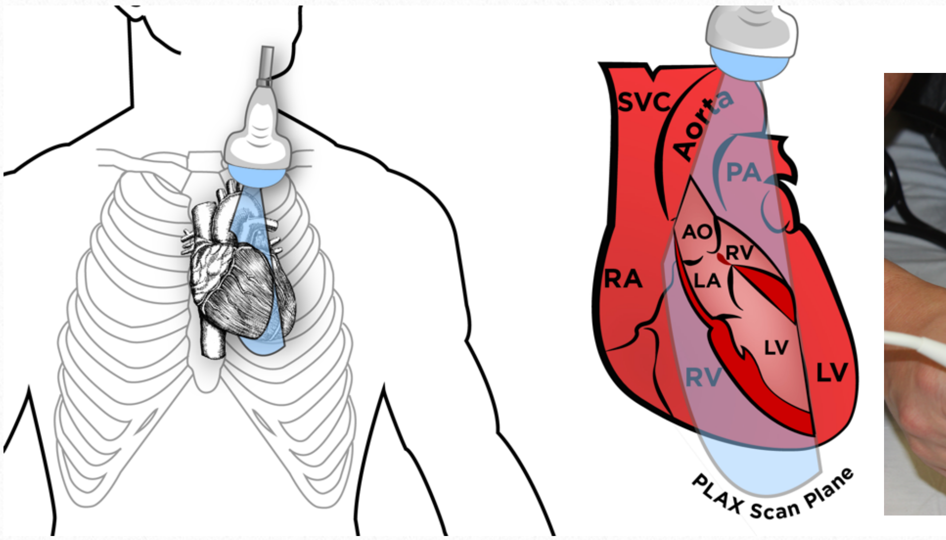
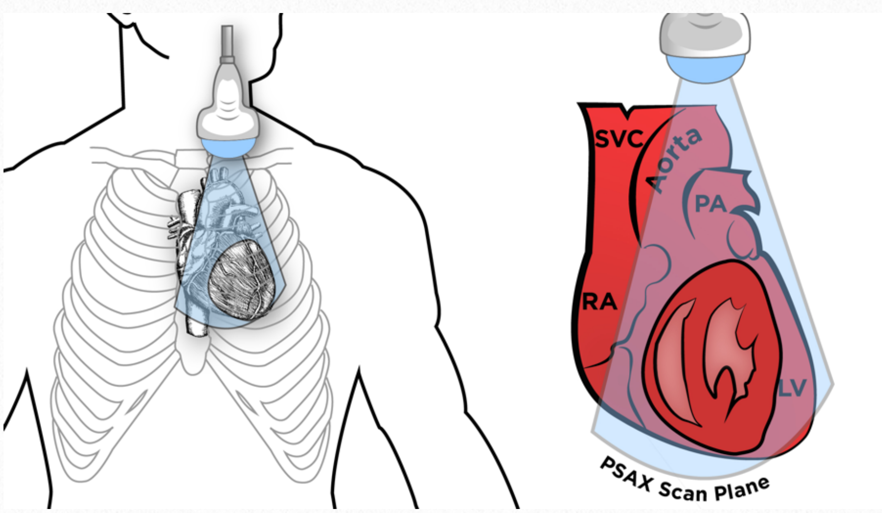
3

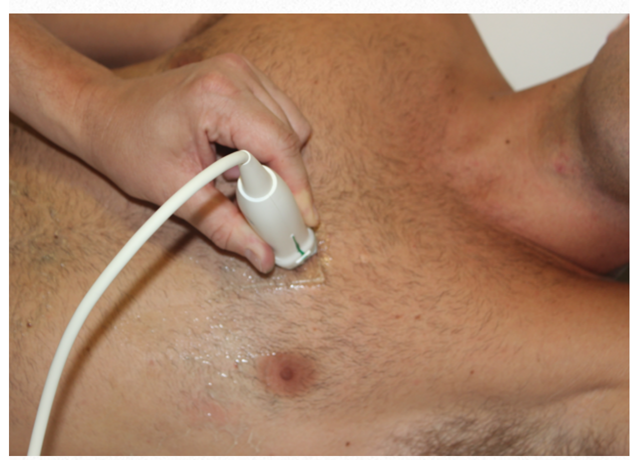
Left Ventricle End-Diastolic Area

Parasternal Long Axis View (indicator at 10 o'clock position "right shoulder")



Parasternal Short Axis View (indicator at 2 o'clock position "left shoulder")





I. Volume Status: Ultrasound provides a variety of techniques to assess the patient's volume status, and, often more importantly, whether or not the patient is fluid responsive. Each subsection (below is part 2 of 5) will cover one ultrasound technique used to answer these questions.

B. **Left Ventricle End Diastolic Diameter/Area:** The diameter and/or area of left ventricle at the end diastole represents the filling of the left heart and can indicate the patient's filling status. Using the measure or caliber feature, one can assess the diameter of the IVC in either a standard 2-D image or an M-mode image. The views used to obtain these measurements are the same views that will be used for further evaluation of cardiac function. Similar to IVC collapsibility, *IT IS IMPORTANT TO REALIZE THAT EVEN THOUGH THIS MODALITY CAN HELP PREDICT LEFT VENTRICLE VOLUME, IT DOES NOT INDICATE VOLUME RESPONSIVENESS.* Please see the below table for the relationship between LV diameter and LV area. In addition to measuring LV diastolic diameter or area to determine LV volume, these views can also be used to assess cardiac contractility by measuring the change in the diameter of LV from diastole to systole. A left ventricular end diastolic diameter of less than 3.5cm is a crude marker of a severely hypovolemic state. This change in area is called fractional area change (FAC) and indicates myocardial contractility (see table below). Also with these views one is able to help identify the **mechanism of shock**:

1. **Cardiogenic shock**: increased LV area/diameter and a decreased FAC (from decreased contractility)

2. **Hypovolemic shock**: decreased LV area/diameter (from decreased preload) and a increased or normal FAC

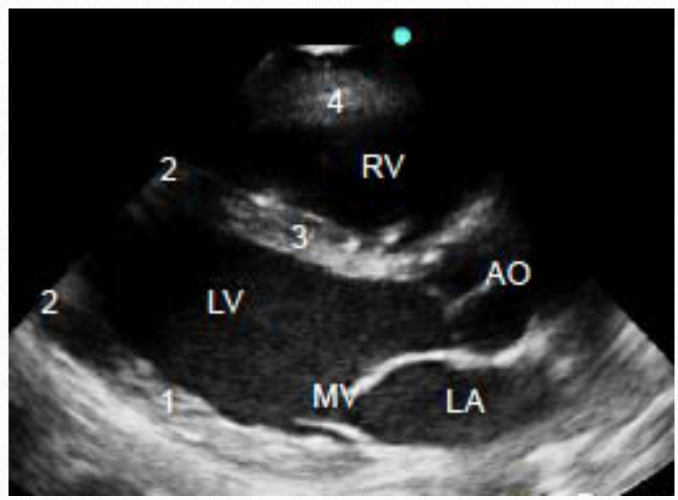
3. **Vasogenic shock:** normal LV area/diameter and a increased or normal FAC (from low SVR state)

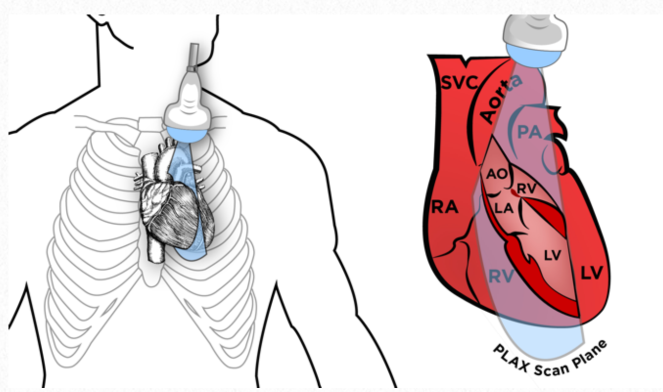
Patient Position: Left-Lateral with L arm extended

Probe type: phased array cardiac probe (small footprint/low frequency)

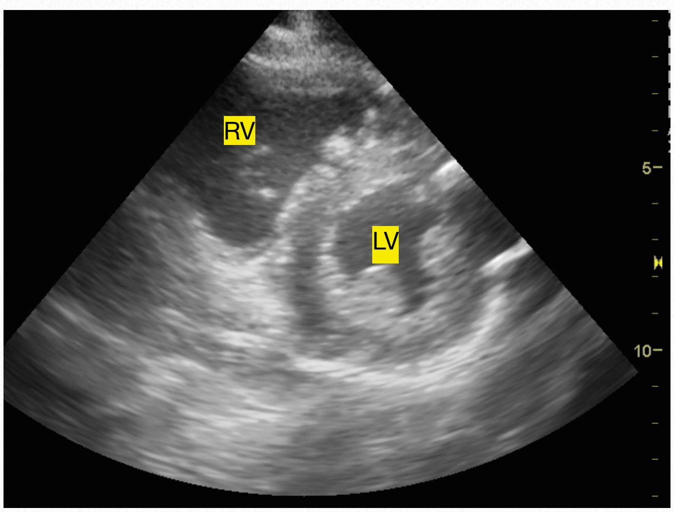
Probe position: 10 o'clock or towards right shoulder.

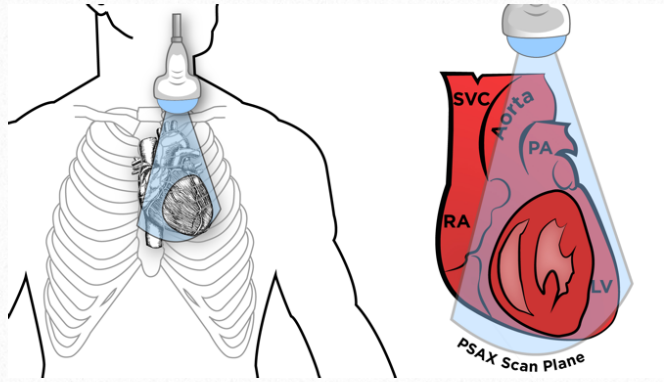
Position 1. **Left parasternal *long axis view*:** 3rd-4th interspace just lateral to the left of the patient's sternum with the index roughly at the *10 o'clock position,* or aiming at the *right shoulder (indicator shown in green).*

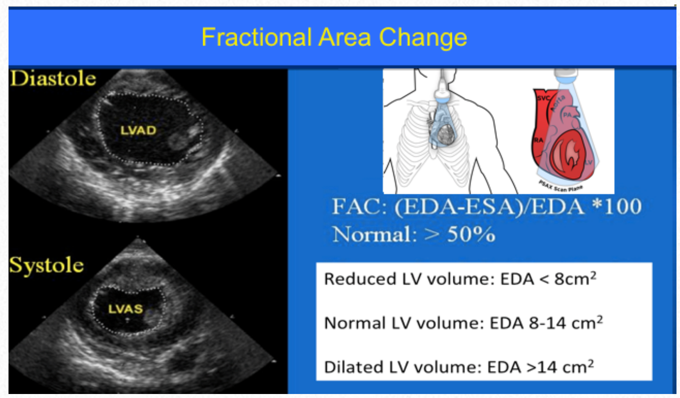


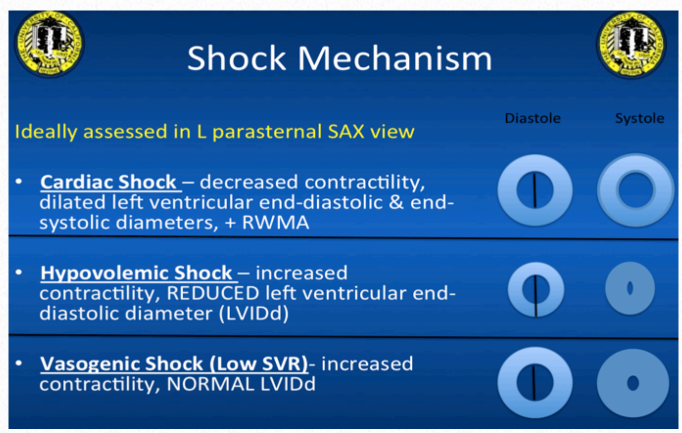


Position 2. <u>Left parasternal *short axis view*:</u> 3rd-4th interspace just lateral to the left of the patient's sternum with the index marker approximately at *the 2 o'clock position* or aiming towards the *patients left shoulder* (90 degrees to LAX view). Also, remember that you must adjust the **angle** to get a good view of the midpapillary level of the ventricle. Aiming towards the head will show the mitral valve followed by the aortic valve, and towards the feet will show the LV apex. Finally, one knows that a good cross section is obtained by making sure the two papillary muscles are equal in size.









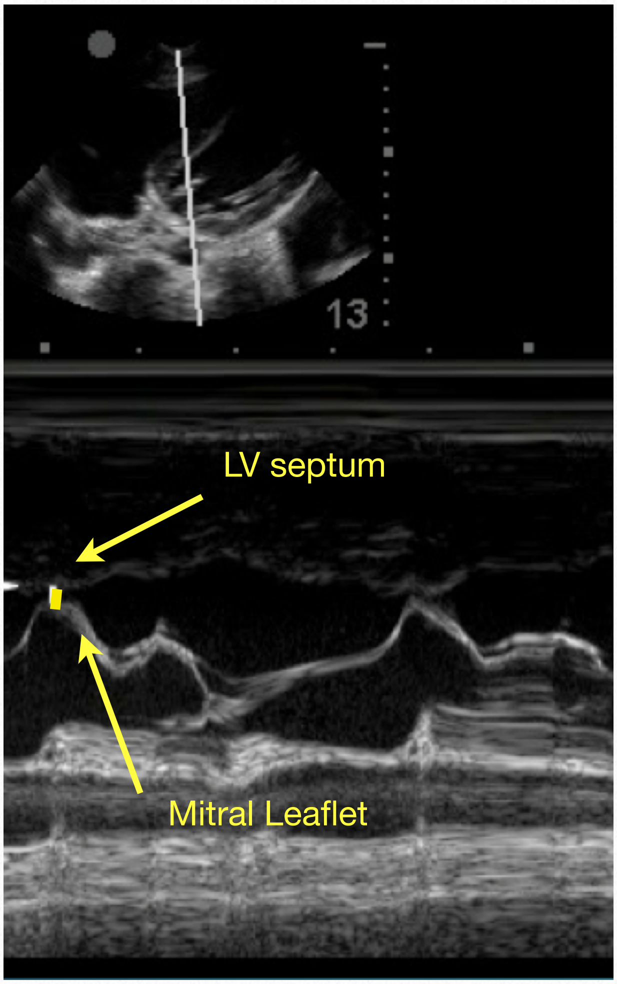
E – Point Septal Separation (EPSS)

EPSS is a measurement obtained using M-mode echocardiography of the heart in the parasternal long-axis (PSLA) view through the LV septum and anterior mitral valve leaflet.

This measurement (in mm) represents the distance from the anterior septal endocardium to the maximum early opening point of the anterior mitral leaflet during early diastole and correlates with ejection fraction.

An increased EPSS is specific for decreased ejection fraction. A normal EPSS is 6mm or less which correlates with a normal EF, between 6mm and 12mm correlates with a low normal EF and any measurement above 12mm correlates with a low EF.

Normal EPSS



Abnormal EPSS