



ACEPAEMUS

ADVANCED EMERGENCY MEDICINE ULTRASOUND

**Focused Practice Designation
Exam Review Course**

January 9, 2024



Basic Echocardiography

Petra Duran-Gehring, MD



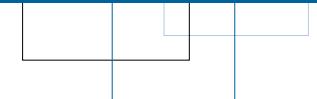
No Disclosures

2023 Core Content

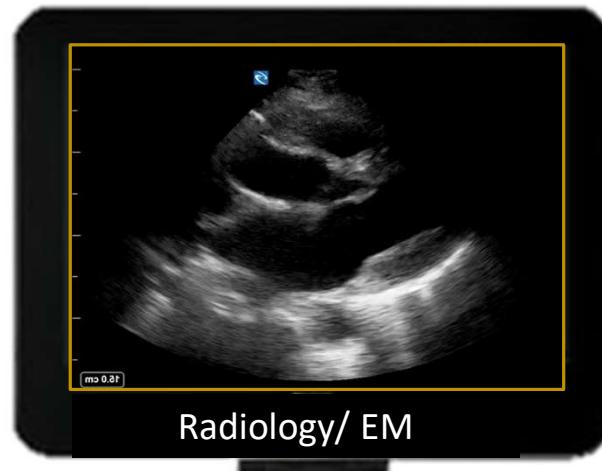


- 1.1.2 Cardiac
 - 1.1.2.1 Basic
 - 1.1.2.1.1 Cardiac arrest
 - 1.1.2.1.2 Global left ventricular function
 - 1.1.2.1.3 Global right ventricular size
 - 1.1.2.1.4 Pericardial fluid
 - 1.1.2.1.5 Tamponade physiology
 - 1.1.2.1.6 Inferior vena cava

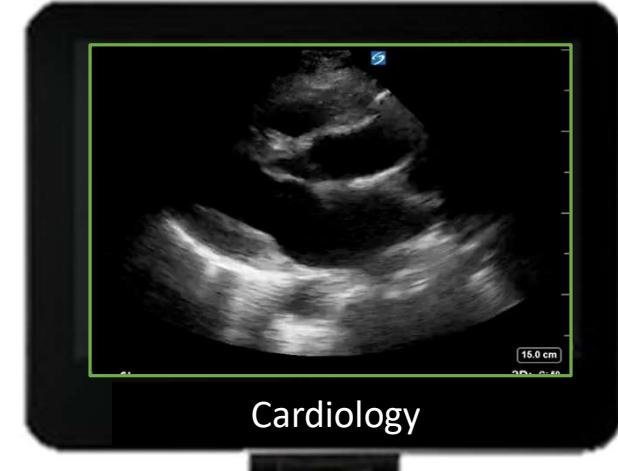
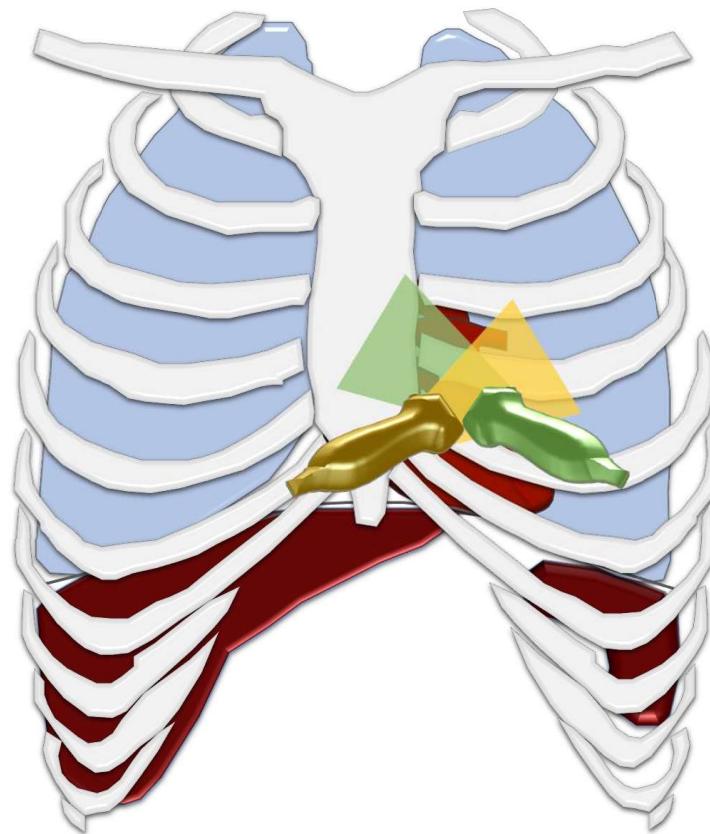
Adhikari S, et al. PMID: 37564703.



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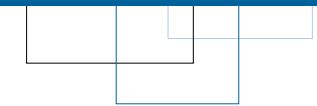


Radiology/ EM

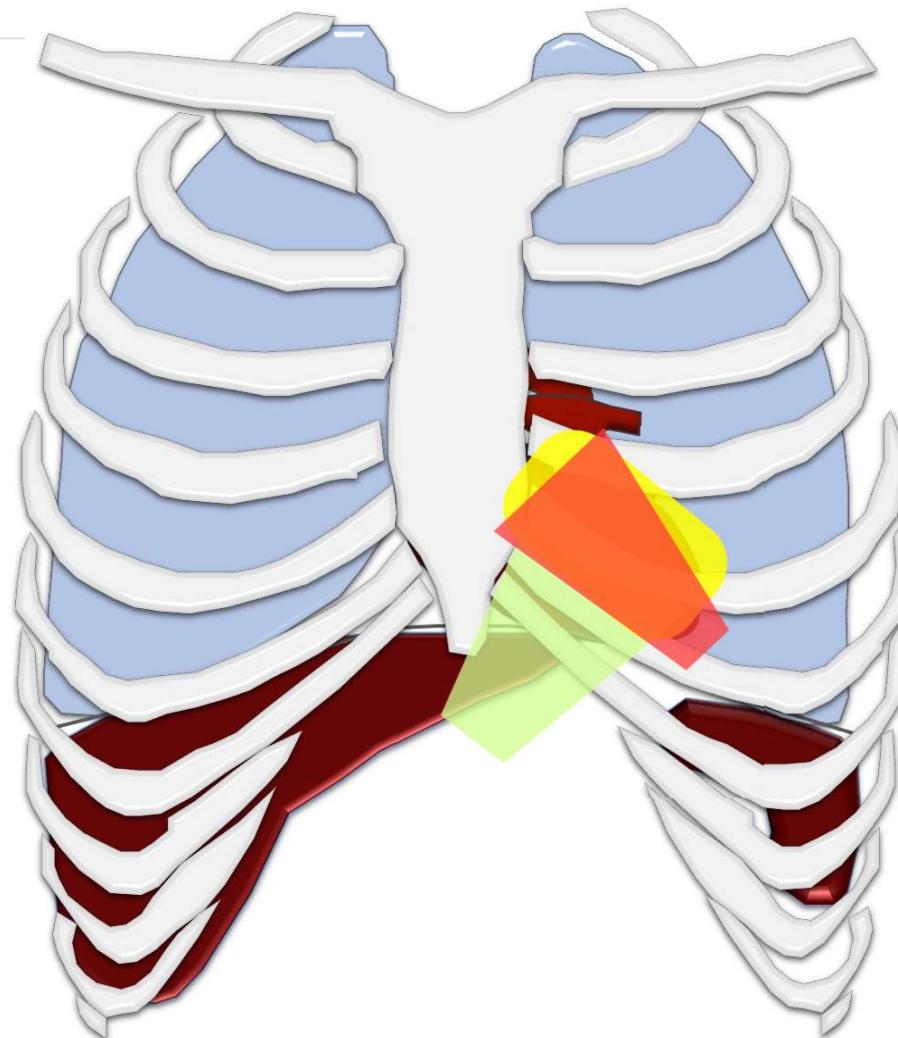


Cardiology

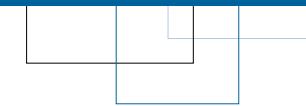
Moore C. PMID: 18304059



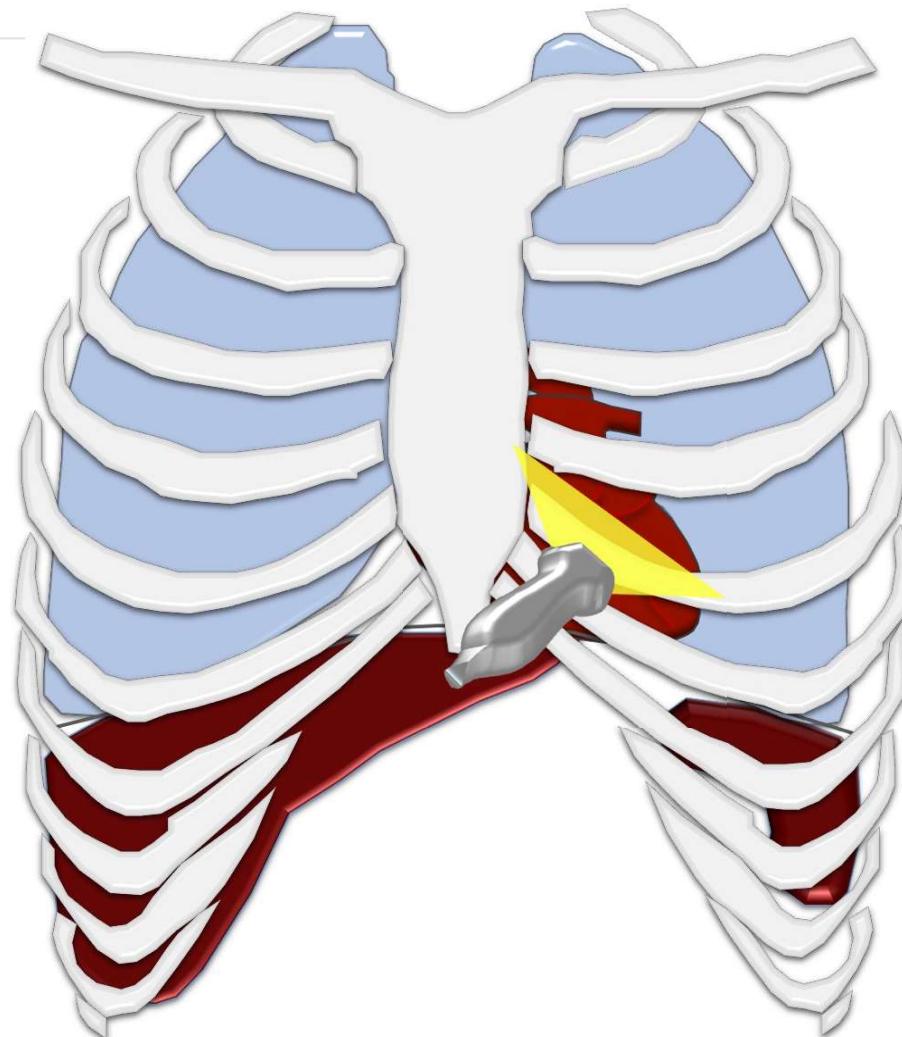
3 windows



6 views

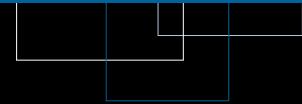


Parasternal Long



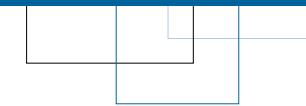


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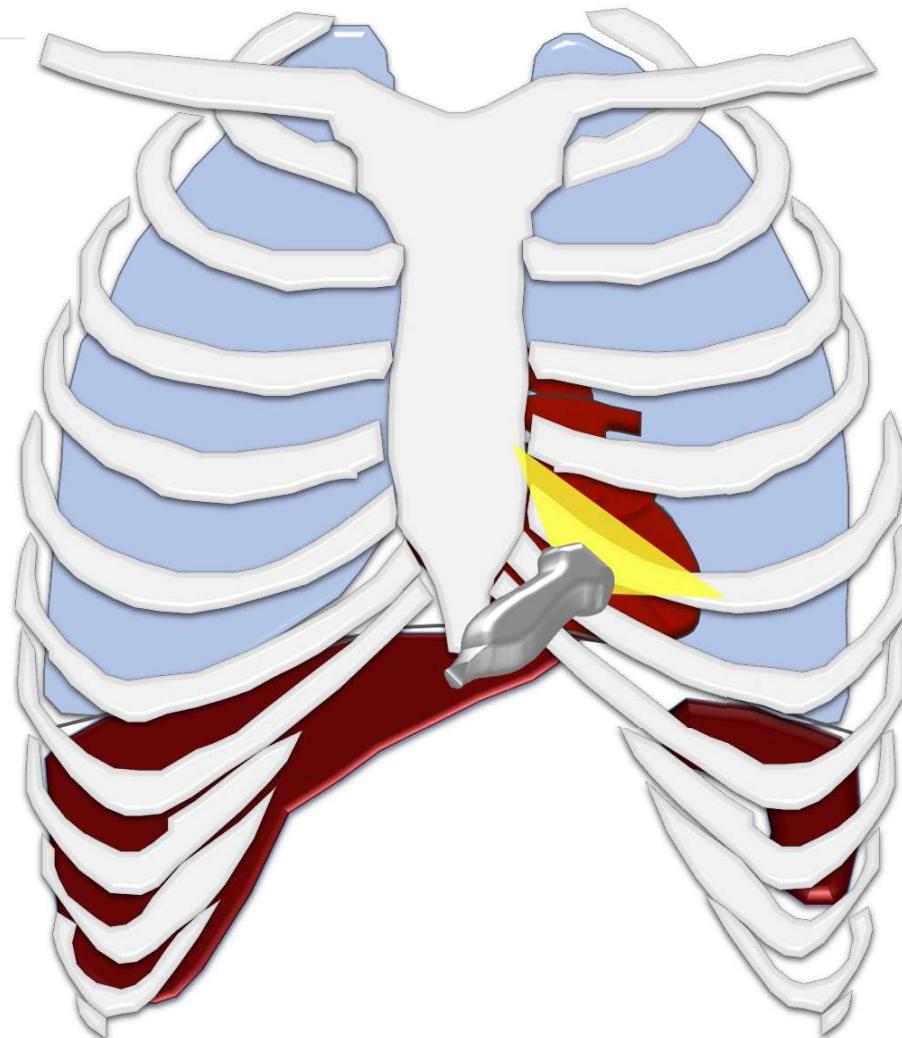


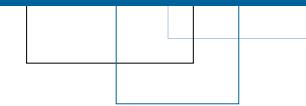
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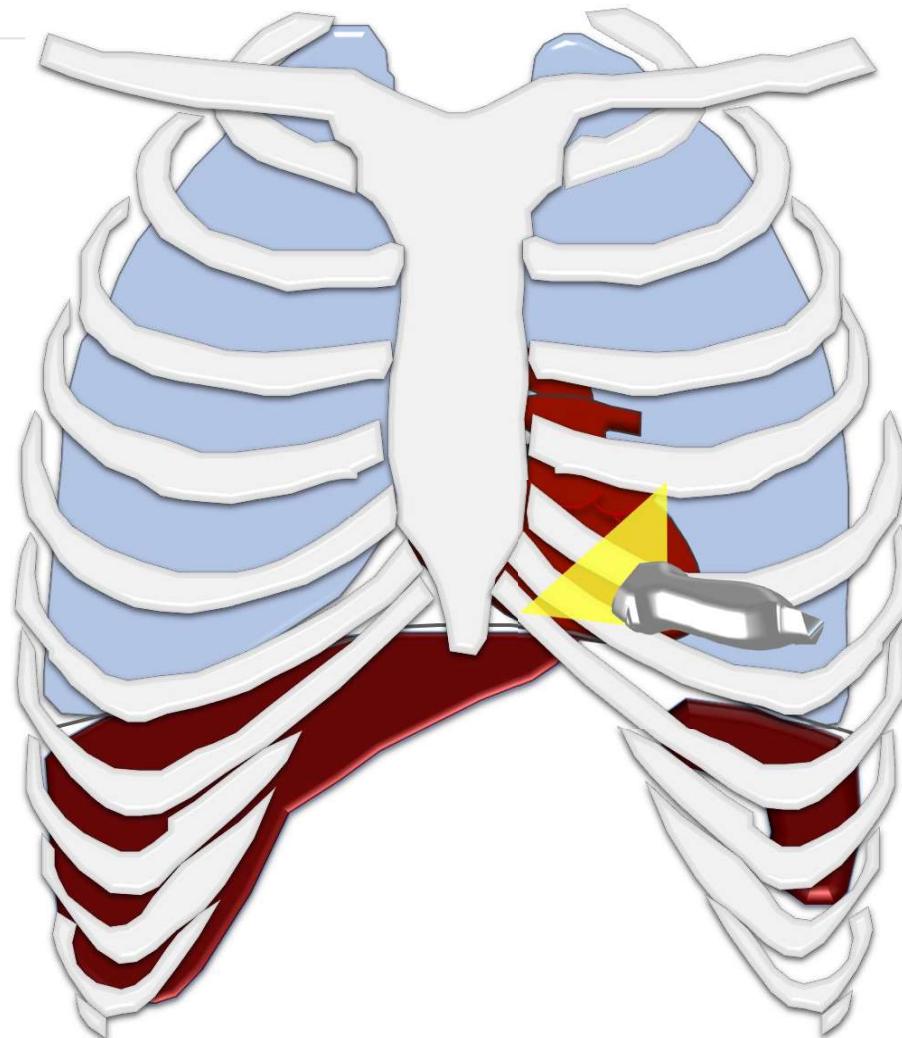


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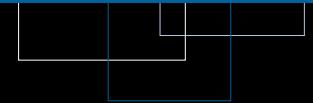


Parasternal Short



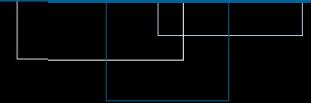


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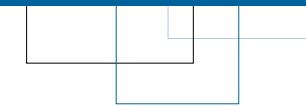
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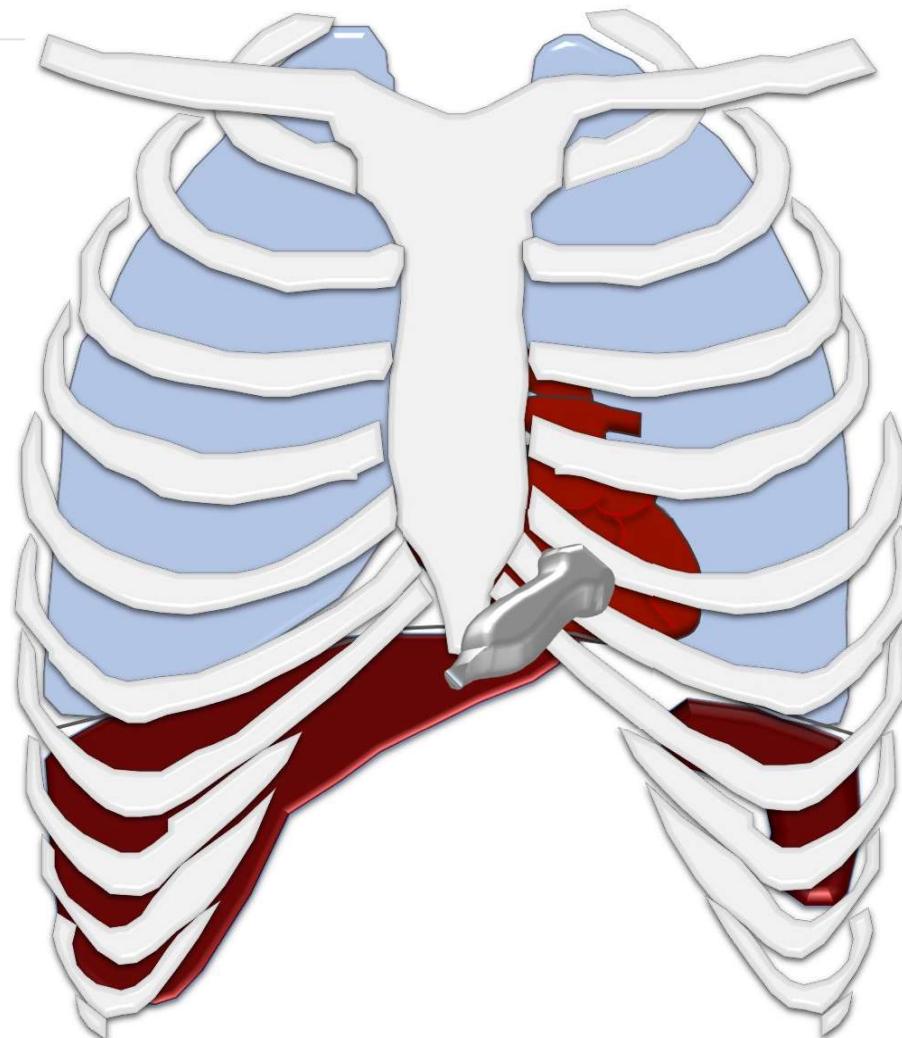


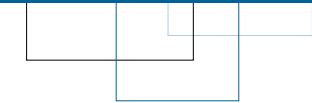
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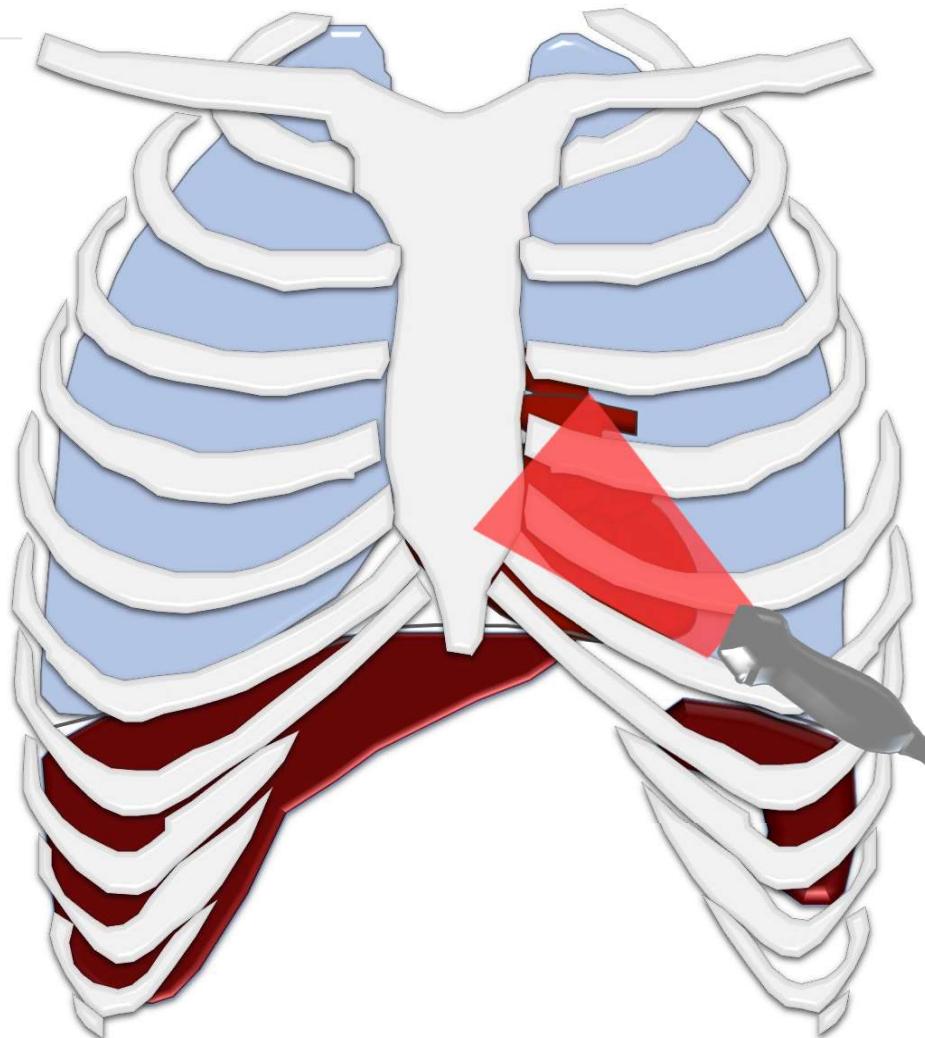


Parasternal





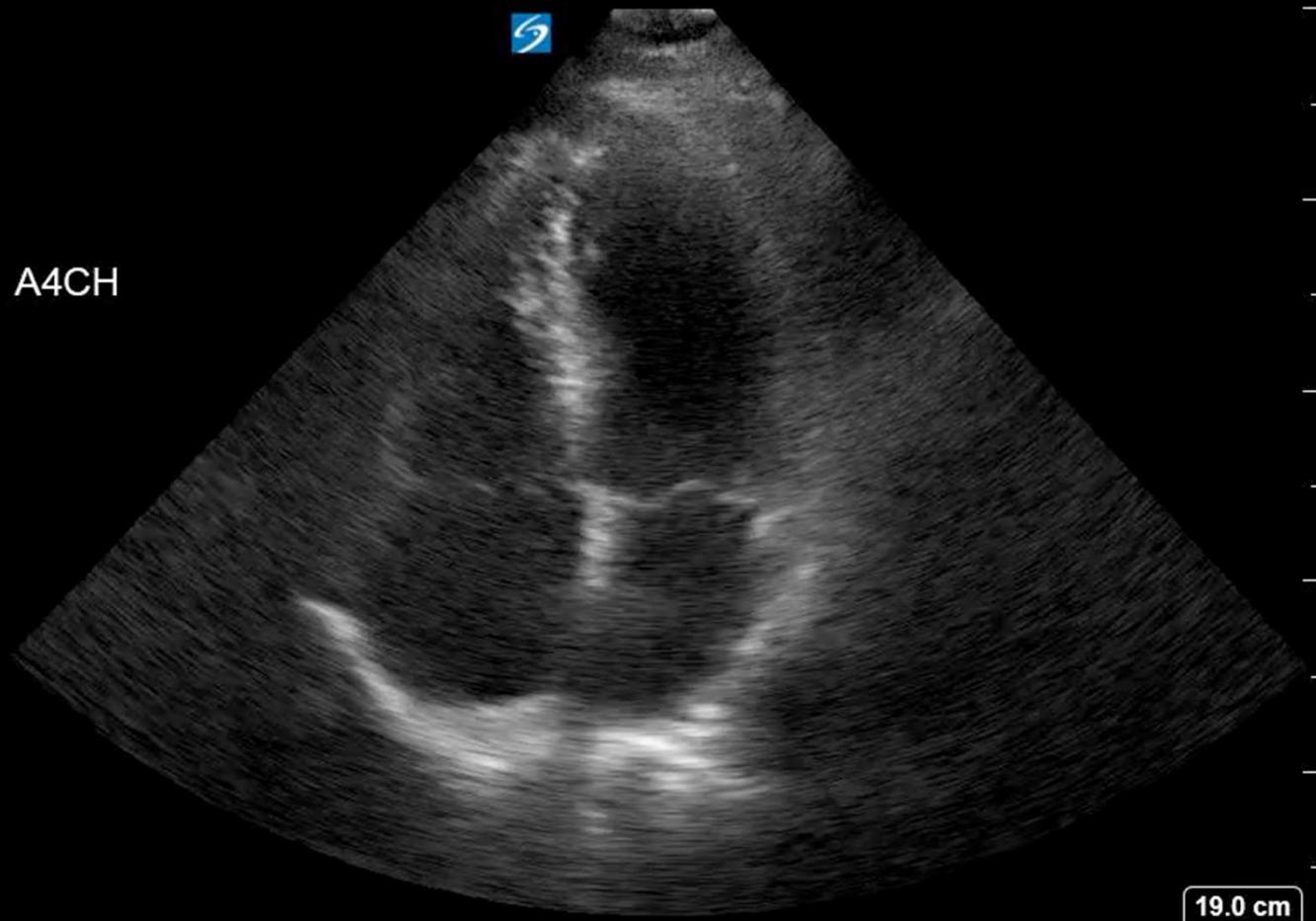
Apical
4 chamber



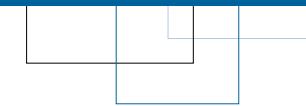


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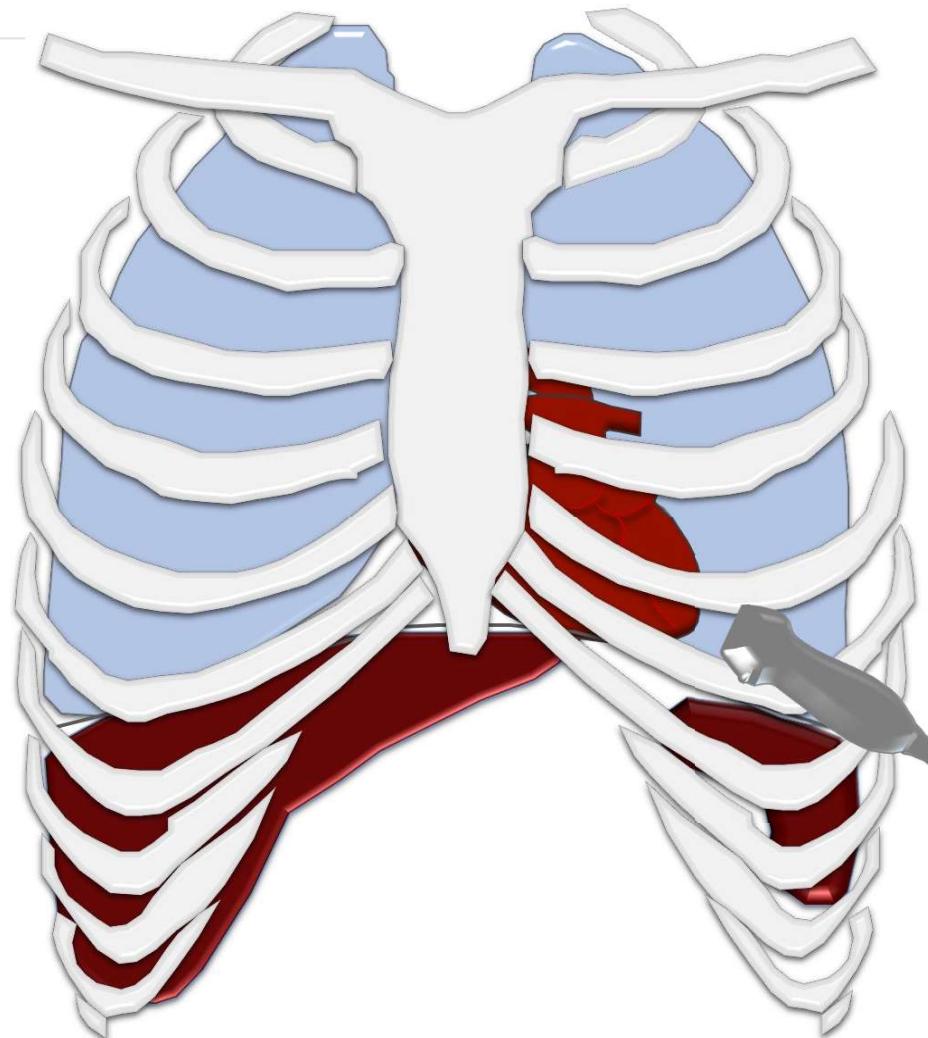
A4CH

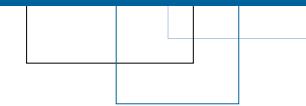


19.0 cm

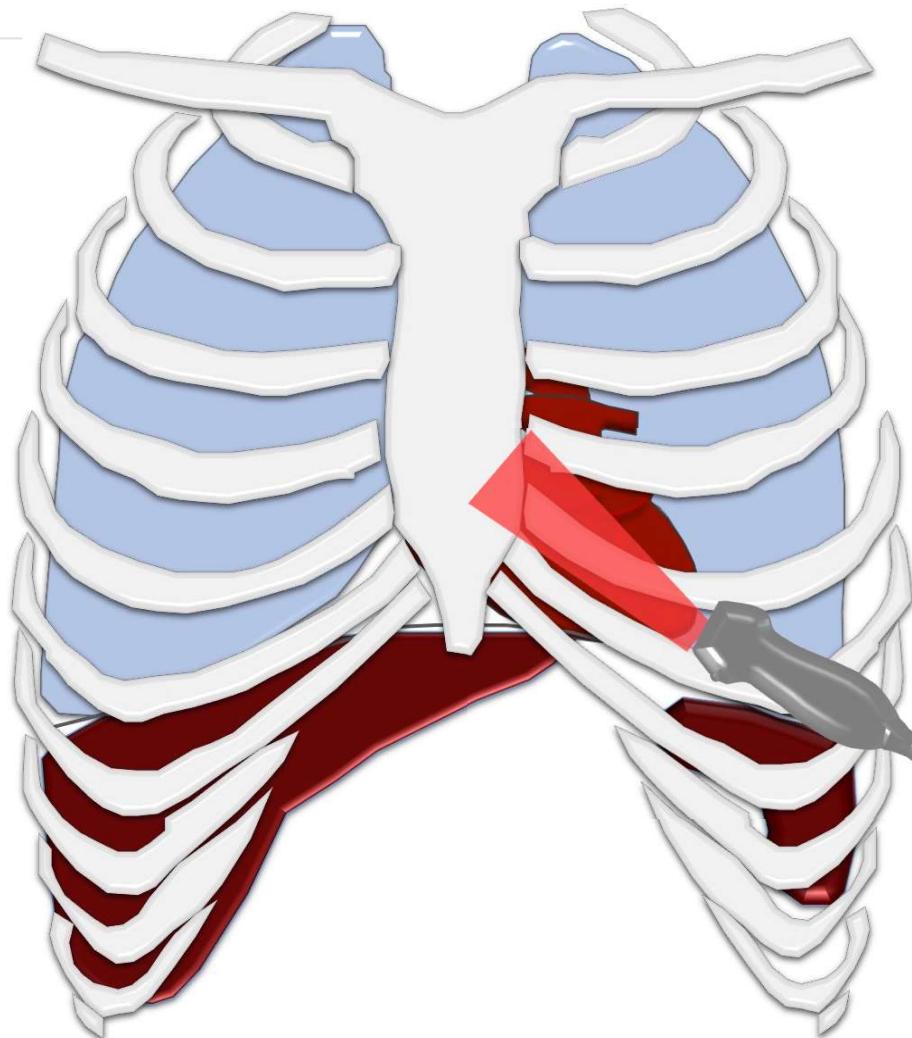


Apical



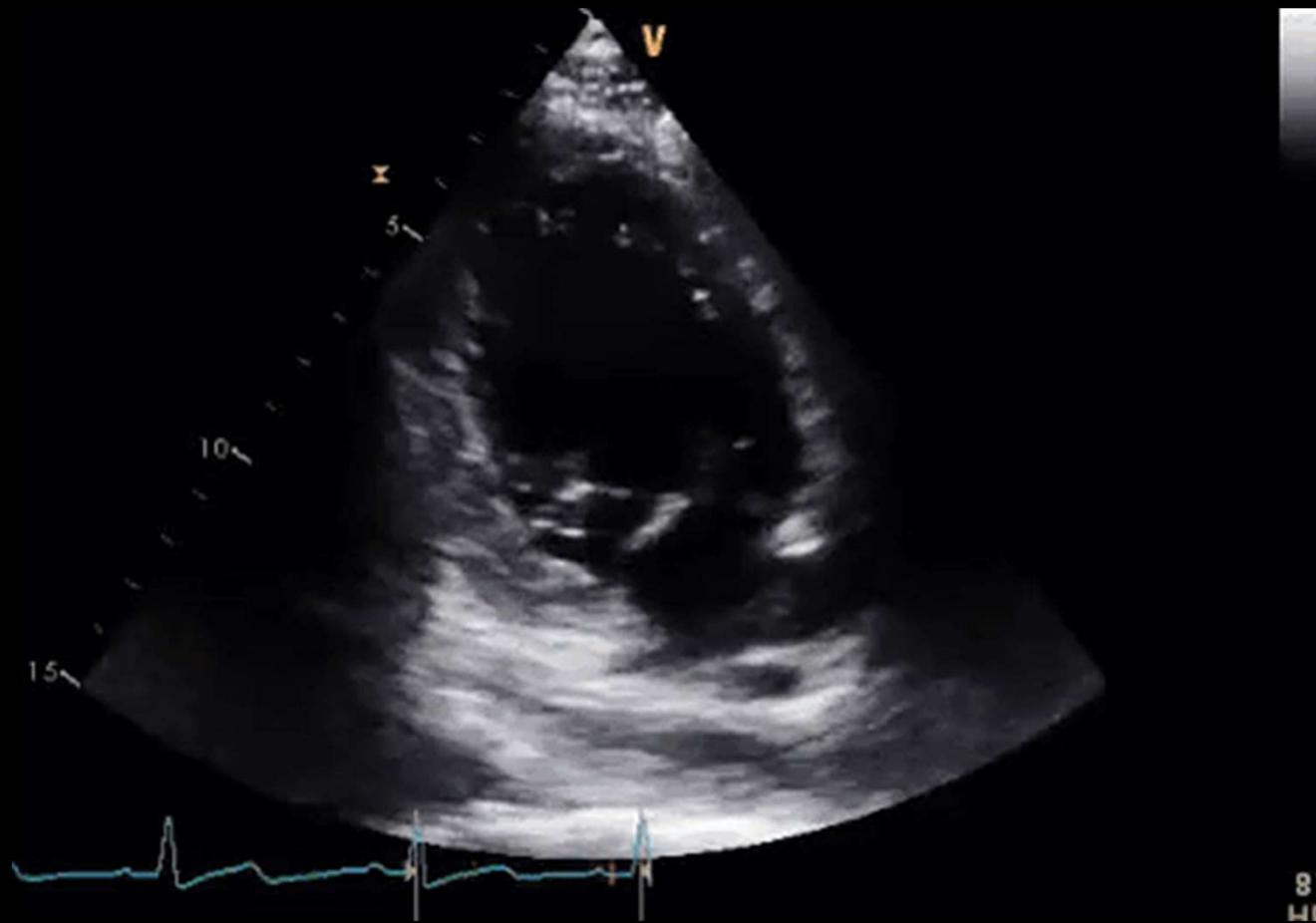


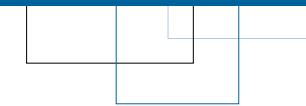
Apical
2 chamber



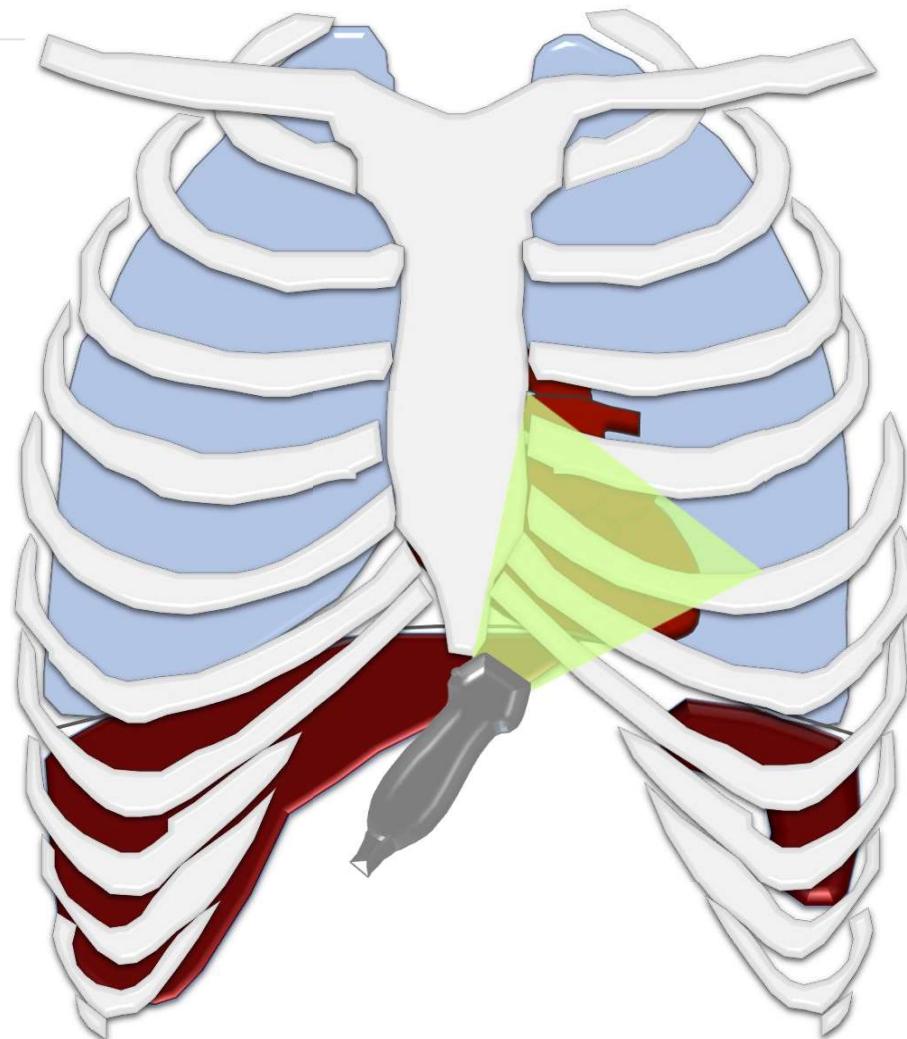


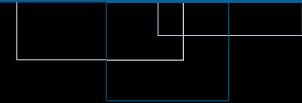
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SUBX



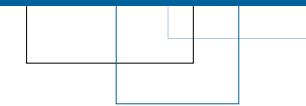


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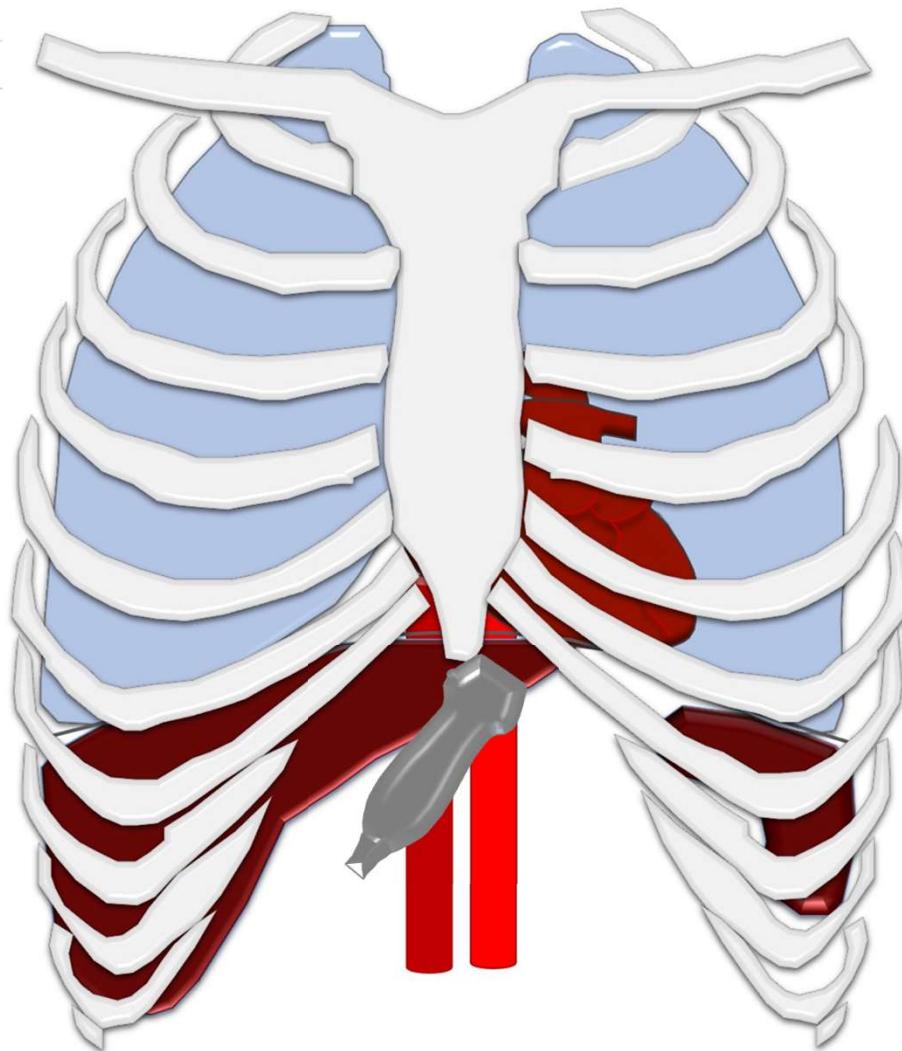
SUBX

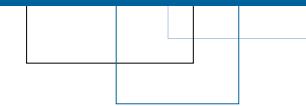
- Crd
- P21
- 
- 93%
- MI
- 0.8
- TIS
- 0.7



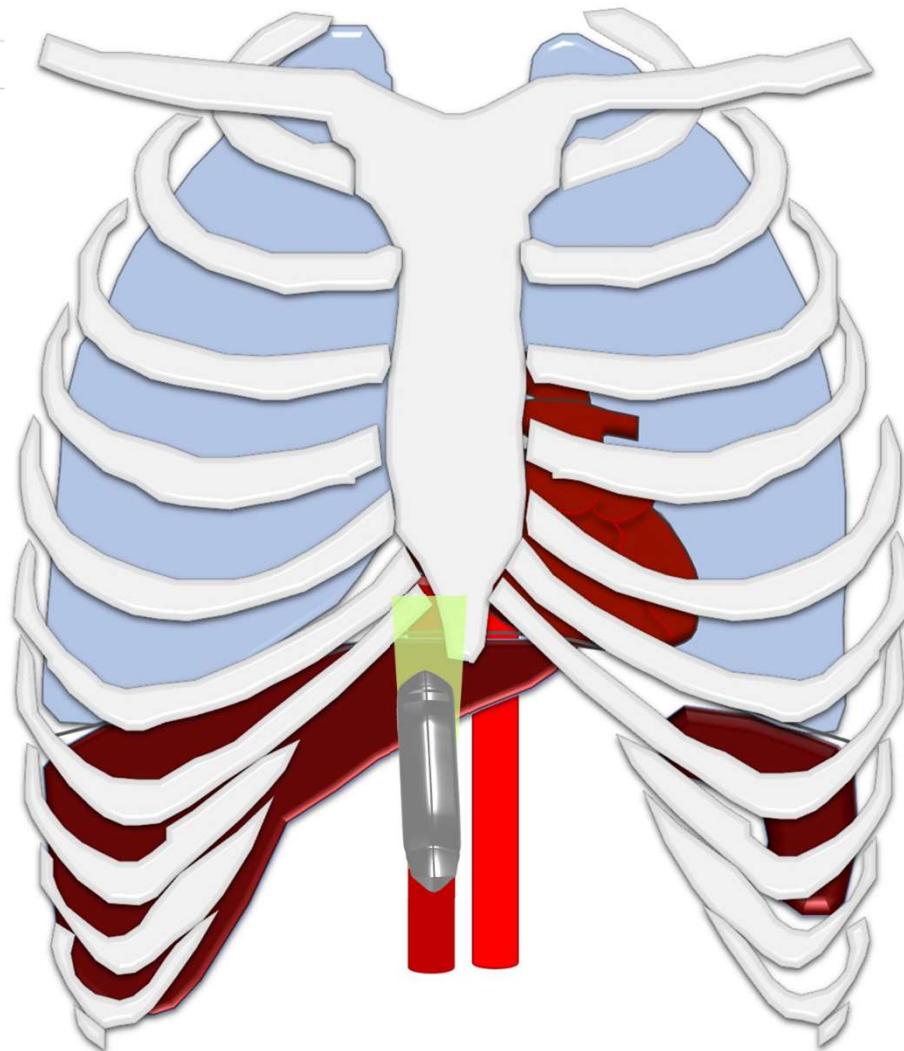


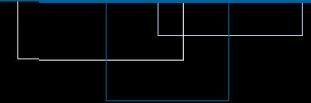
SUBX





IVC





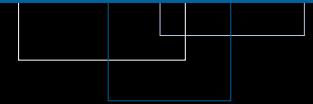
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IVF|



- Crd
P21
· 
· 
55%
· MI
· 1.0
· TIS
· 0.7

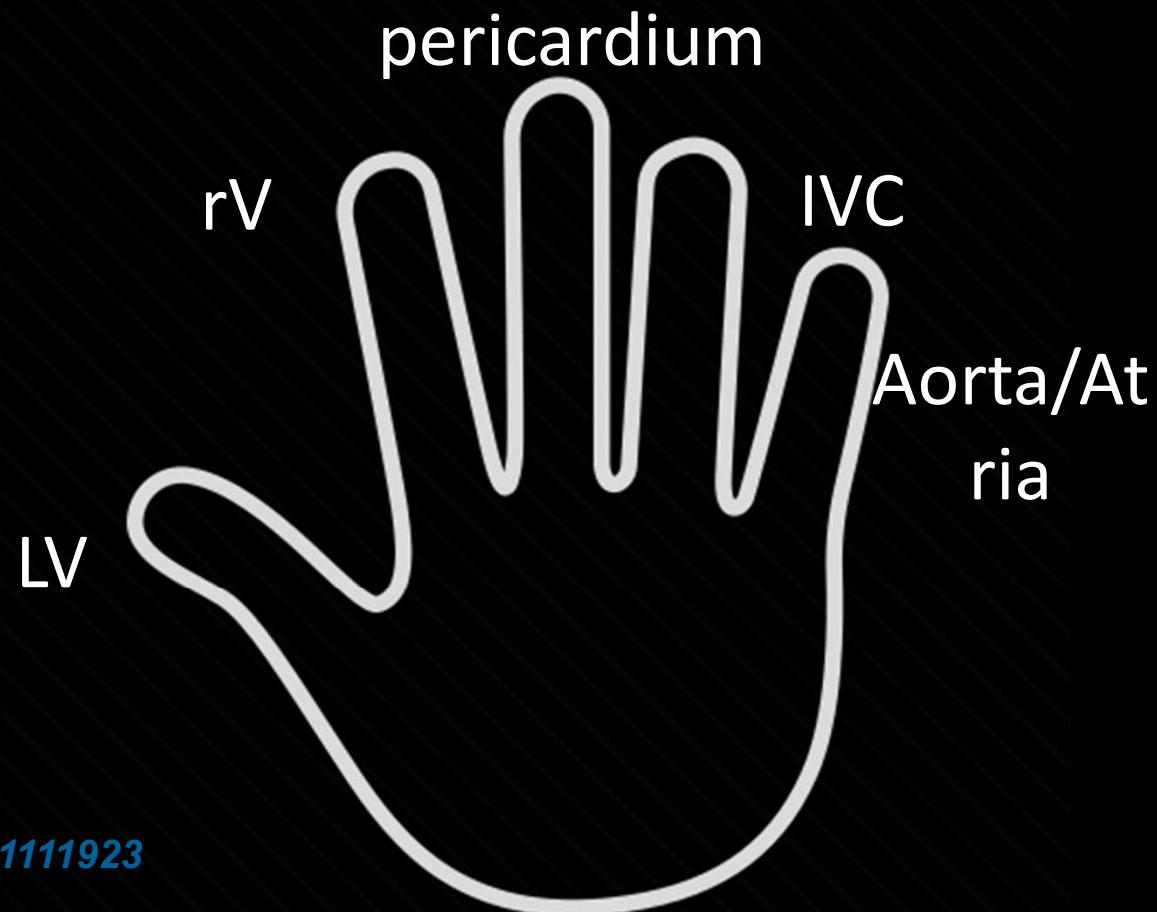
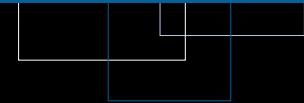
A 
B 



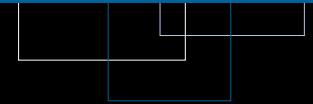
Focused Cardiac US Indications

- Cardiac trauma
- Cardiac arrest
- Hypotension/shock
- Dyspnea/SOB
- Chest pain
- Syncope
- Abnormal ekg
- Cardiomegaly on CXR
- AMS
- Sepsis
- Hypoxia
- Tachycardia

Labovitz AJ, et al. PMID: 21111923



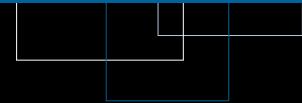
Labovitz AJ, et al. PMID: 21111923



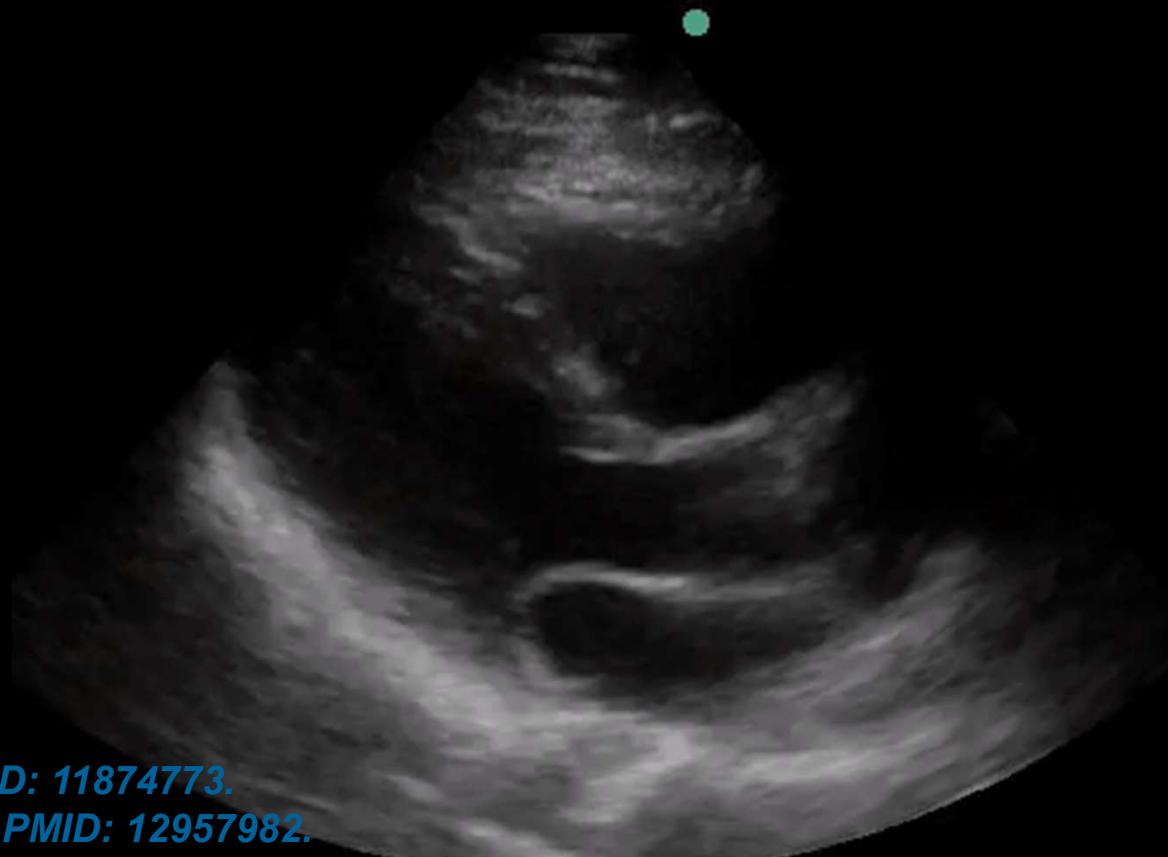
Which of the following is considered the gold standard for LVEF estimation?

- A. EPSS
- B. Eyeballing
- C. Fractional shortening
- D. Simpson biplane





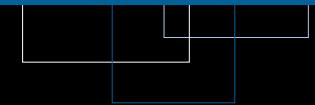
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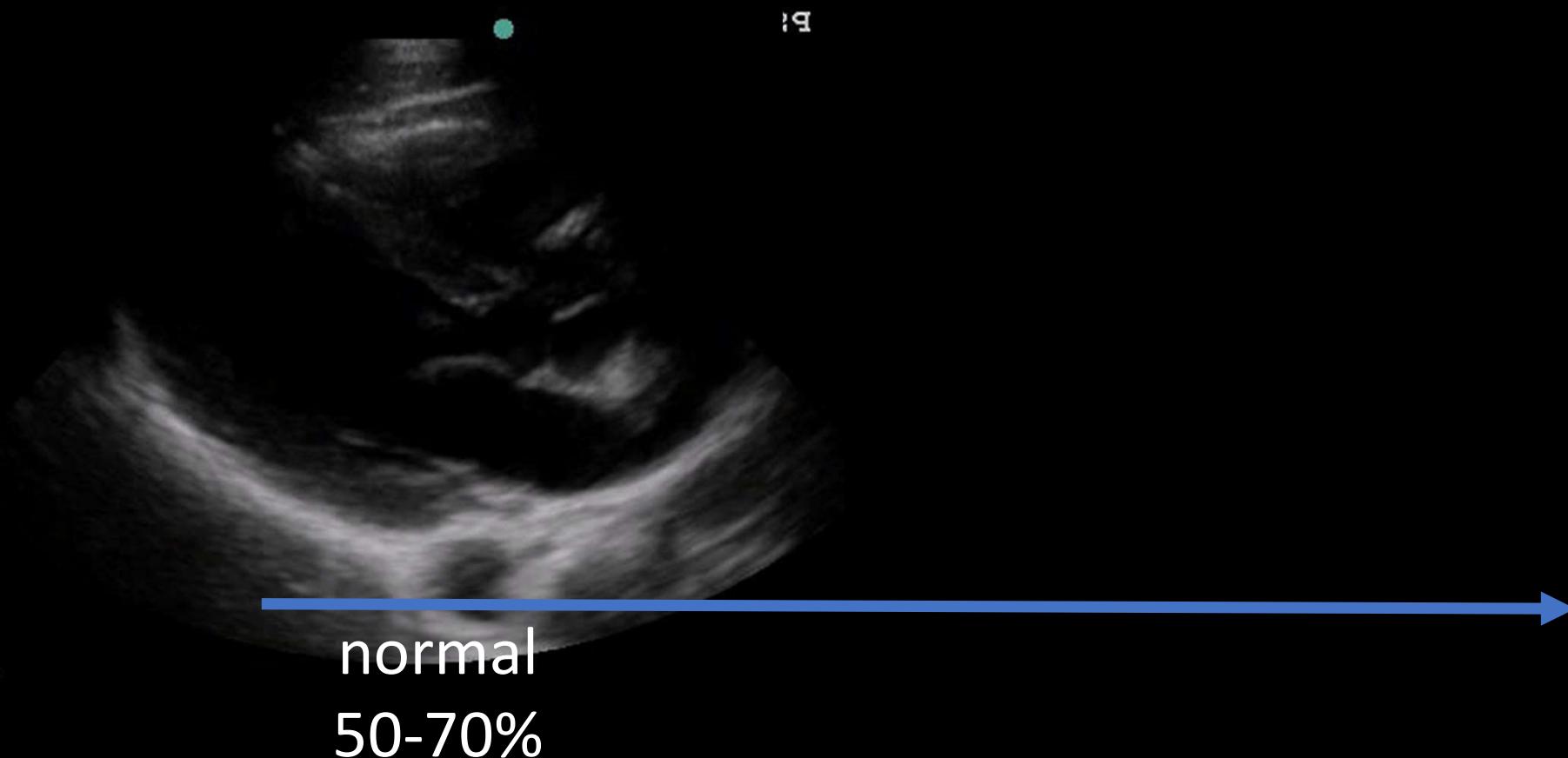
Moore CL, et al. PMID: 11874773.

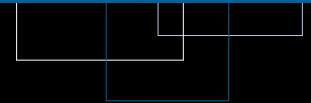
Randazzo MR, et al. PMID: 12957982.

Unlüer EE, et al. PMID: 24672616

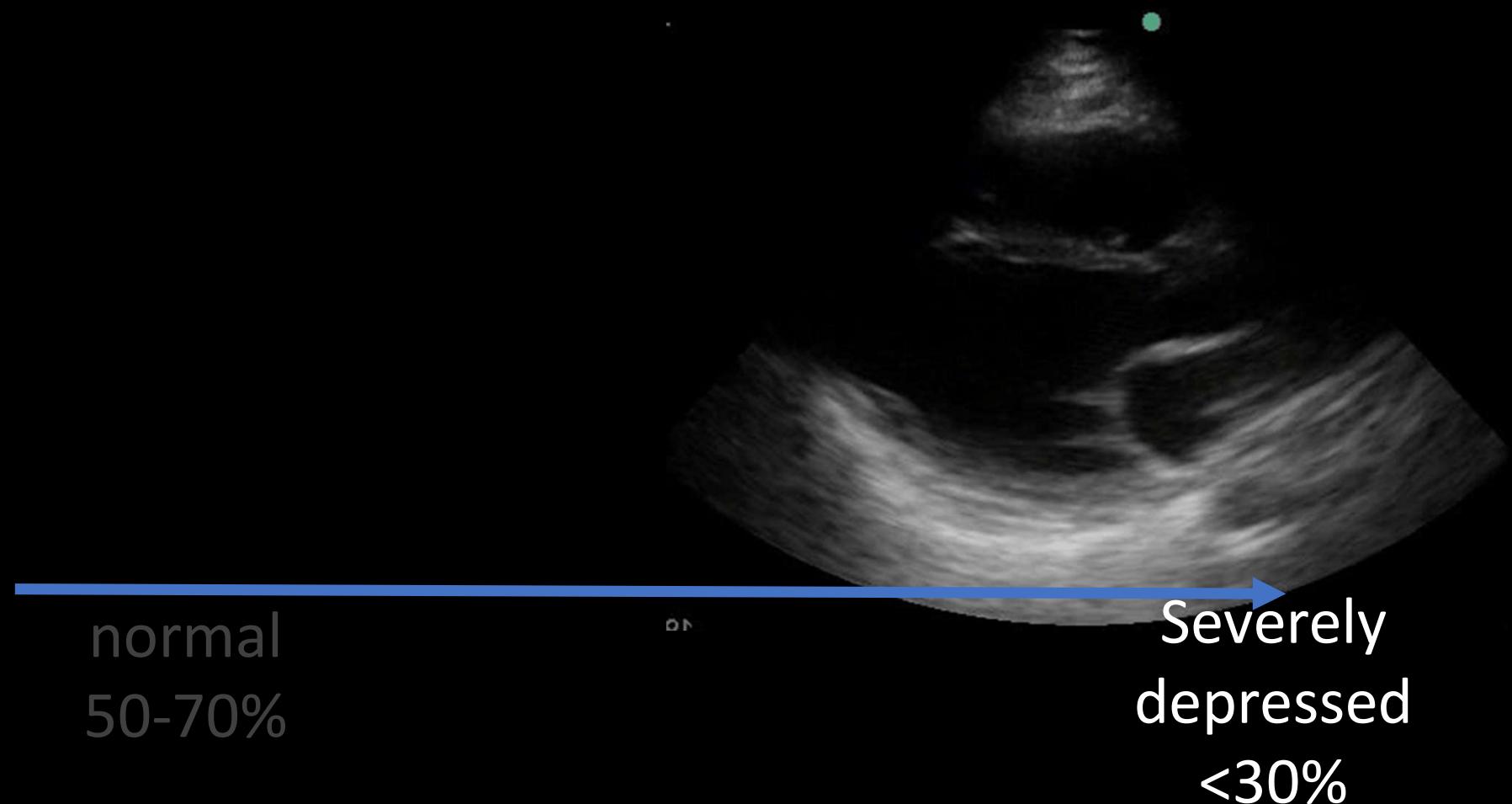


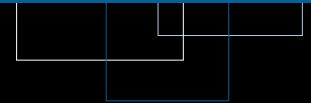
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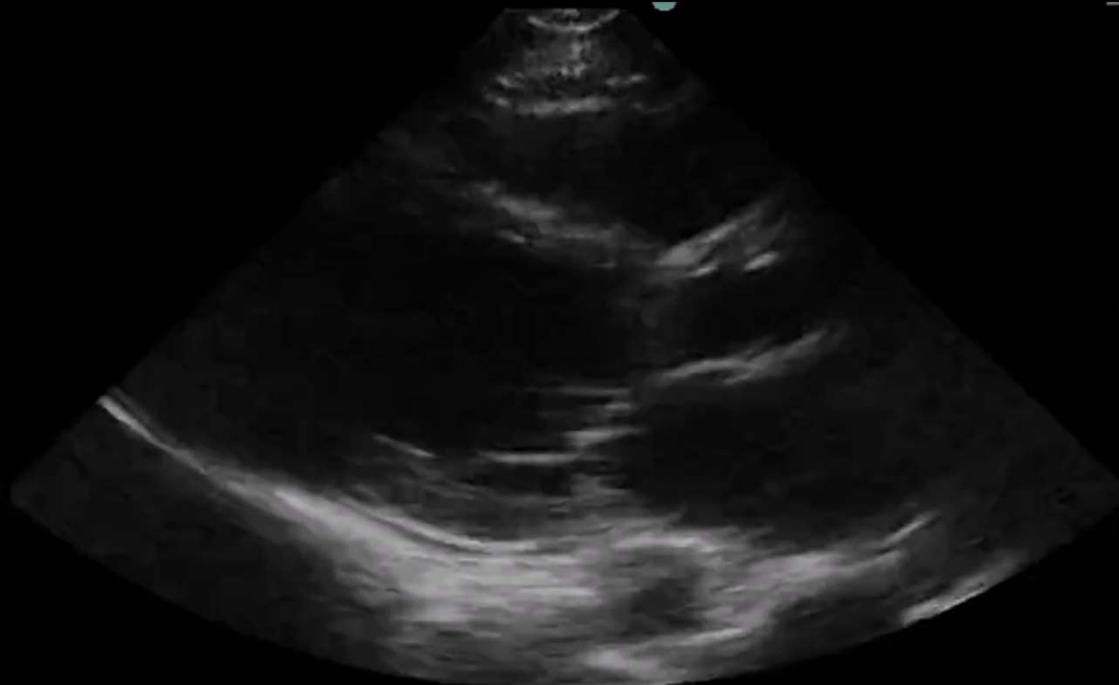


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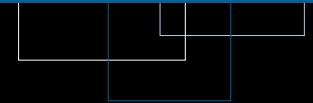
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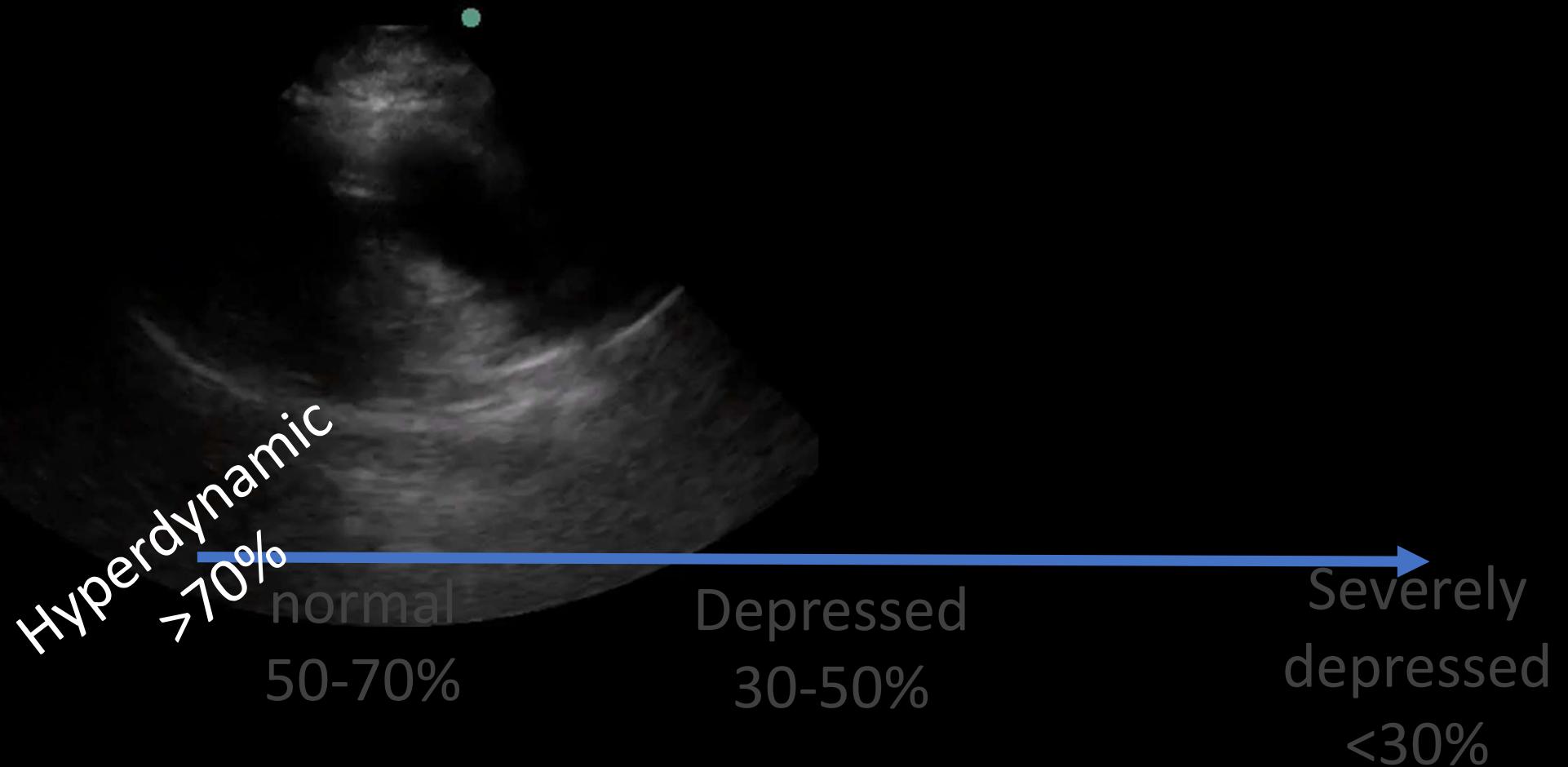
normal
50-70%

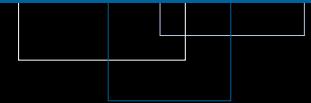
Depressed
30-50%

Severely
depressed
<30%

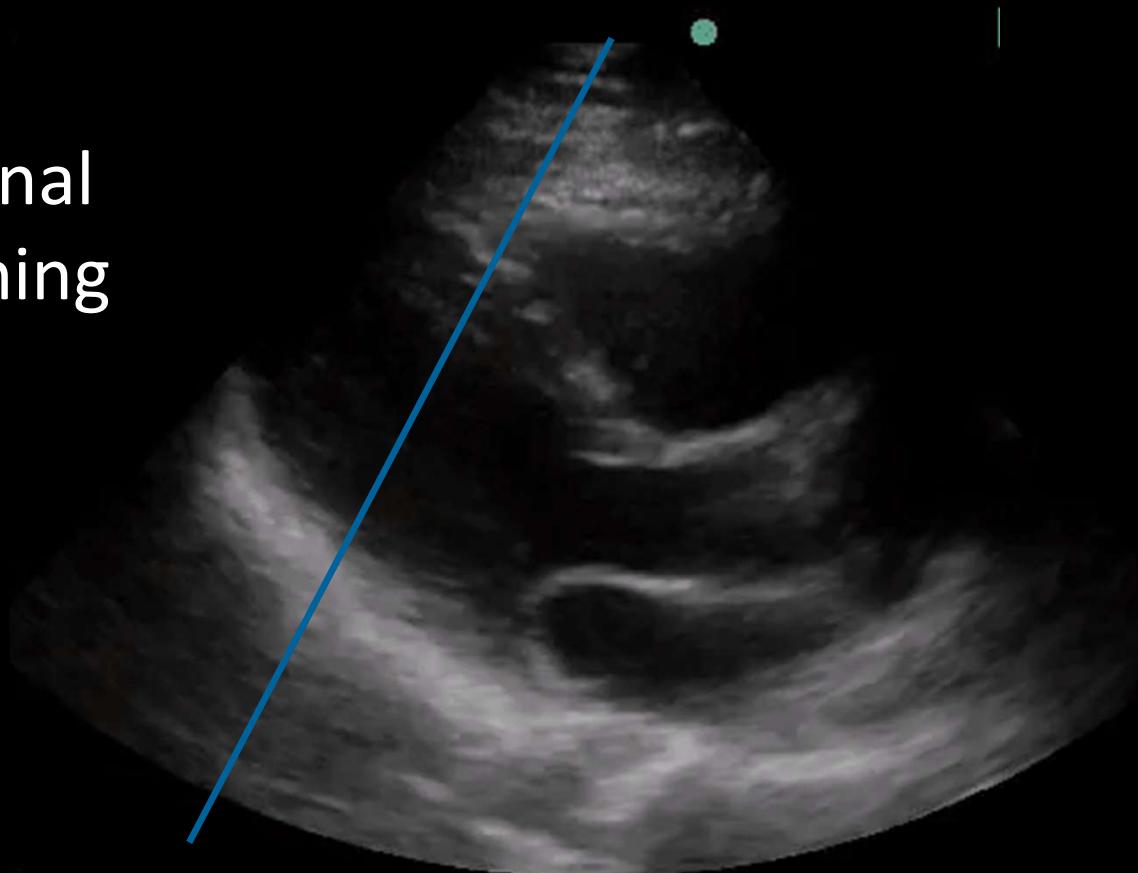


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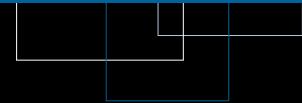




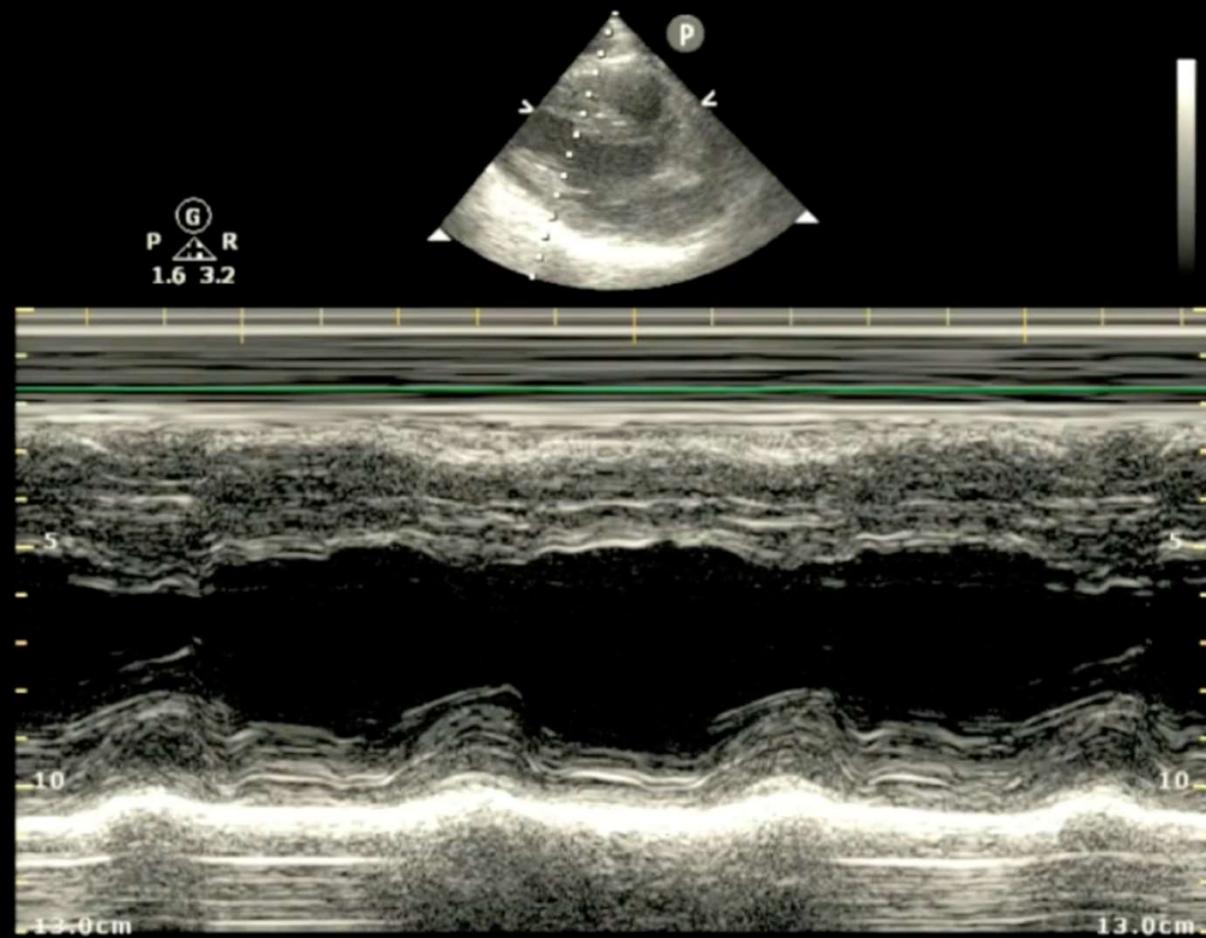
Fractional Shortening

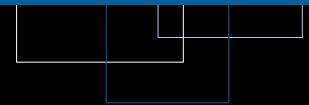


Weekes AJ, et al. PMID: 23197541.



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$FS = (LVEDD - LVESD) / LVEDD$

Normal FS:
30-45%

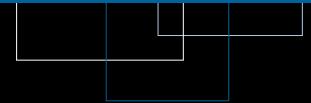


10

10

13.0 cm

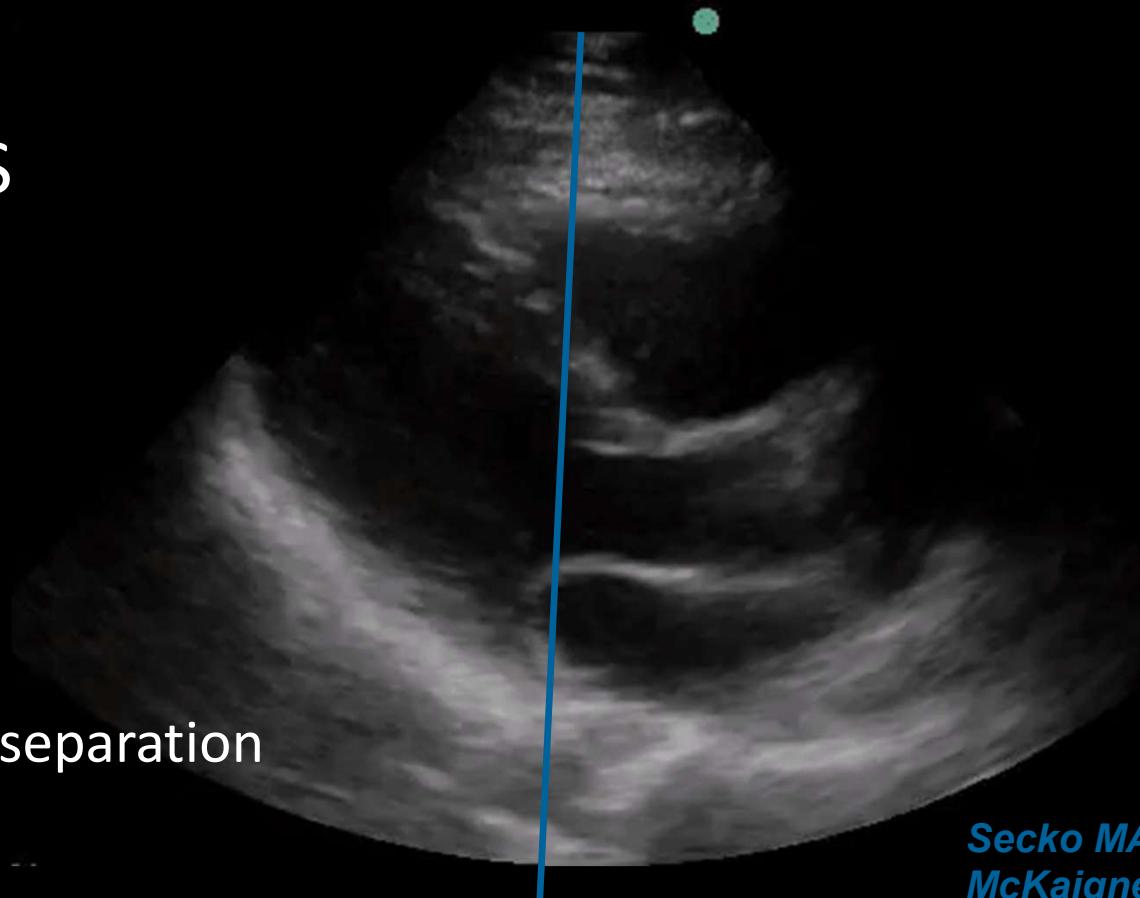
13.0 cm



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EPSS

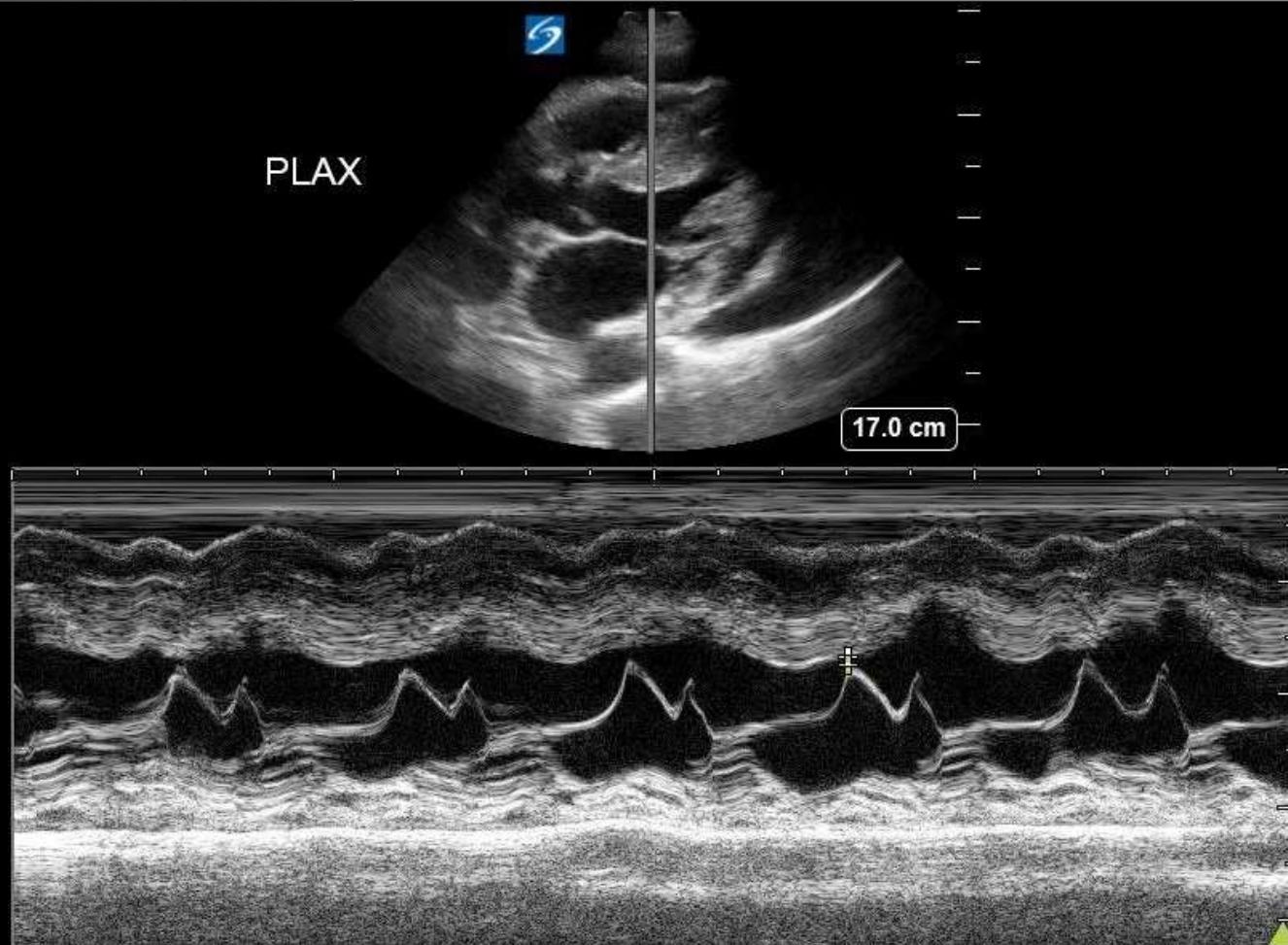
E-Point Septal separation



Secko MA, et al. PMID: 22044429.
McKaigney et al. PMID: 24630604.



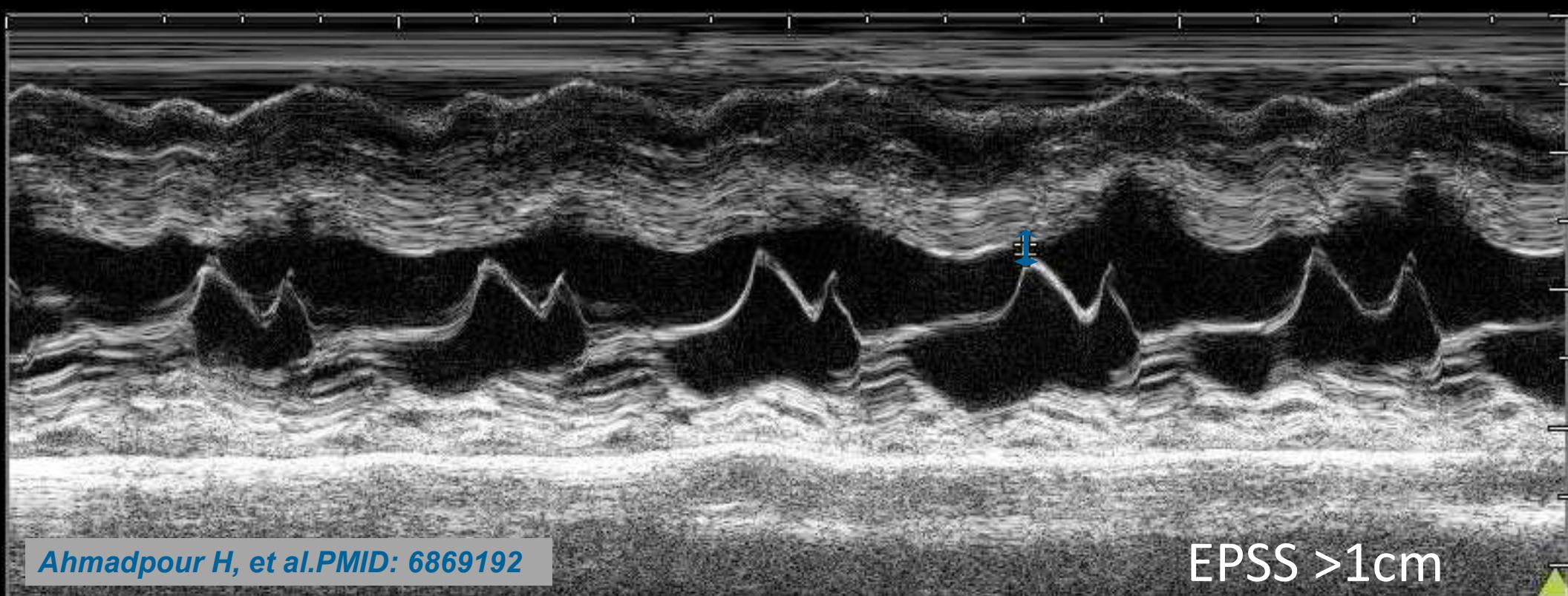
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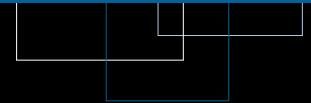
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EPSS <7mm



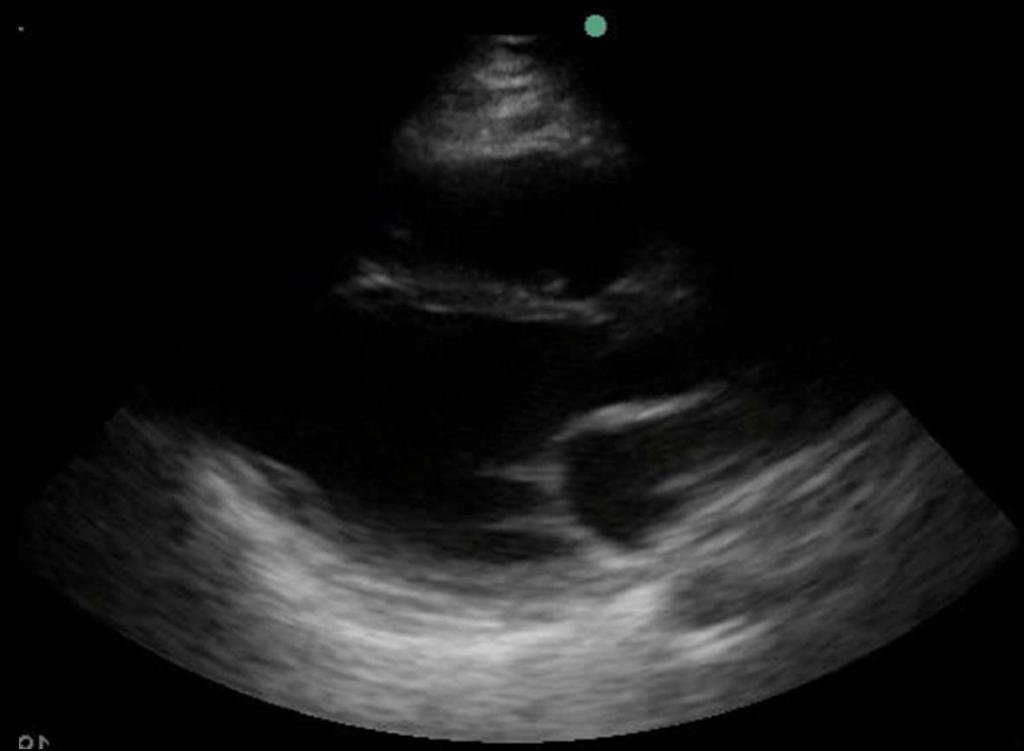
Ahmadpour H, et al. PMID: 6869192

EPSS >1cm

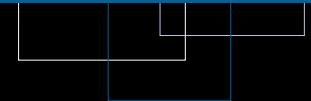


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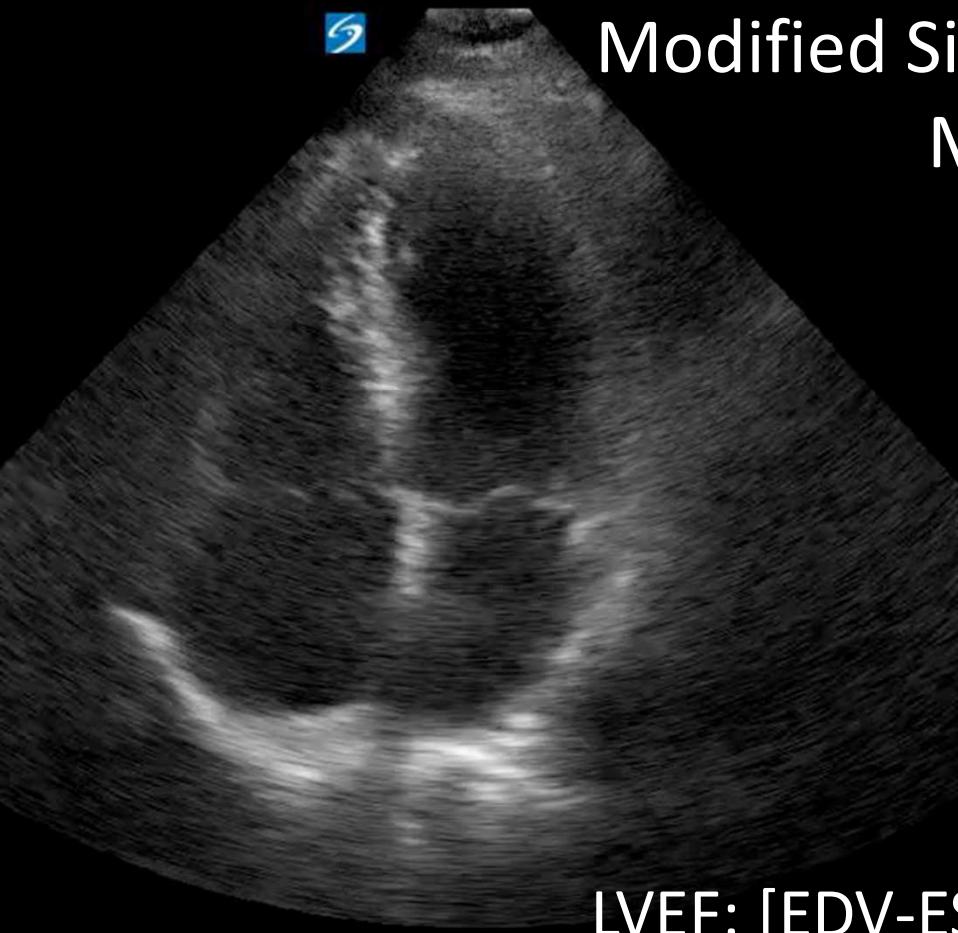
LVEF= 75.5- (2.5 x EPSS)



Silverstein JR, et al. PMID: 16377299.



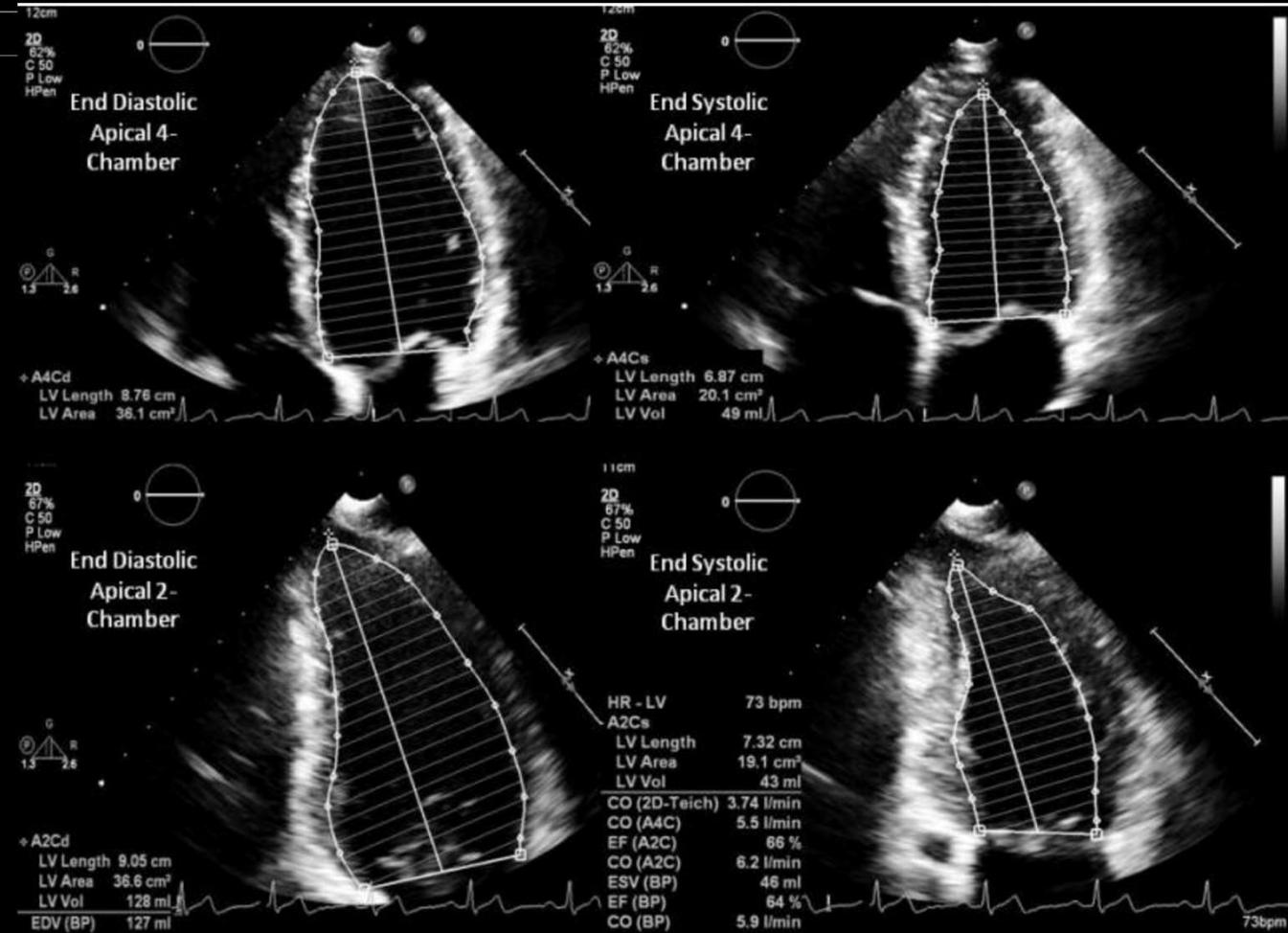
Modified Simpson (BIPLANE) Method



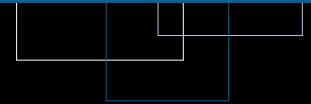
LVEF: $[EDV-ESV/EDV] \times 100$

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Modified Simpson (BIPLANE) Method



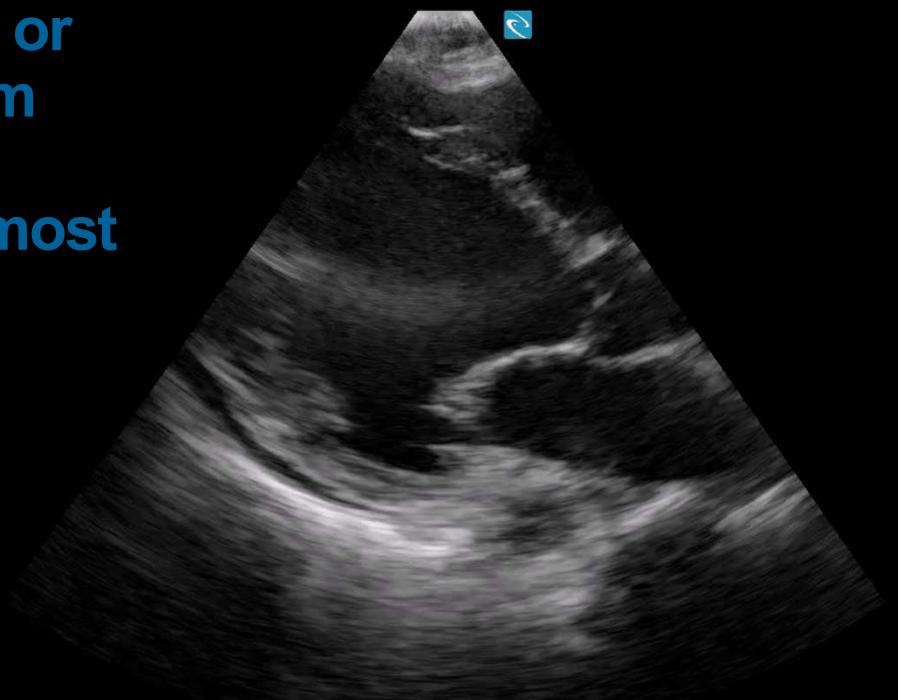
Kosaraju A, et al. PMID: 29083812.

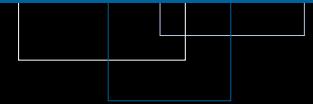


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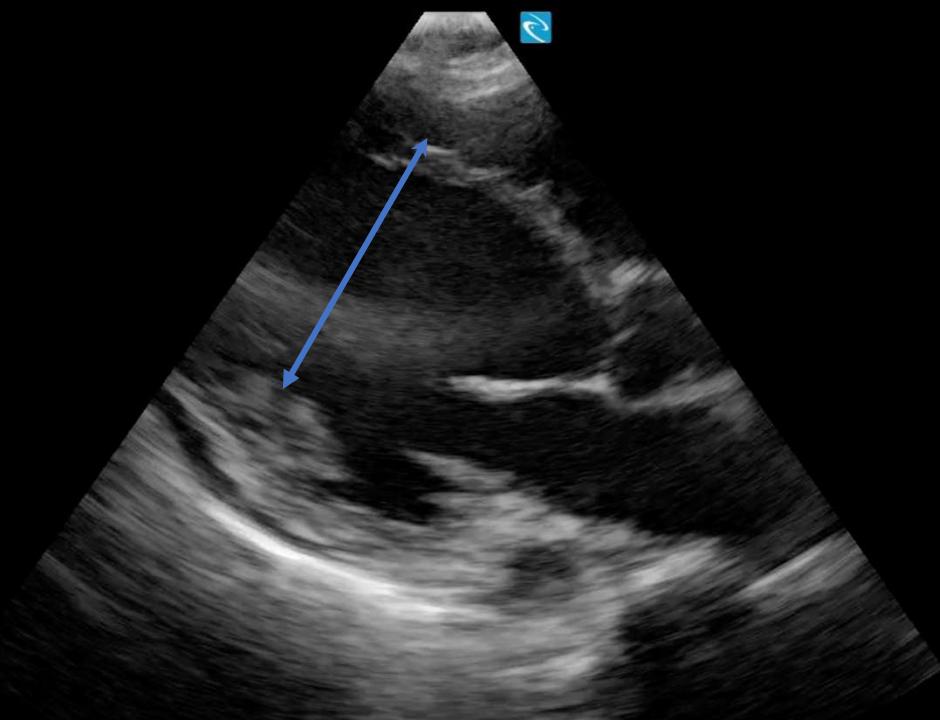
24 y/o F presents to the ED with c/o shortness of breath gradually worsening x 3 days. She denies chest pain, cough or fever/chills. She is 10 days postpartum from a normal spontaneous vaginal delivery of her first child. What is the most likely diagnosis?

- A. aortic dissection
- B. cardiac tamponade
- C. new onset heart failure
- D. pulmonary embolism

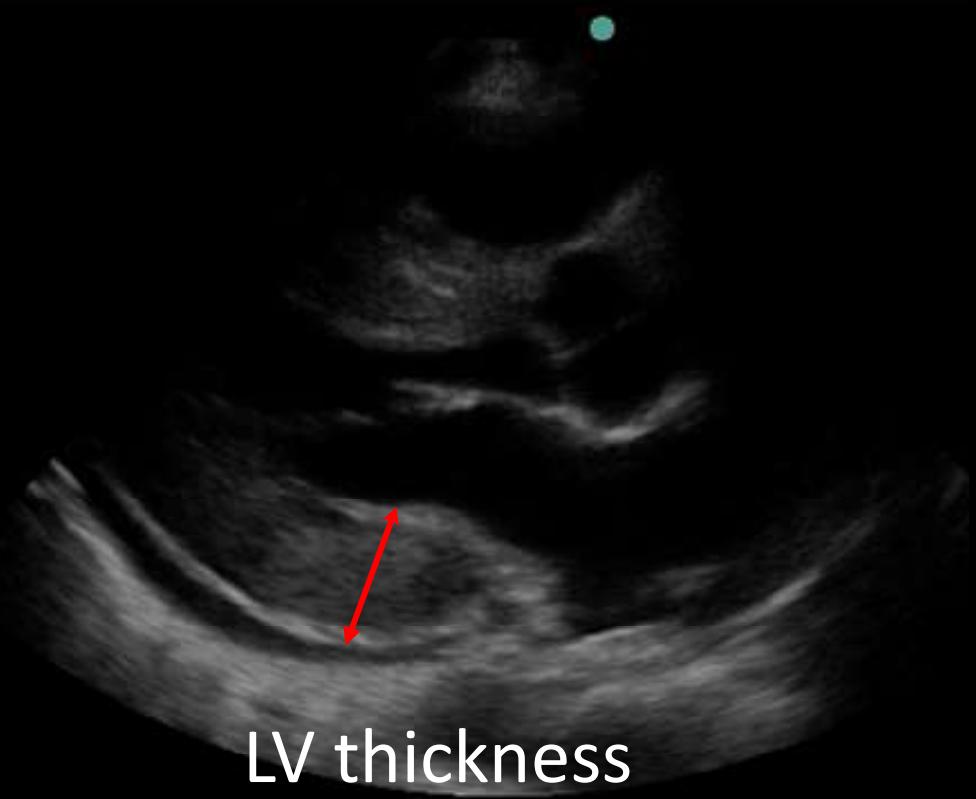




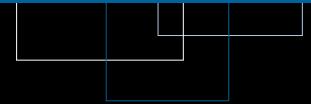
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LV diameter
 $<5.2\text{cm}$

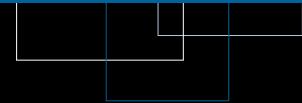


LV thickness
 $<1.2\text{cm}$



Symmetric
contractility



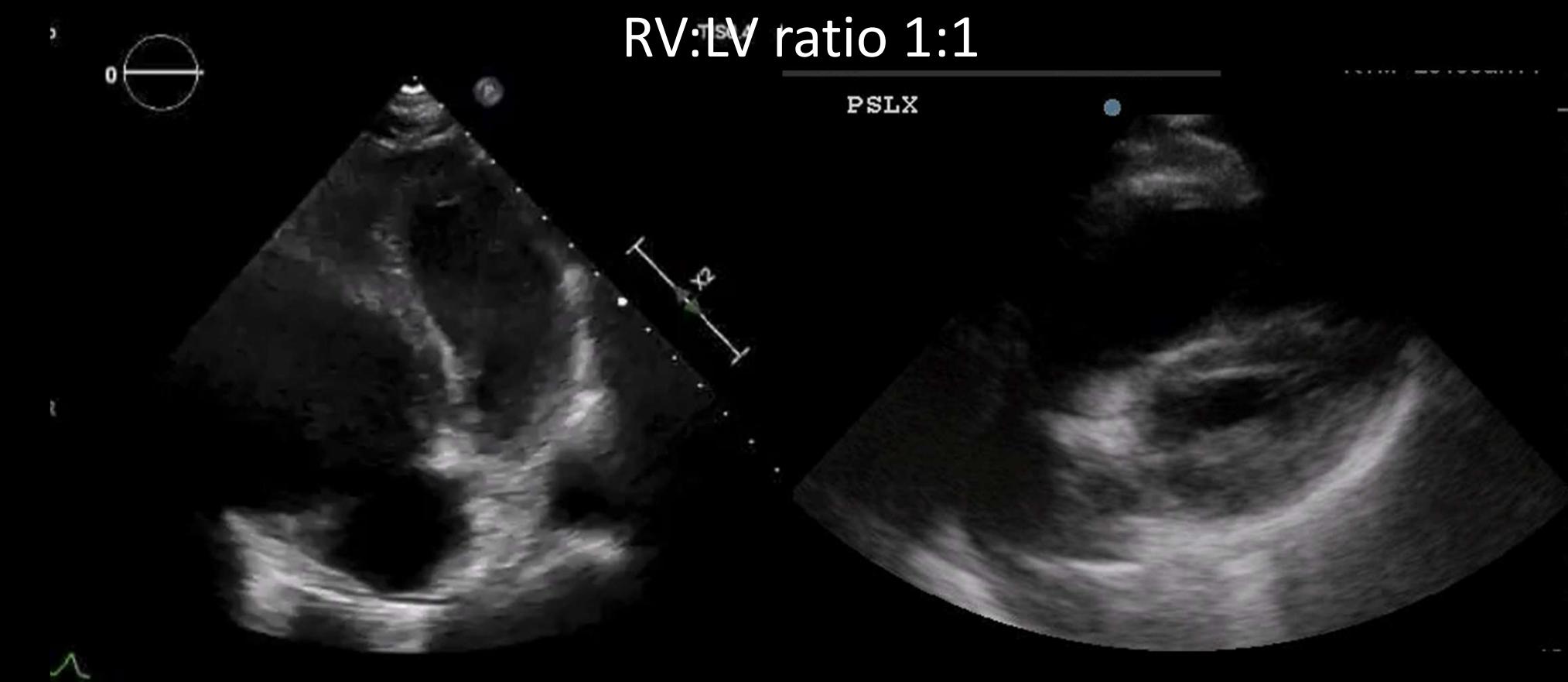


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RV:LV ratio 1:1

PSLX

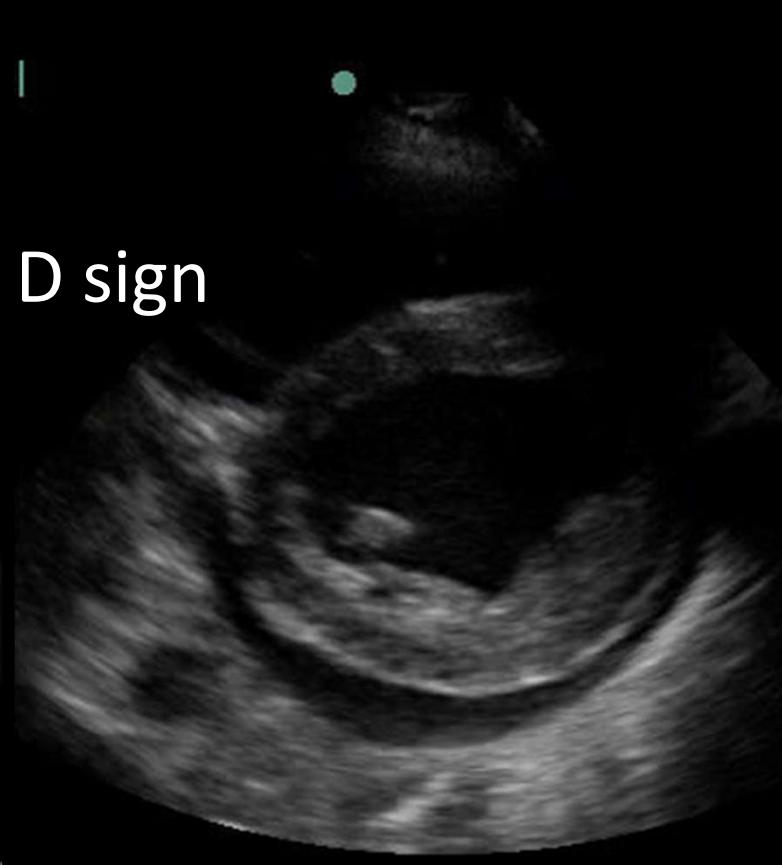
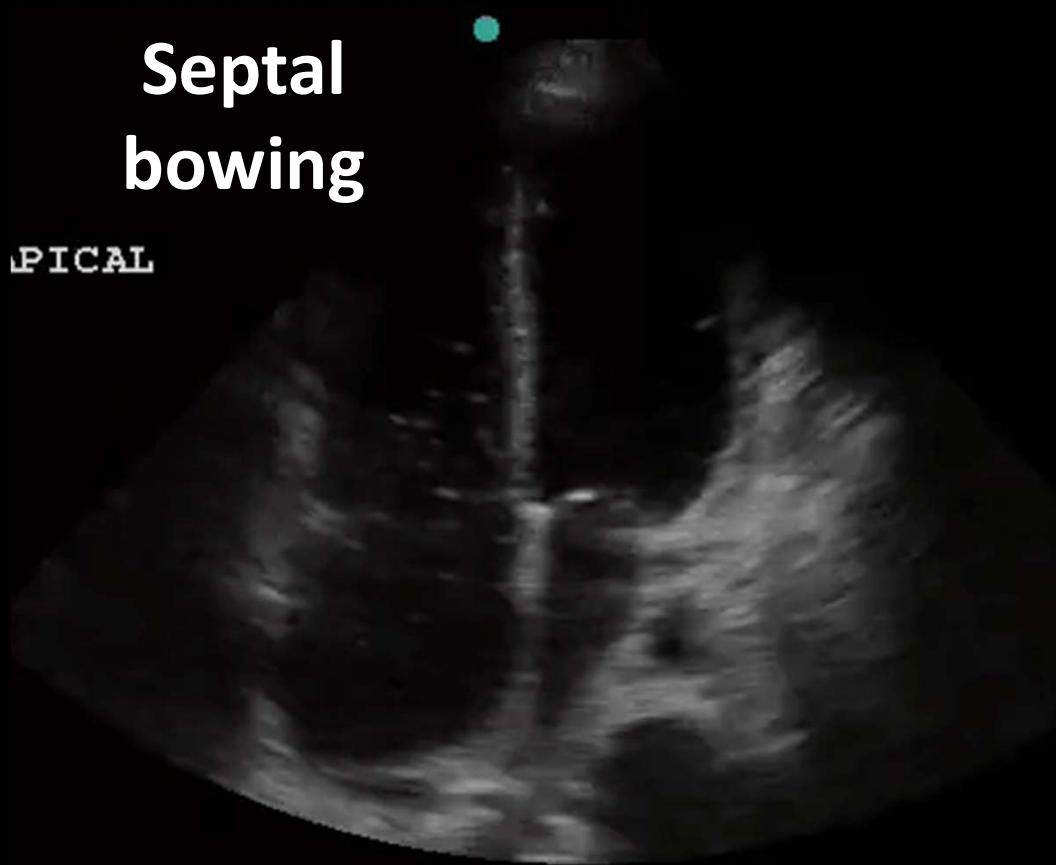




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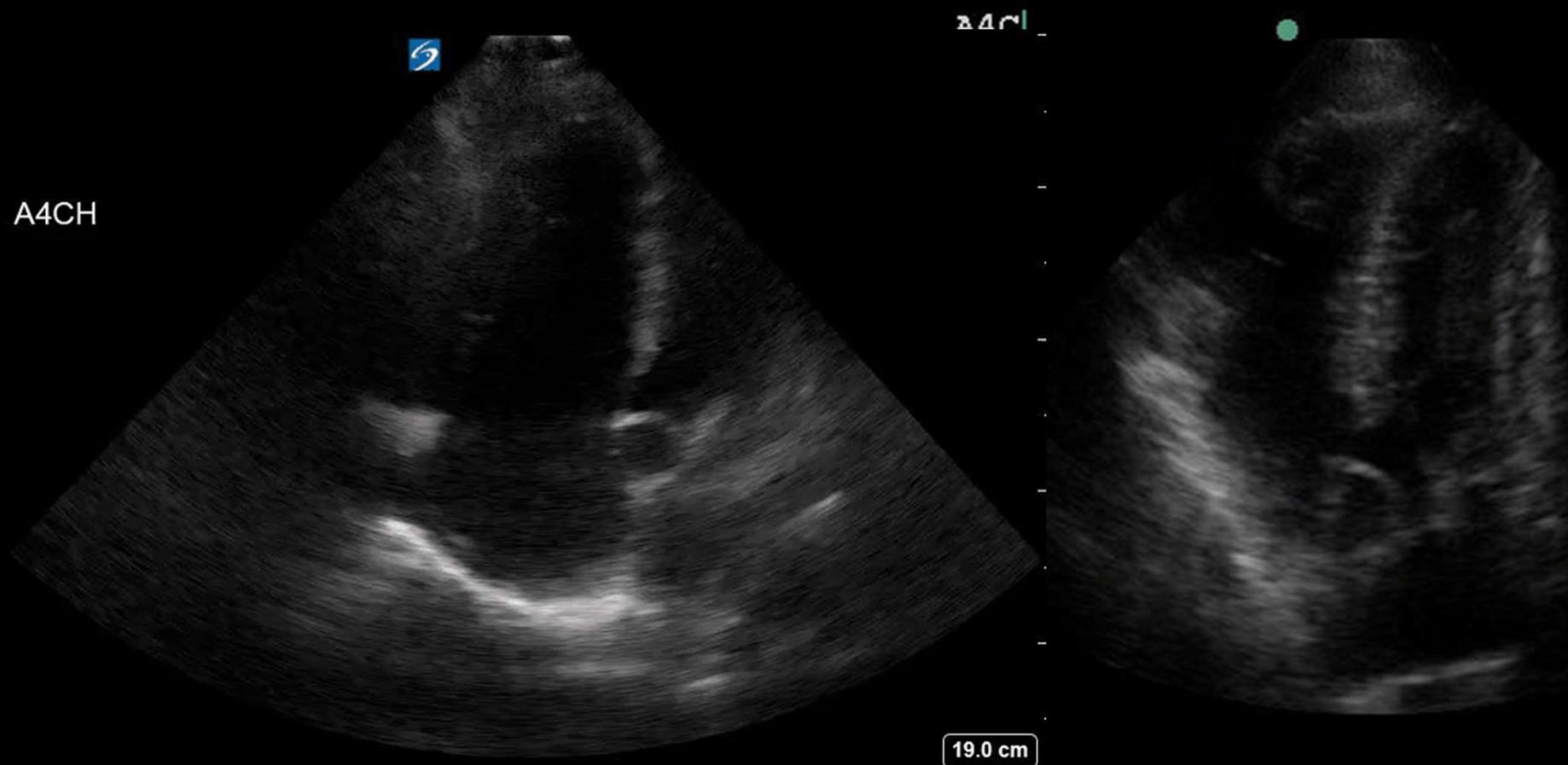
**Septal
bowing**

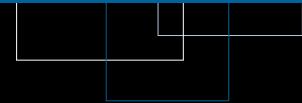
APICAL





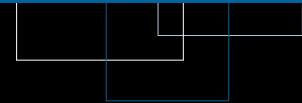
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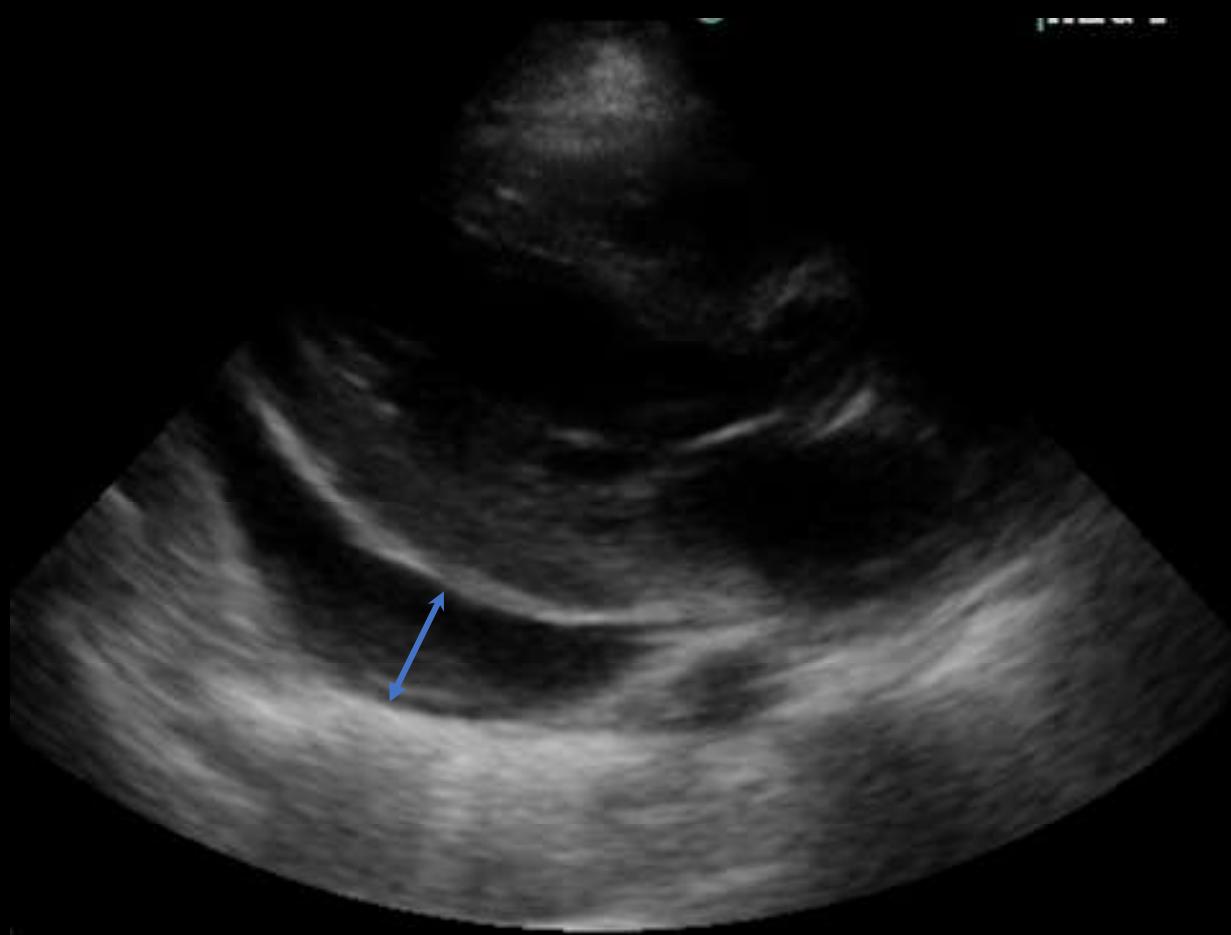


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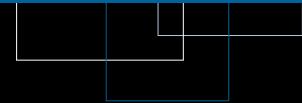
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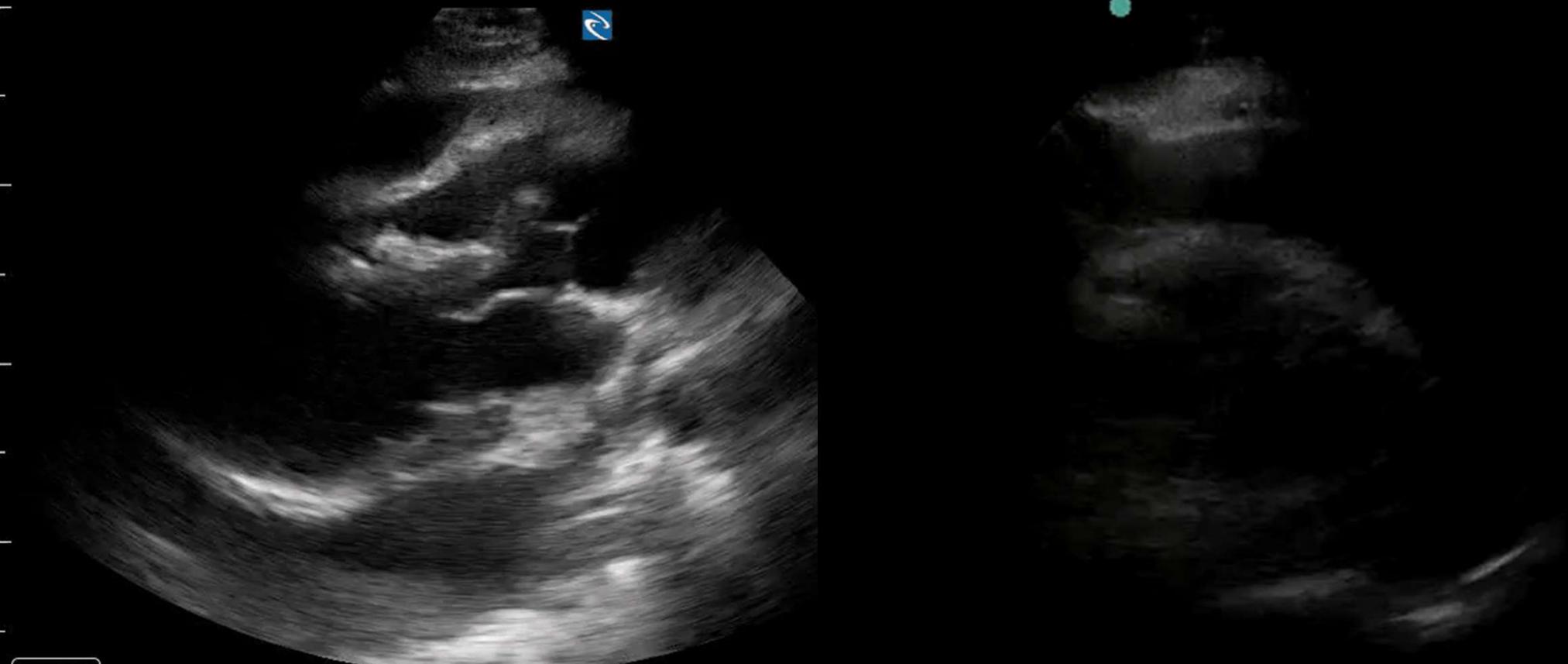
Small
<1cm

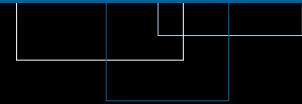
Moderate
1-2 cm

large
>2cm



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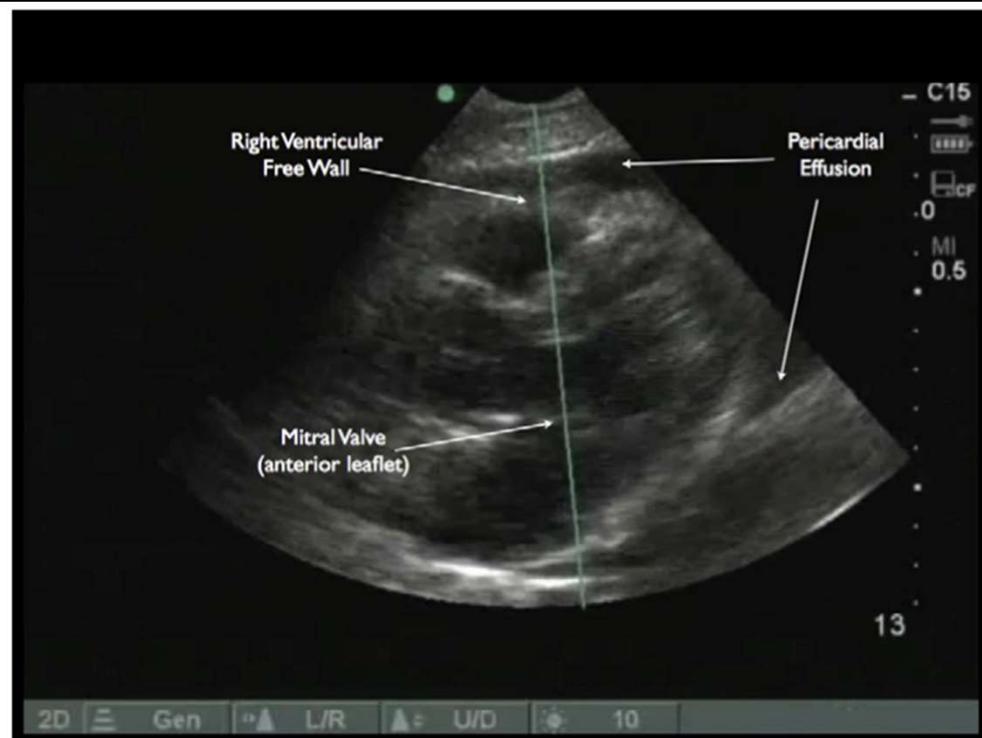


Fig. 1. Parasternal long image using radiology orientation.

Nagdev A, Stone MB. PMID: 21397379.

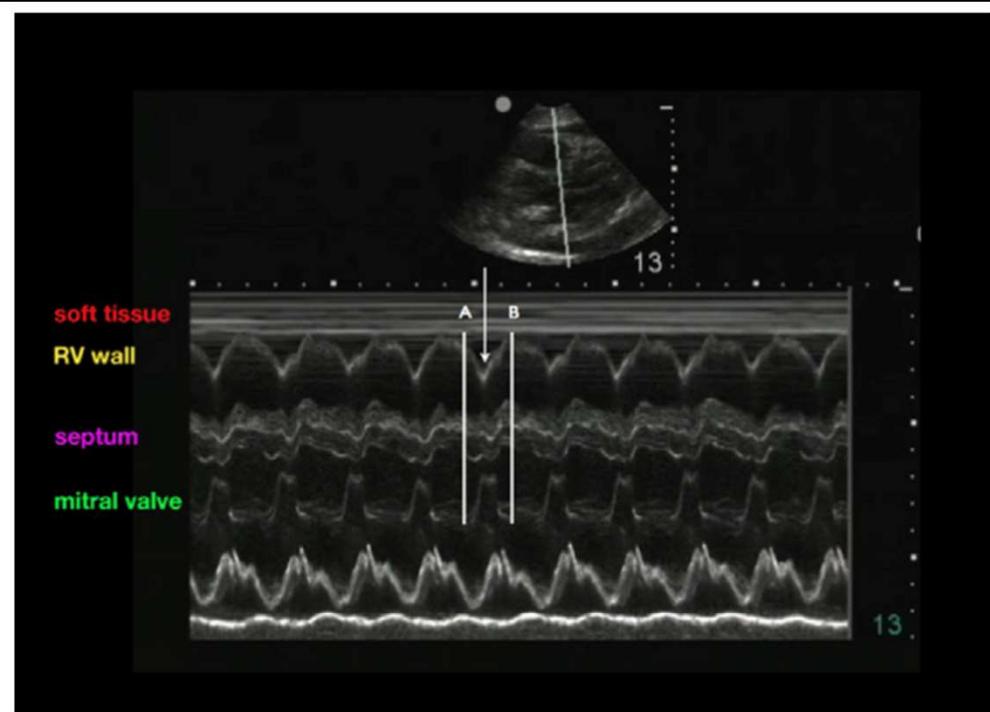
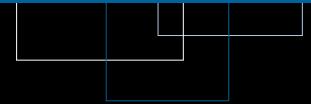


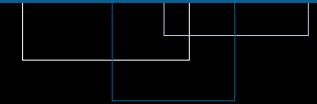
Fig. 2. M-mode image obtained from parasternal long orientation. Diastole, with associated mitral valve opening and right ventricular free wall collapse, occurs between the A and B. The arrow represents the abnormal posterior wall motion of the right ventricular free wall in early diastole.



In which patient should the Distensibility Index be used to assess volume status instead of the Caval Index?

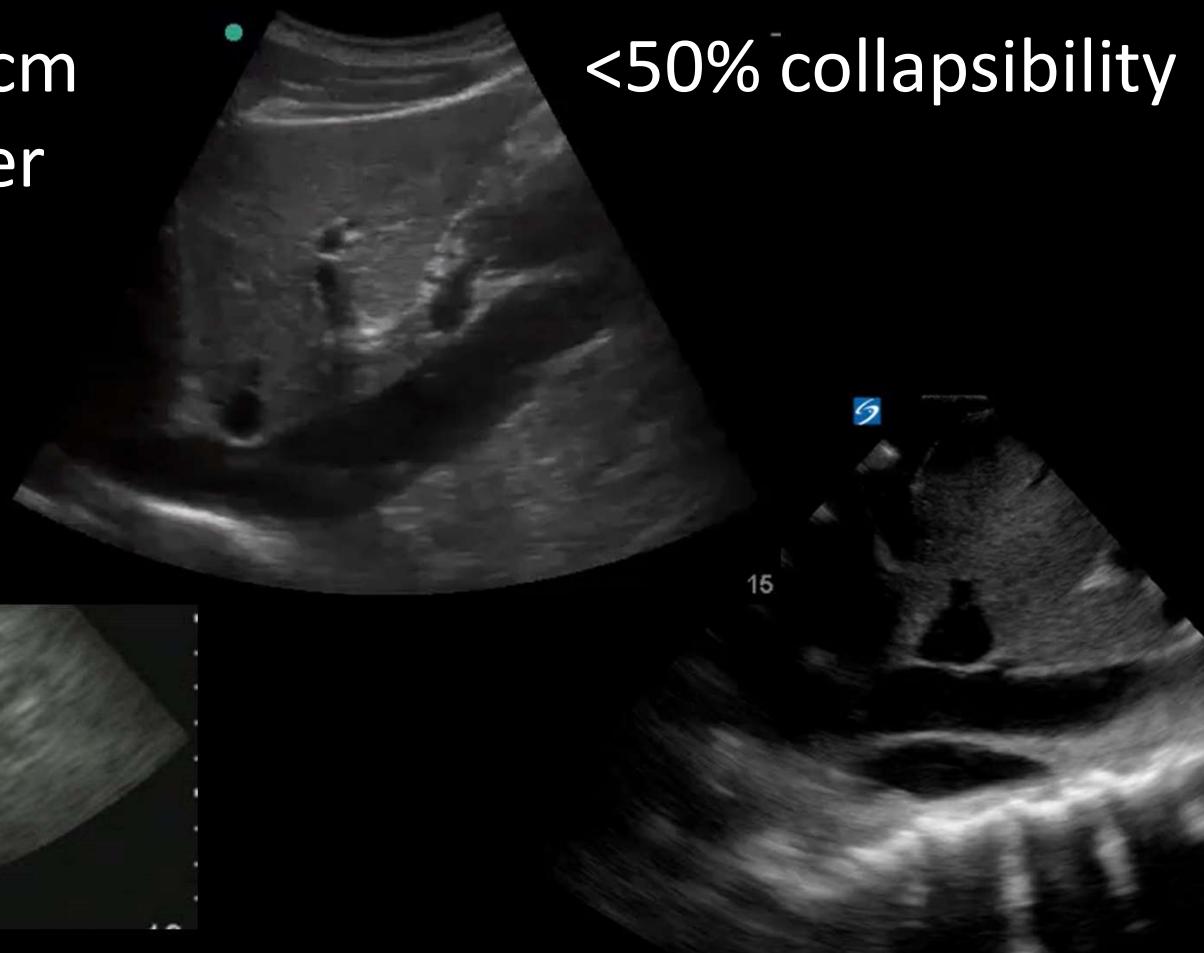
- A. 65y/o COPD patient on NRBM
- B. 19y/o drug OD patient on ventilator
- C. 43y/o Asthmatic patient on duoneb
- D. 78y/o CHF patient on BiPAP

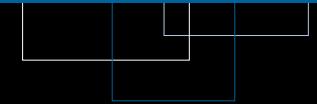




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IVC <2.5cm
diameter

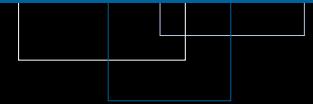




Caval Index= $(\text{Max diameter} - \text{min diameter}) / \text{Max diameter}$

Distensibility Index= $(\text{Max diameter} - \text{min diameter}) / \text{Min diameter} \times 100\%$

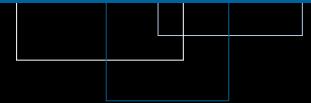
Ventilated patient
Nagdev AD, et al. PMID: 19556029.
Barbier C, et al. PMID: 15034650.



Thoracic aortic
root &
descending
aorta <4cm

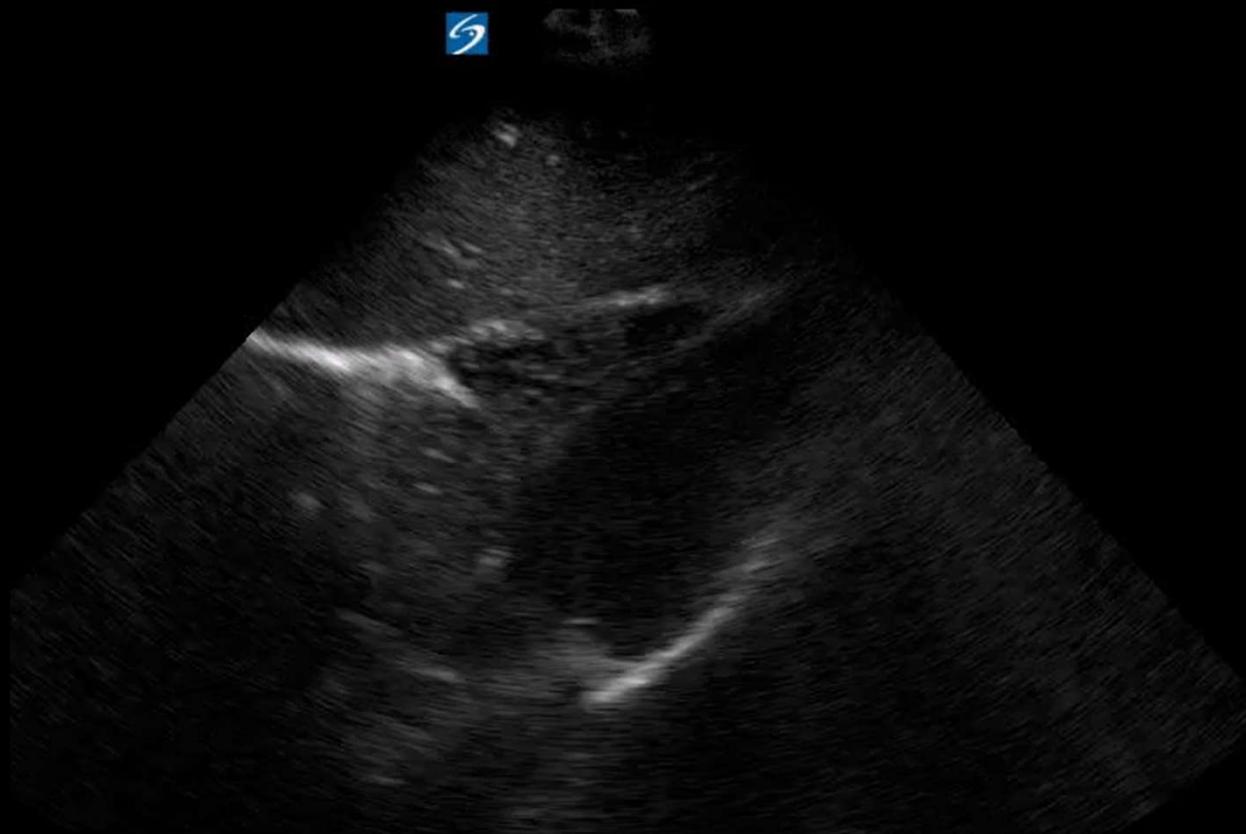


Atria diameter
<4cm

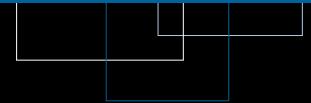


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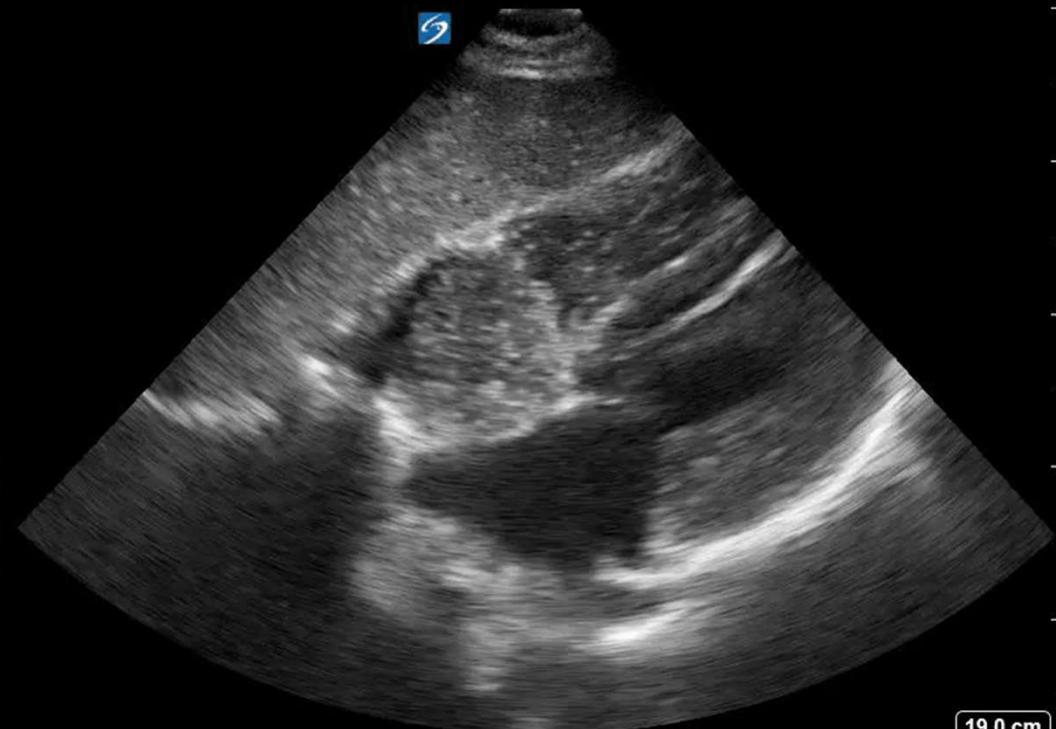
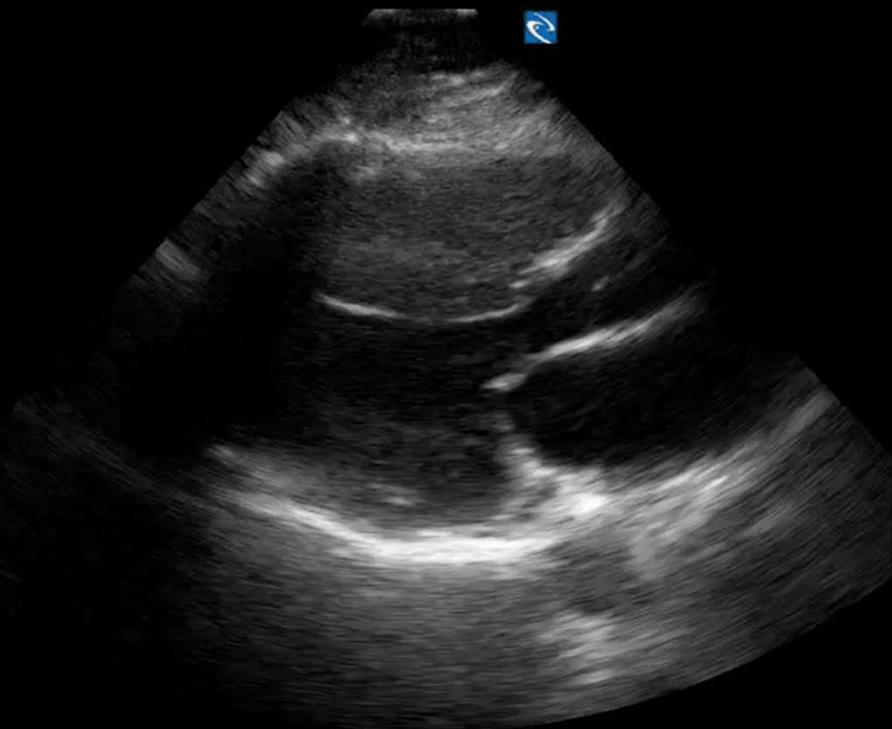
V Fib



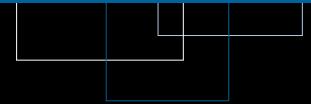
*Tsou PY, et al. PMID: 28263791.
Huis In 't Veld MA, et al PMID: 28754527.*



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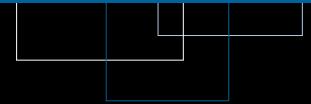
*Gaspari R, et al. PMID: 28916478.
Gaspari R, et al. PMID: 27693280*



Which of the following is considered the gold standard for LVEF estimation?

- A. EPSS
- B. Eyeballing
- C. Fractional shortening
- D. Simpson biplane

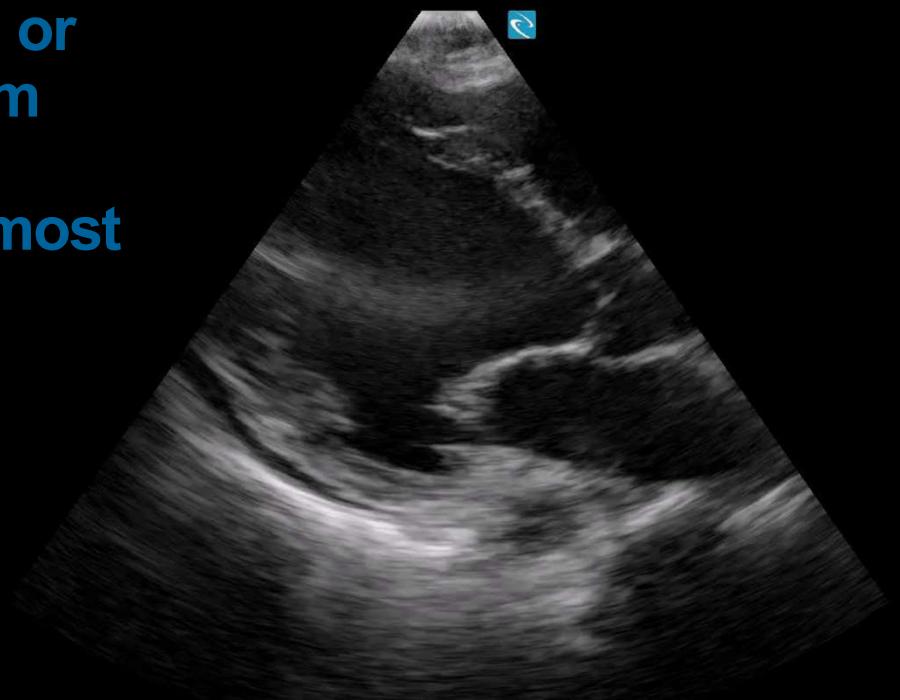


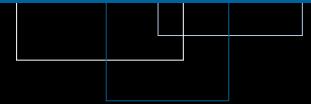


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24 y/o F presents to the ED with c/o shortness of breath gradually worsening x 3 days. She denies chest pain, cough or fever/chills. She is 10 days postpartum from a normal spontaneous vaginal delivery of her first child. What is the most likely diagnosis?

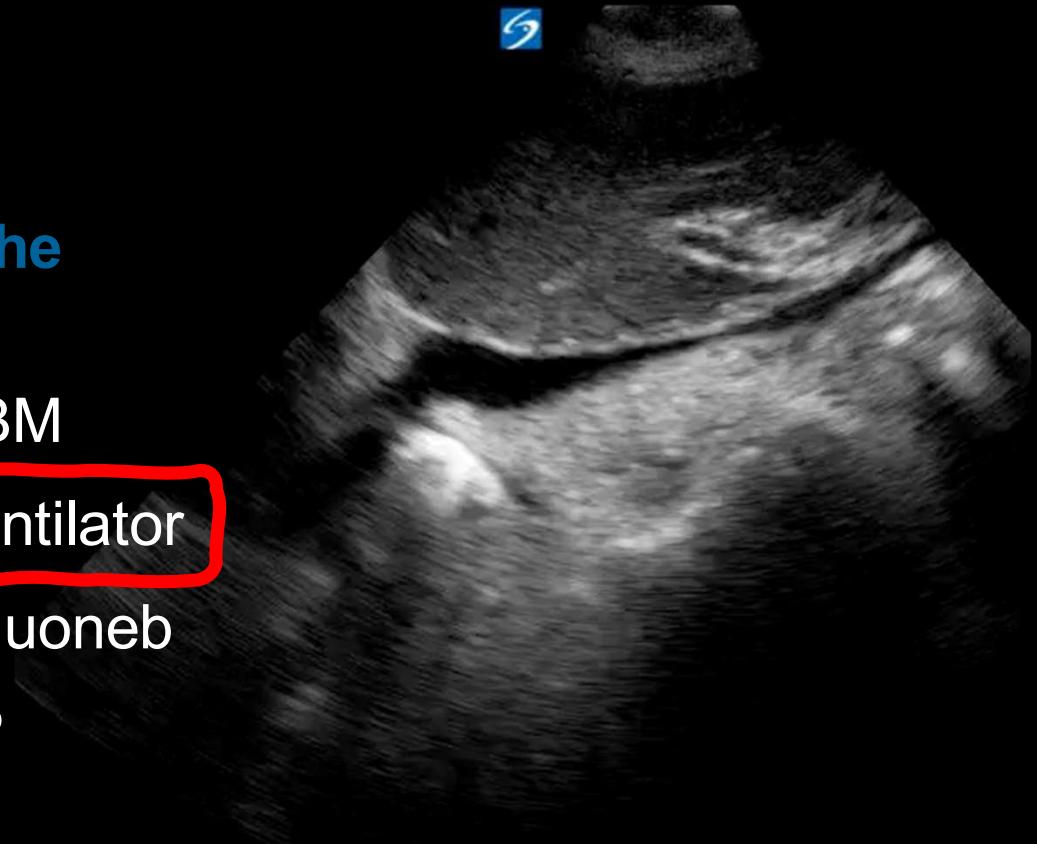
- A. aortic dissection
- B. cardiac tamponade
- C. new onset heart failure**
- D. pulmonary embolism





In which patient should the Distensibility Index be used to assess volume status instead of the Caval Index?

- A. 65y/o COPD patient on NRBM
- B. 19y/o drug OD patient on ventilator**
- C. 43y/o Asthmatic patient on duoneb
- D. 78y/o CHF patient on BiPAP





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