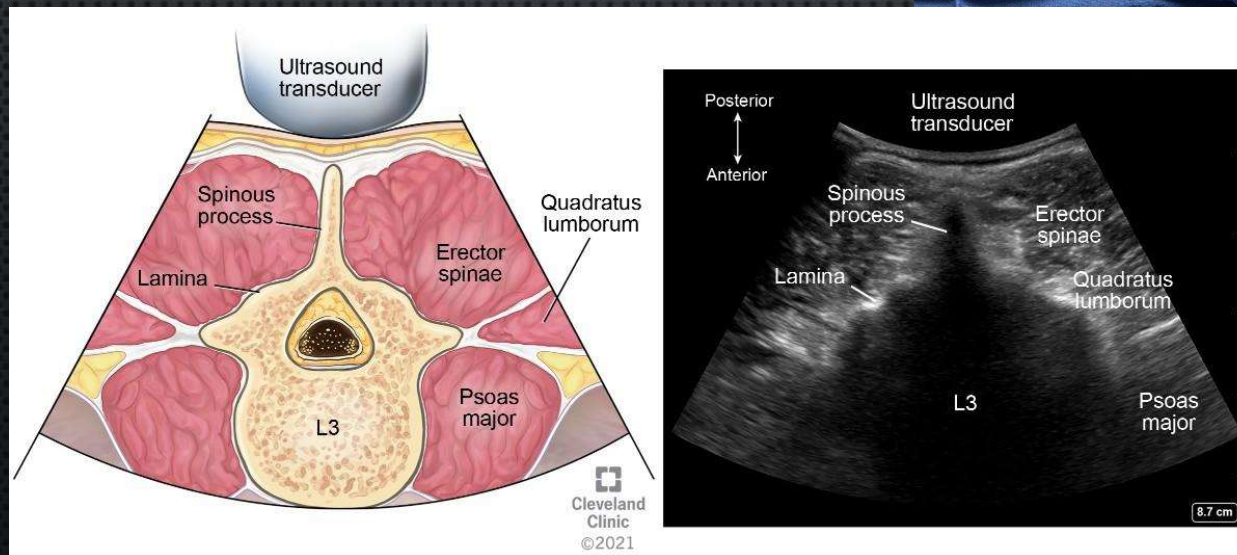


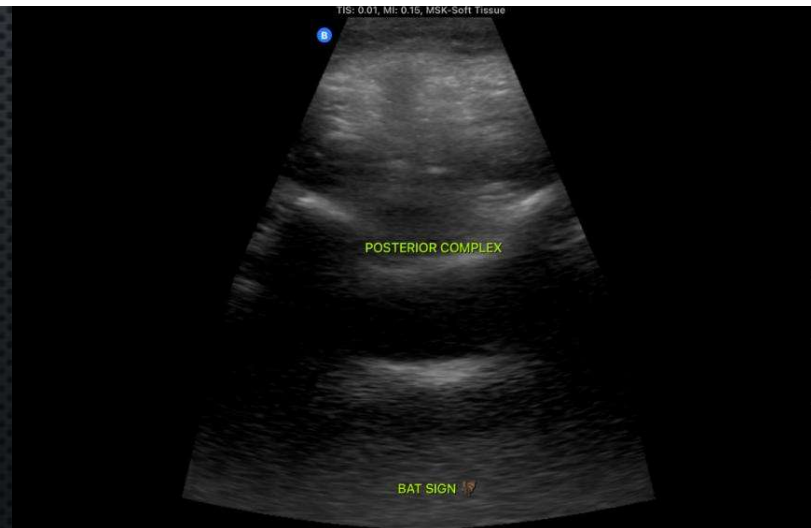
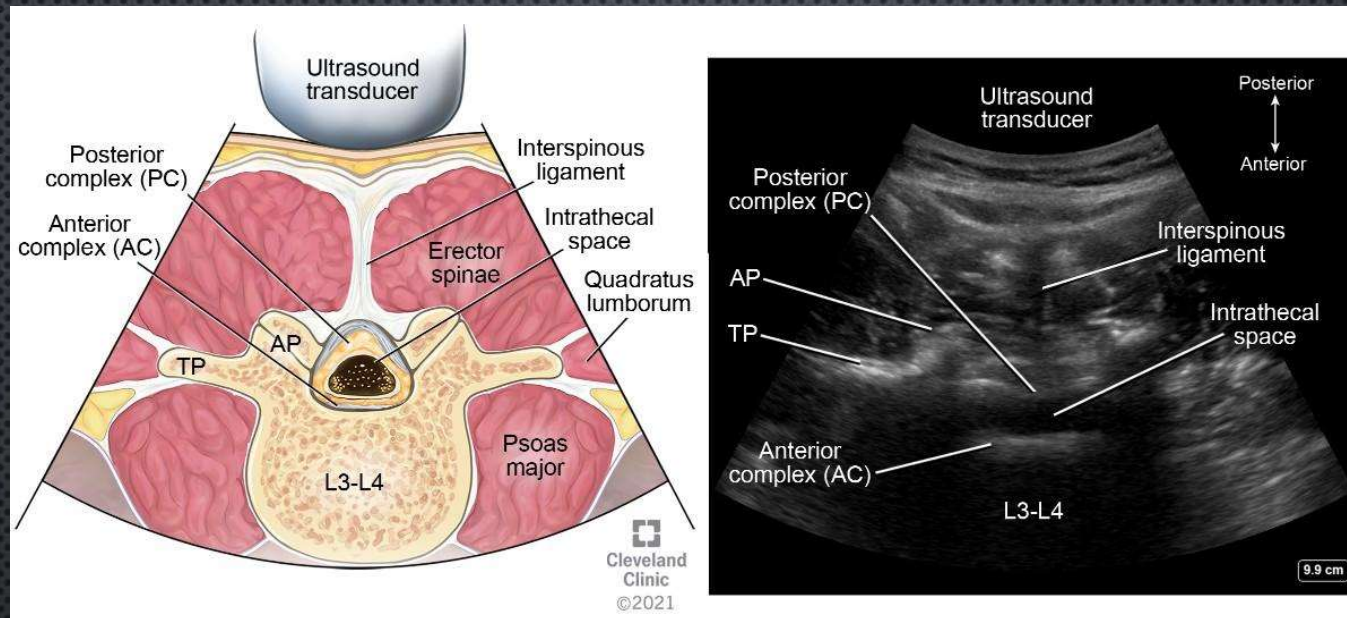




# SPINAL ULTRASOUND: FINDING MIDLINE

- INDICATIONS: SCOLIOSIS, HARDWARE, ARTHRITIS, OBESITY
- PROBE: CURVILINEAR
  - MSK ON BUTTERFLY IQ WORKS WELL
- TURN ON CENTERLINE MARKER
- START IN TRANSVERSE VIEW
- FIND SPINOUS PROCESS, MARK ON SKIN
- FIND THE POSTERIOR COMPLEX, THIS IS THE APPROXIMATE DEPTH TO EPIDURAL SPACE





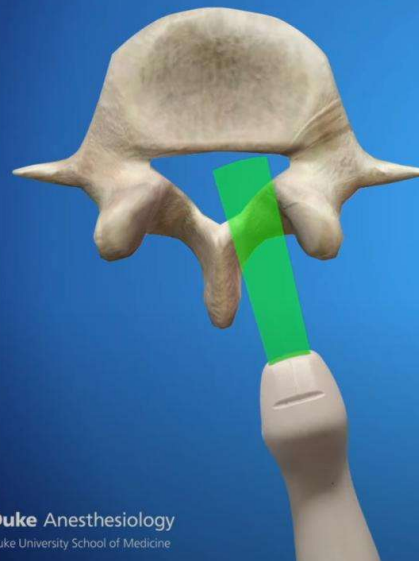


# SPINAL ULTRASOUND: FINDING A SPECIFIC SPACE



MEDIAN  
L,

## Vertebral Sonoanatomy

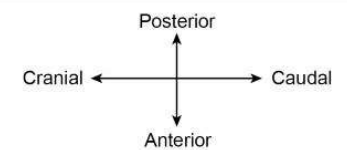
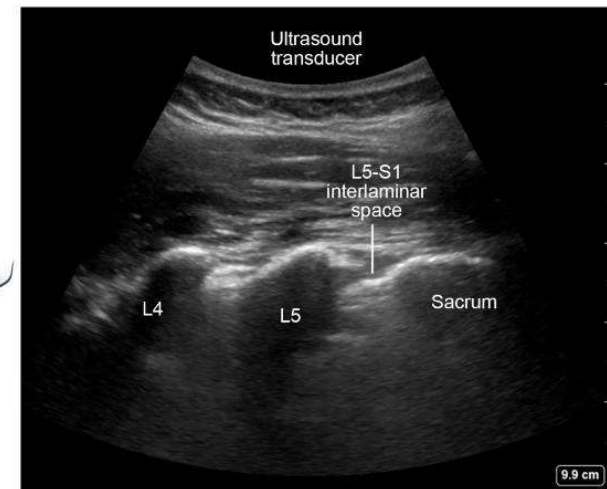
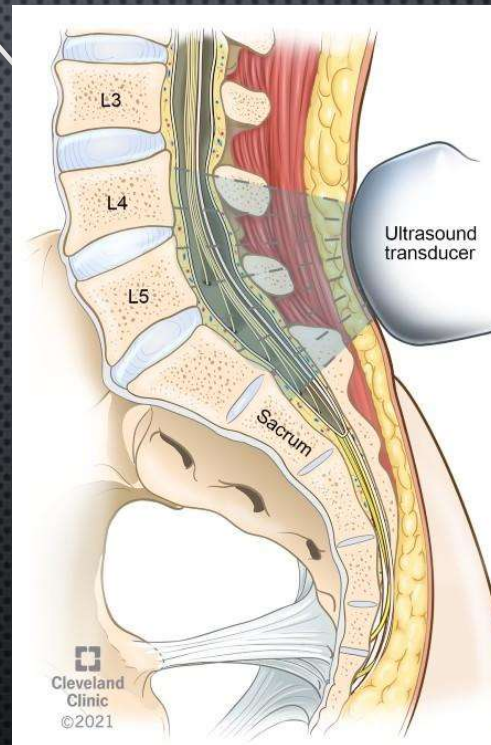


**Duke Anesthesiology**  
Duke University School of Medicine


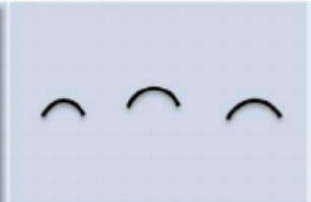


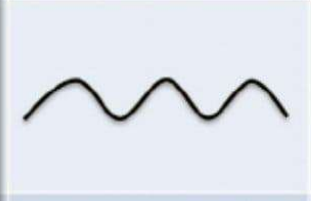





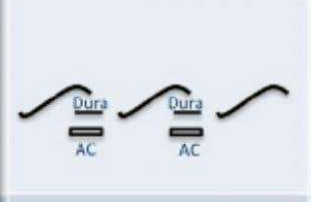


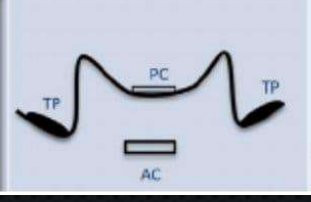

**Regional Anesthesia**  
and Acute Pain Medicine

## FINDING A SPACE, CON

- SCAN DOWNWARDS UNTIL YOU FIND THE SACRUM
- L5 RIGHT ABOVE THAT
- COUNT SPACES TO GET TO L4-L5, L3-L4



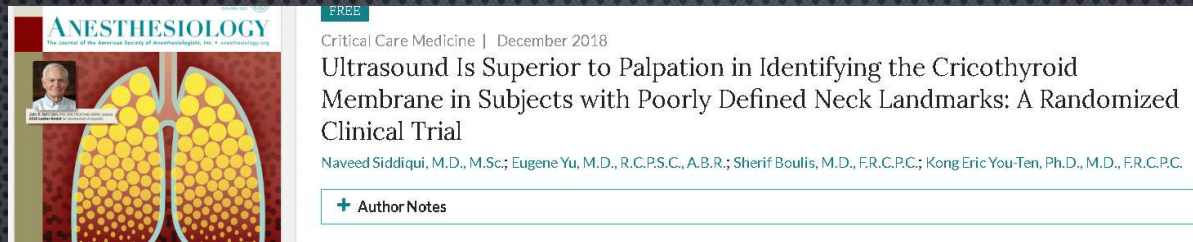


View	Probe orientation	Pattern recognition image	Ultrasound view	Notes
Paramedian Sagittal Transverse Process View				The "trident sign" represents finger-like shadowing behind the transverse processes.
Paramedian Sagittal Articular Process View				"Camel humps" represent continuous hyperechoic bone, due to vertebrae being connected by articular processes.
Paramedian Sagittal Laminar View				"Sawtooth" or "Horse Heads" represent the laminae, the hyperechoic bone is not continuous and the interlaminar space allows visualization of the posterior and anterior complex.
Paramedian Sagittal Oblique View				Slight medial tilt optimizes the view of the posterior and anterior complexes. The dura is seen as a thin hyperechoic line.
Tranverse Interlaminar view				The articular processes/facet joints and transverse processes (TP) are visible. Tilting the probe will highlight the posterior (PC) and anterior (AC) complexes.

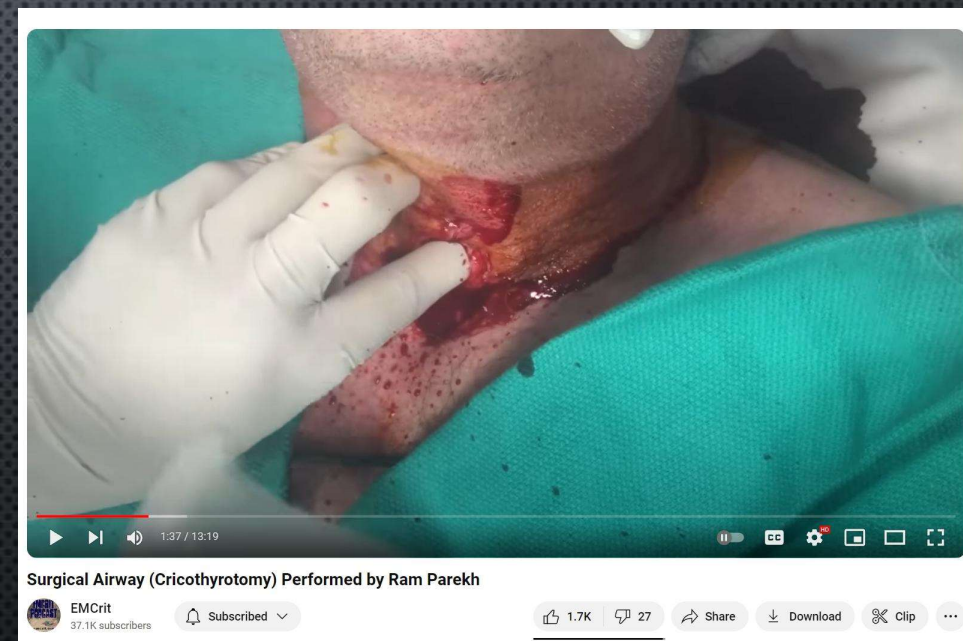
# AIRWAY: WHERE'S THE LARYNX?





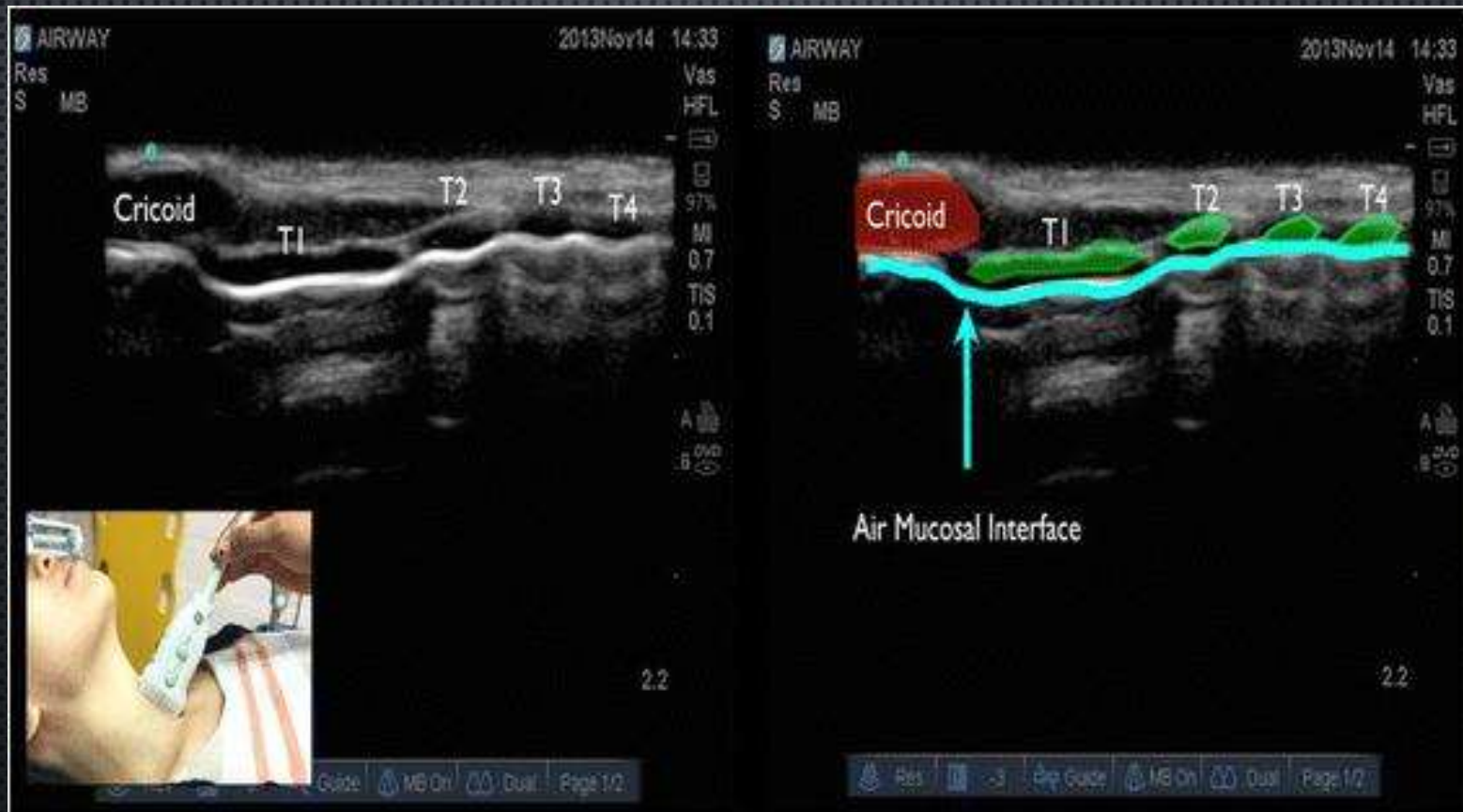


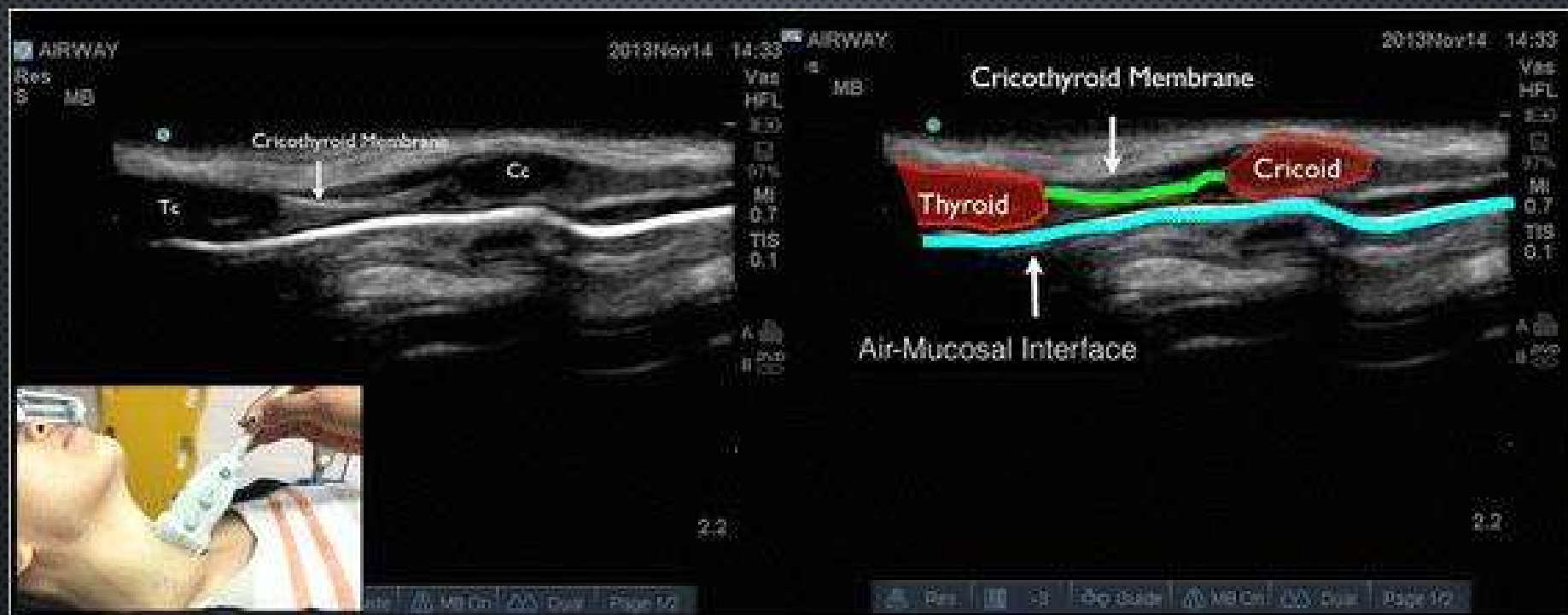
- PROBE: LINEAR
- POSITION: SUPINE, NECK EXTENDED IF POSSIBLE
- START WITH PROBE IN A TRANSVERSE VIEW
  - OBTAIN VIEW OF TRACHEA, SCAN TO FIND VOCAL CORDS
  - MARK MIDLINE OF TRACHEA IN THE TRANSVERSE VIEW
- OBTAIN SAGITTAL VIEW
  - FIND "PEARLS" OF TRACHEAL RINGS
  - FIND CTM AFTER DROP-OFF FROM CRICOID CARTILAGE
  - MARK LOCATION
- TRICK FOR RAPID MARKING OF CTM: USE A NEEDLE WHILE IN SAGITTAL VIEW, UNDERNEATH PROBE HEAD







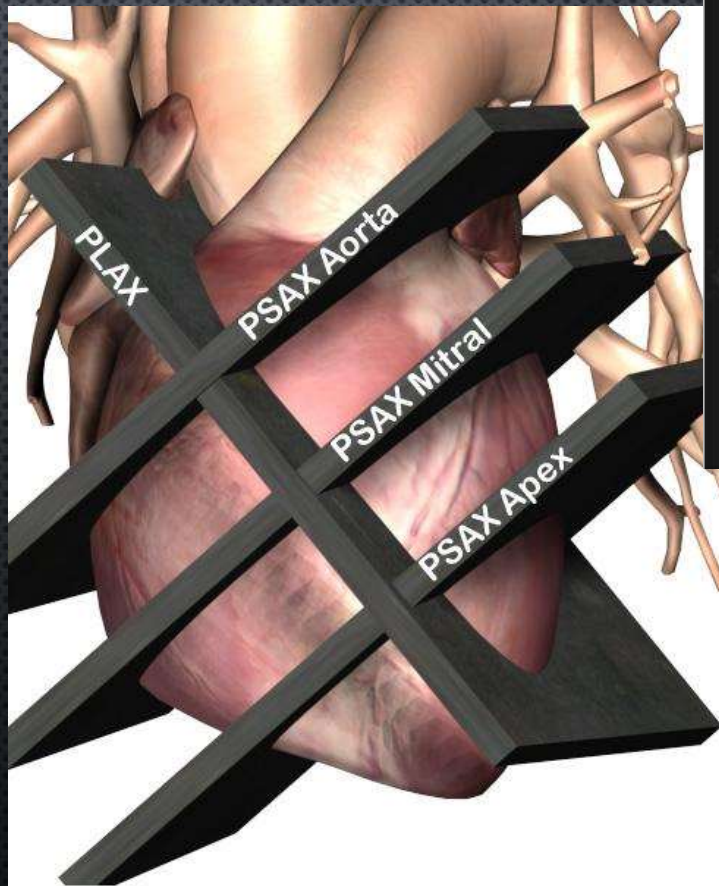






# CARDIAC: PARASTERNAL LONG AXIS (PLAX)

- USEFUL FOR PRE-OP AND INTRA-OP EVALUATION OF THE HEART
- CROSS-SECTION OF THE HEART THAT INCLUDES MAJOR VALVES AND CHAMBERS
- BASIC DIAGNOSTIC CAPABILITIES:
  - EF ESTIMATION VIA EPSS
  - RV VS LV SIZE AND FUNCTION
    - MI IN PROGRESS, RHYTHM CHANGES
  - AV, MV FUNCTION
  - PERICARDIAL EFFUSION
  - THROMBUS FORMATION
  - CONTINUAL MONITORING OF CHANGES
- PROBE: PHASED, CURVILINEAR
- POSITION: SUPINE
- TECHNIQUE:
  - LEFT OF STERNUM, 3<sup>RD</sup>/4<sup>TH</sup> ICS
  - INDICATOR TOWARD RIGHT SHOULDER



198197242273808 - Quick ID

5/22/2019 11:32:45

0

5

10

15

16cm

P

MI  
0.9

TIS  
0.2

Frame Rate  
26 Hz

Gain  
52

Depth  
16.0 cm

Transducer  
S4-1

Preset  
Cardiac

Power  
-0.3 dB





APPROXIMATE - 0.00 0

APPROXIMATE - 0.00 0

0

10

20

30

100%



0.9

0.2

26 Hz

52

16.0 cm

54-1

Cardiac

-0.3 dB

953030463361843 - Quick ID

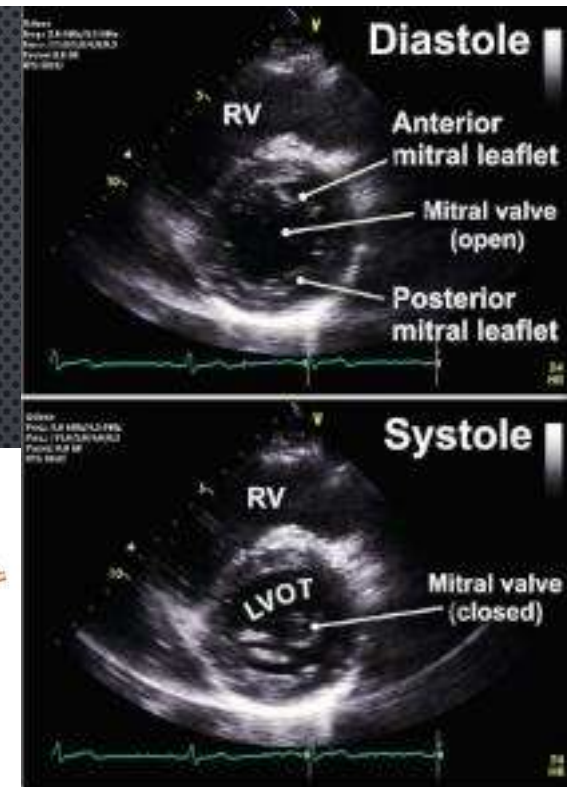
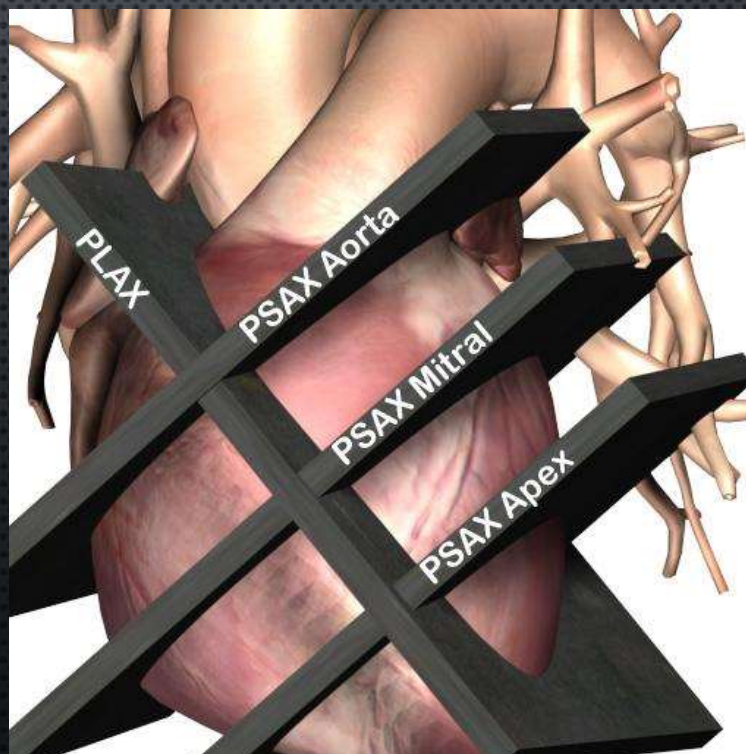
9/6/2019 08:36:51





# CARDIAC: PARASTERNAL SHORT AXIS

- USEFUL FOR ASSESSING MITRAL, AORTIC VALVES, RV/LV FUNCTION, RV/LV RATIO, PERICARDIAL EFFUSION
- THREE DIFFERENT VIEWS
- PROBE: CURVILINEAR/PHASED
- POSITION: SUPINE
- TECHNIQUE:
  - SAME POSITION AS PLAX, PROBE IS ROTATED 90 DEGREES TO POINT TO RIGHT SHOULDER



112897187554183 - Quick ID

7/24/2019 10:43:39

0

5

10

15

16cm



P

MI  
0.9

TIS  
0.2

Frame Rate  
26 Hz

Gain  
52

Depth  
16.0 cm

Transducer  
S4-1

Preset  
Cardiac

Power  
-0.3 dB





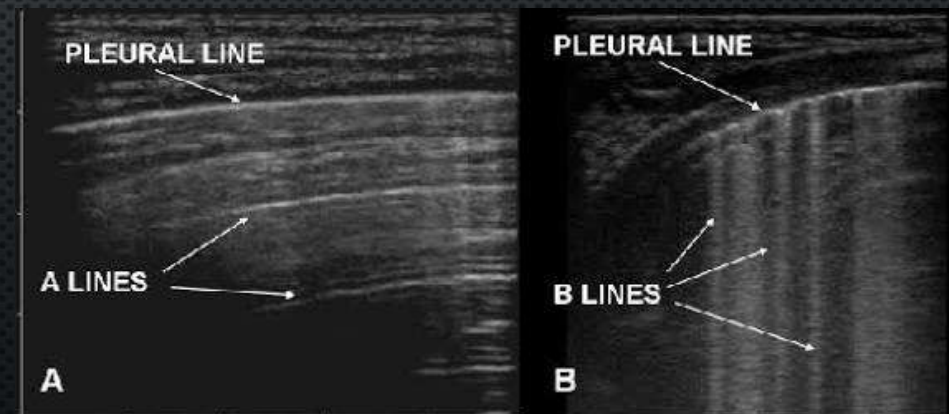
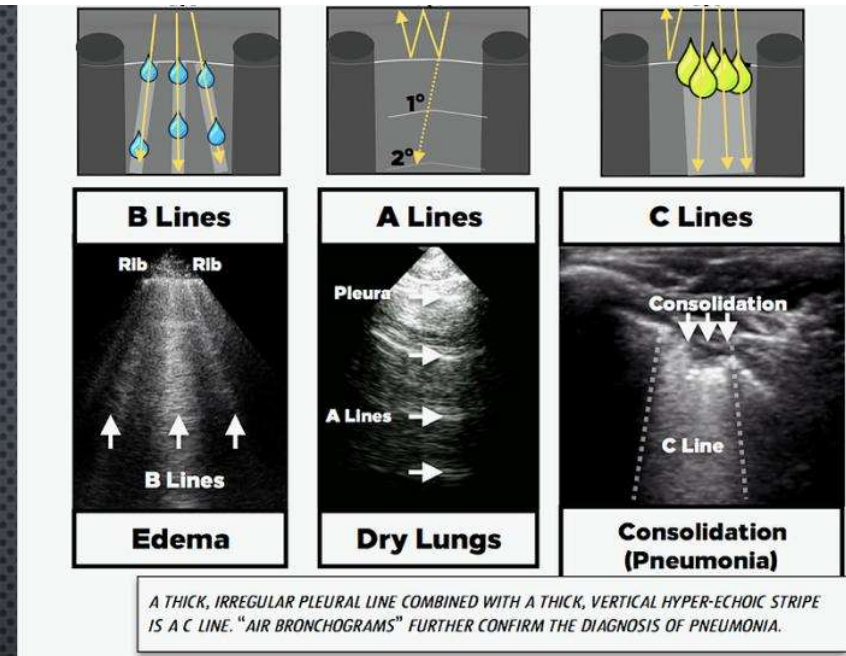




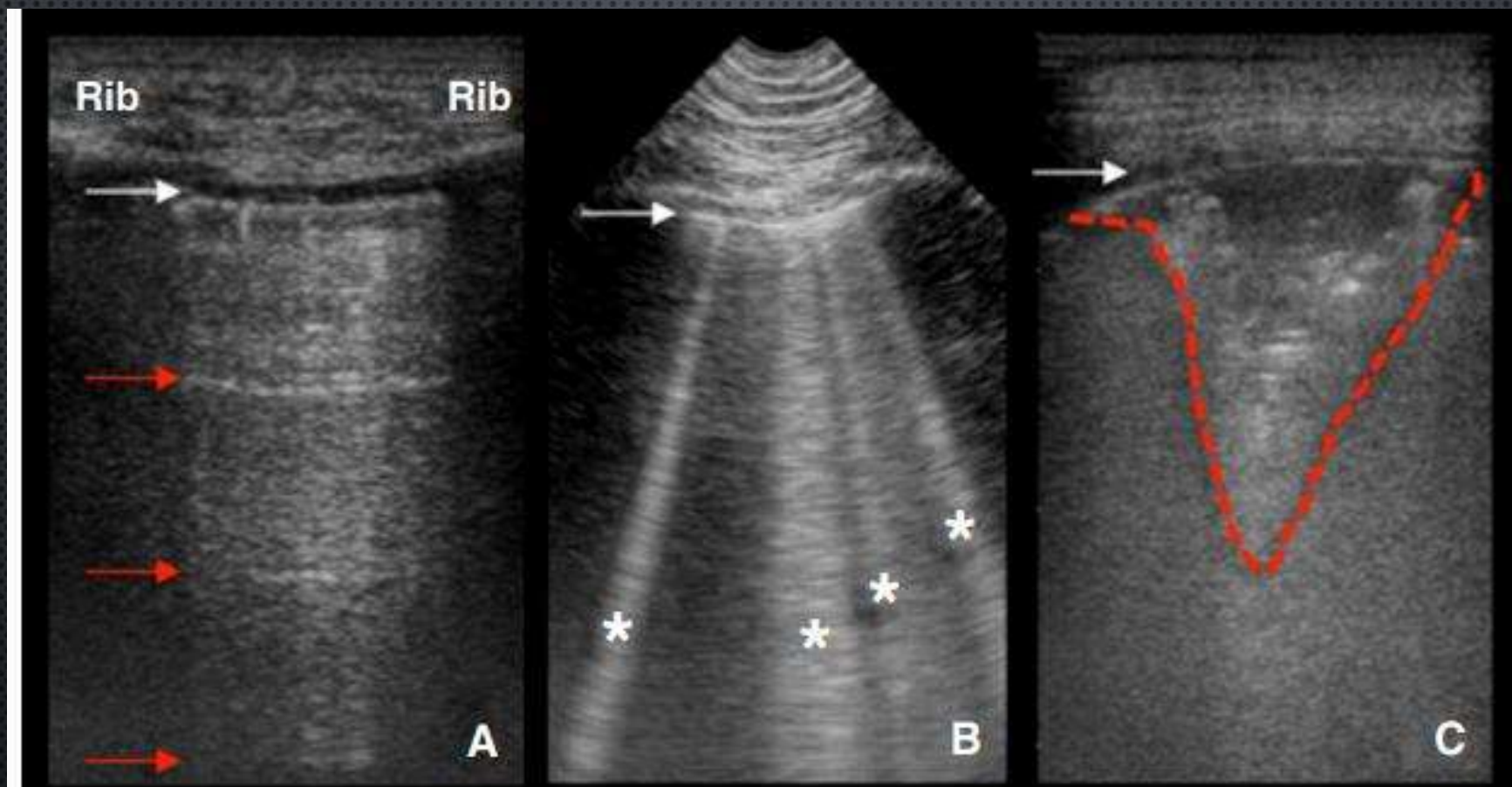


# 2 SLIDE LUNGS: A, B, AND C LINES

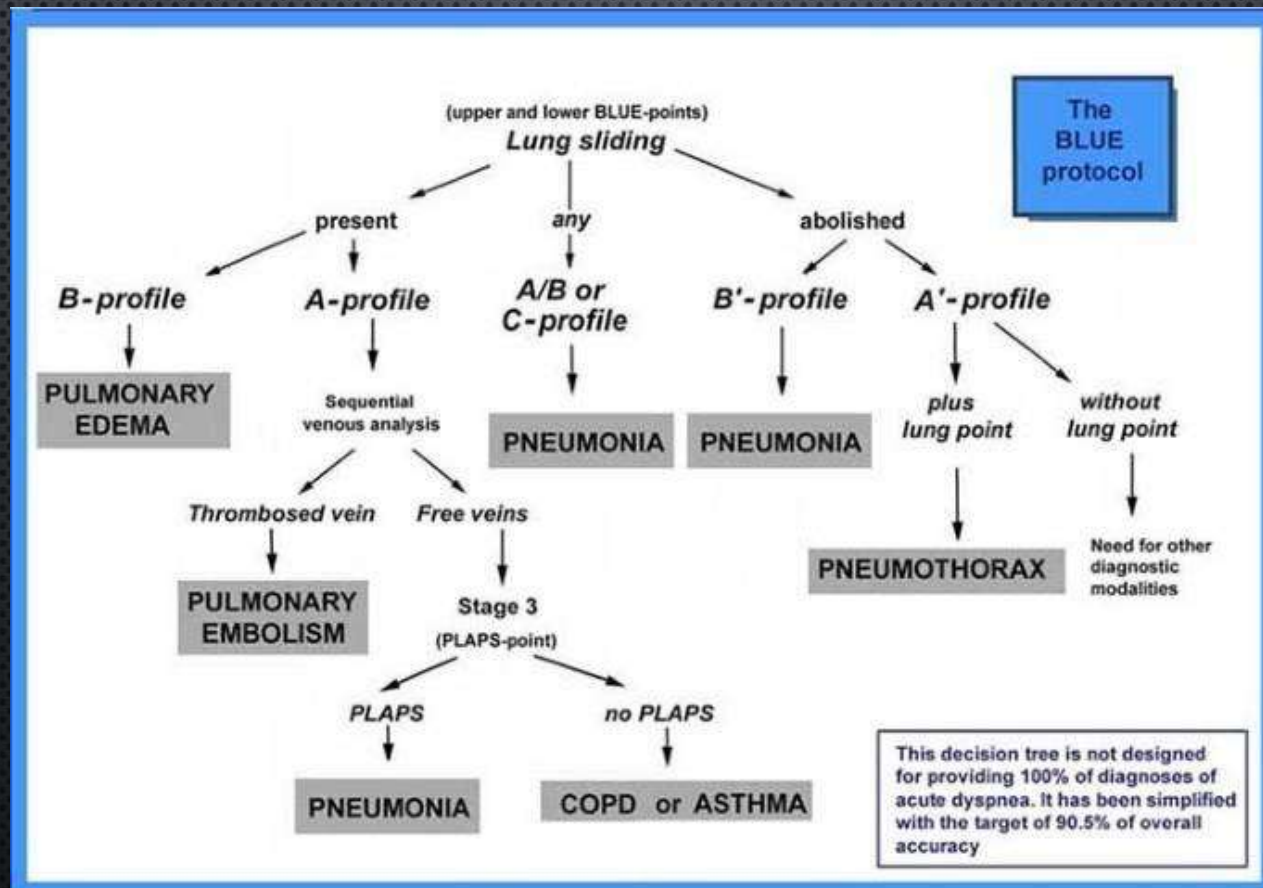
- INDICATE FLUID OR CONSOLIDATION IN THE LUNGS
- A LINES: **NORMAL** ARTIFACT, AND A DESIRABLE, EXPECTED FINDING
  - HORIZONTAL HYPERECHOIC LINES
  - SPACED REGULARLY
  - A "MIRAGE"
- B LINES: INDICATIVE OF PULMONARY EDEMA
  - THE MORE B LINES, THE WORSE THE EDEMA
- C LINES: INDICATE PLEURAL THICKENING AND TISSUE TOUCHING PLEURA – CONSOLIDATION OF ALVEOLAR TISSUE/PNEUMONIA: "SHRED SIGN"







# BLUE PROTOCOL FOR LUNG EVALUATION





# QUESTIONS?

POCUS and USGRA Page



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