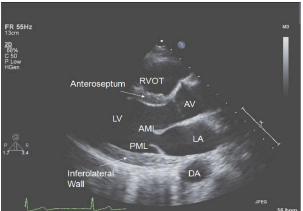
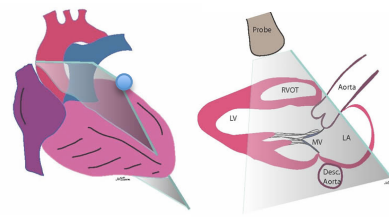
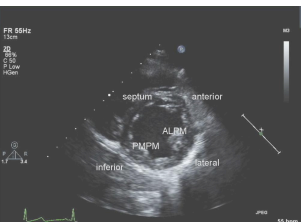
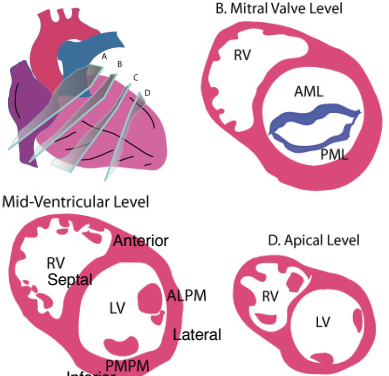
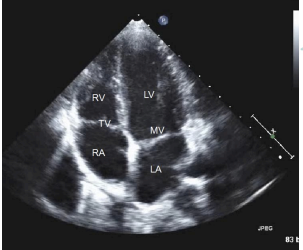
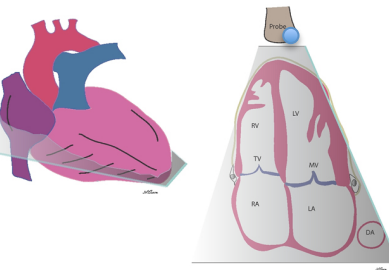
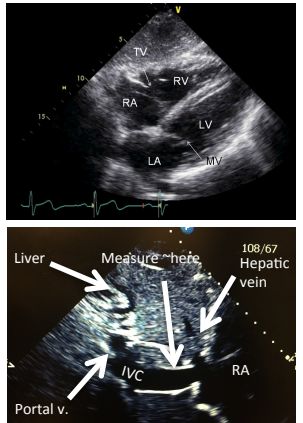
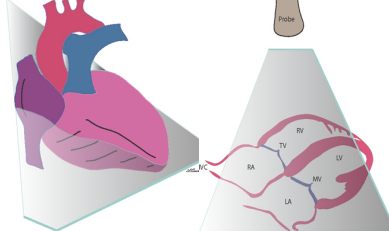
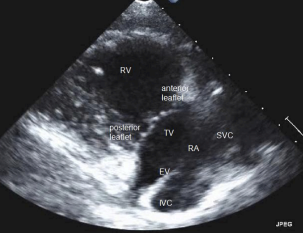
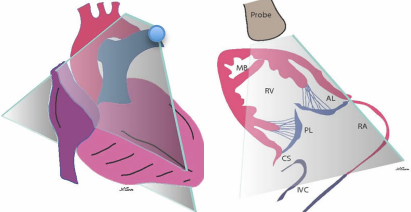
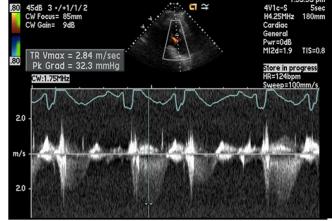
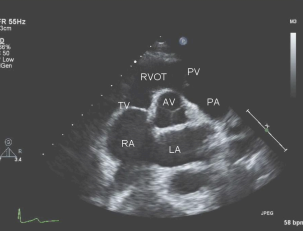
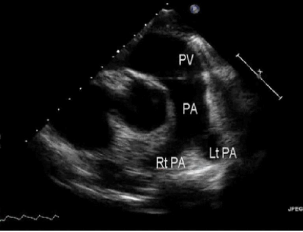
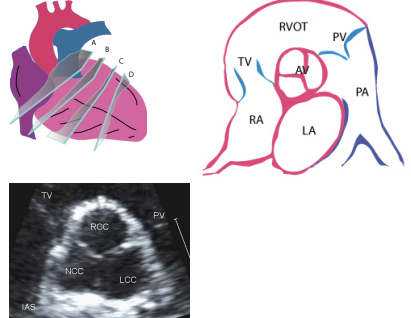

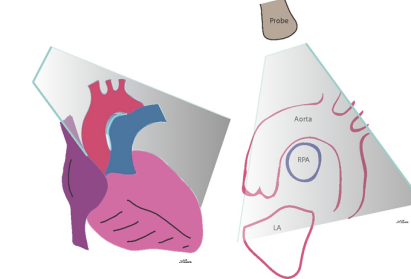
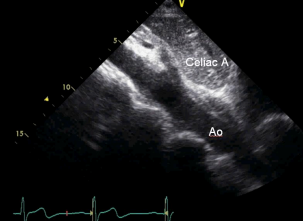
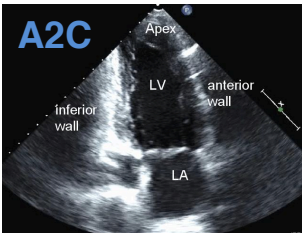
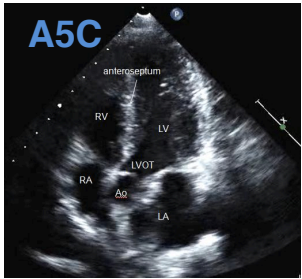
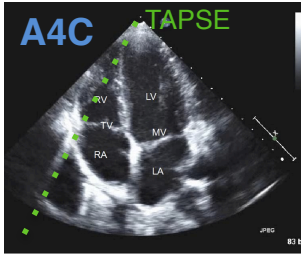


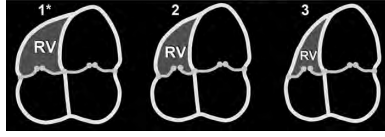
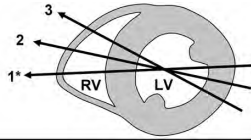
View	Transducer	Assessments	Tips
<p>Parasternal Long Axis (PLAX)</p> 	 <p>Transducer @2nd-4th left intercostal space, pt's left of sternum; notch toward pt's right shoulder</p>	<p>Quick look at LV and RVOT function/hypertrophy, effusion AV and MV gross function, LA and aortic root size</p> <p>-Underest MR cLVH - >1.1cm mid-septum</p>	<p>-Positioning: for most views, left lateral (1 pillow behind pt's right flank), left arm up above head with HOB @10-20 degrees to open up rib spaces; inspiratory holds can help</p> <ul style="list-style-type: none"> -RV is closest to chest wall/probe -View of RVOT not 'RV' -Shouldn't see apex of LV -Should see ant/post mitral leaflets (centered) and AV leaflets -This view is home base, always revert to PLAX view to reorient
<p>Parasternal Short Axis (PSAX)</p> 	 <p>-Start from PLAX view, turn probe clockwise (notch) toward pt's Left shoulder; sometimes easiest to turn w/ R hand while bracing probe w/L hand</p>	<p>Limited look at regional wall motion abnormalities; sense of LV filling; RV:LV pressure</p>	<ul style="list-style-type: none"> -Start at 'fish mouth' view of MV (b), then mid papillary muscle view(c), then apex (d) -Can tilt up/down to apical/basal views; more of a tilt than a slide toward the apex -Mid-papillary view can demonstrate LV filling – 'kissing' papillary muscles can suggest underfilled LV -LV should be round; if interventricular septum is flattened, creating a 'D' shape of the LV, this <i>suggests</i> RV pressure overload (not diagnostic) -SALPI (septum, ant, lat, post/inf) -Don't evaluate RV sys function here
<p>Apical 4 Chamber (A4C)</p> 	 <p>-Start at PMI with notch toward pt's Left shoulder; angle slightly toward sternal notch</p>	<p>Limited look at chamber sizes, systolic function; caution with estimating RV size here (see TTE 102)</p>	<ul style="list-style-type: none"> -Can be difficult view to obtain unless pt nearly in left lateral position; inspiratory hold can be helpful too -Very easy to forshorten (if LV round or not in <u>center</u> of view, then likely you are off axis) -Should see TV and MV in same view -In this view, the RV lies anterior and caudal relative to the LV (make sure probe oriented correctly)
<p>Subcostal</p> 	 <p>-4 chamber view: just below xiphoid, probe flat on abdomen (no fingers beneath), indicator right; point to the heart! (inhale for view)</p> <p>-IVC view: probe perpendicular to pt, beneath xiphoid, indicator toward pt's head; sweep/angle medial/lateral to see IVC and aorta</p>	<p>Most info f/this view and quickly; IVC size ~volume statu; best look at RV; LV systolic function, effusion; abdominal aorta; PFO</p> <p>Best septal & RV wall thickness (<0.5cm end diastole)</p>	<ul style="list-style-type: none"> -Can often get all info f/ 4Cv -Especially good if ventilated pt -Bend pt legs to relax abdomen -Orient by tracing RA to IVC -Measure IVC ~2cm proximal to connection to RA -IVC view ~ happy sperm whale (IVC = smile, liver = head, hep vessel on end = eye) -ASE 2010 Guidelines IVC diameter: <ul style="list-style-type: none"> • ≤ 2.1cm + collapses >50% w/ sniff = nl RAP ~0-5 mmHg • >2.1 + <50% collapse w/sniff = RAP 10-20 mmHg <p><i>Rudski et al, J Am Soc Echocardiogr 2010</i></p>

View	Transducer	Assessments	Tips
<p>PLAX RV Inflow</p> 	 <p>-RV Inflow view: standard PLAX view, tilt transducer to aim toward pt's right hip -PV view- f/PLAX aim toward pt's L shoulder (look up), may see PA bifurc</p>	<p>TV, CX of TR to estimate PASP (though not best view for this); PA diameter, Pulmonary VTI (PW PV)</p> <p>Eustachian valves (EV) – fetal flow from IVC/RA to LA</p>	<p>-Only small movement from PLAX view needed -PASP = $4V^2 + RAP$</p> 
<p>PSAX AV</p>  	<p>A. Aortic, Tricuspid, & Pulmonic Valve Level</p>  <p>-Start from PLAX → PSAX, then angle up toward pt's right shoulder; may slide up one rib space or slide 1cm down toward apex -Further angulation toward pt's chin or simply moving up one rib space or rotate cw/ccw may show 'pants view' of the PA</p>	<p>Good view for CW of TV, PV, RVOT, Aortic leaflets, PA, pulmonary VTI</p> <p>-Can also look for PFO</p>	<p>-Can be challenging view -Positioning pt left lateral can help -Sometimes lung over PV, ask pt to exhale -May not see valve well, but try color doppler -Good view for CW across TV to estimate PASPs</p> <p>-PASP – CW on TV; $4v^2$; TR velocity > 2.8 m/s ~36mmHg if nl RAP -'snail view' -May have to move transducer toward pt's right shoulder to obtain view</p> <p>-Pulmonary VTI – PW proximal to PV (14-16 @HR80) if low suggests low CO (if not tachy)</p>
<p>Suprasternal</p> 	 <p>-Have pt look up and left; place transducer in suprasternal notch with indicator pointed to 14:00; tilt probe up and down</p>	<p>Aortic arch, Rt PA</p>	<p>-If RPA is smaller than aorta, filling pressures likely normal -look for dissection</p>
<p>Subcostal+</p> 	<p>-4CV – see TTE 101 -Lateral IVC view – can see IVC from far lateral if midline incision etc -Aorta view – once found IVC w/ typical midline technique, scan to pt's right by tilting probe; can often see celiac take off</p>	<p>Abd aorta, celiac, IVC</p>	<p>-IVC measurements can vary with pt position; ?significance if positive pressure vent -Continuous IVC flow nl = suction -Normal Abdominal aorta width at subcostal view = ~2cm diameter -With subcostal 4CV, can put doppler color across interatrial septum for ASD/PFO</p>

View

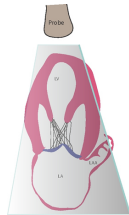
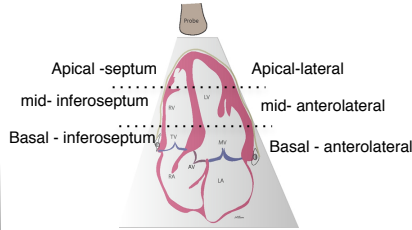


Transducer



-Small angle changes can affect appearance of RV
-Caution with foreshortening

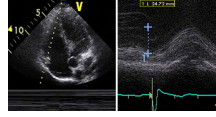
-F/A4C, aim probe upward to get A5C view (ie LVOT)



-F/A4C, use 2 hands to rotate 90 degrees clockwise to get A2C view; angle toward aorta if desired view of aorta

Assessments

TAPSE, RV function, tamponade (caution)



LVOT VTI, Aortic Stenosis

Category	Mild AS	Moderate AS	Severe AS
Valve Area (cm ²)	>1.5	1.0-1.5	<1.0
Peak Jet Velocity (m/s)	<3	3-4	>4
Mean Gradient (mmHg)*	<25	25-40	>40

RWMAs (ischemia); descending thoracic aorta

Tips

-RV size – should end before LV apex and be narrower at apex

-RA size - > 4.4 x 5.3cm

-TAPSE – tricuspid annular plane systolic excursion >1.6cm ~good RV systolic function (caution w/ this measurement)

-Tamponade - Can look at respirophasic variation of MV inflow, do PW of MV inflow @ MV leaflet tips and decrease sweep speed as much as possible (~25)

-LVOT VTI – estimates CO; A5C PW in LVOT as close to AV as possible; ~1m/s; AUC = VTI (nl 19-21 if nl HR); should see clicks of the valve

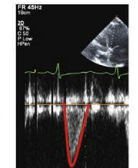
-Aortic Stenosis - A5C, if CW on aortic root side of AV and much higher than PW for VTI, possible AS; similar principal for HOCM

-AVA = $\pi(LVOT\ radius)^2(LVOT\ VTI)/AV\ VTI$ = (continuity equation) (LVOT diameter measured in PLAX_{st})

-Cardiac Output: HR(SV); SV =

PLAX Systole

5 chamber LVOT PW



LVOT diameter = 2.0 cm

LVOT VTI = 19 cm

Misc Tips

- PLAX - Pericardial effusions tend to be anterior to descending aorta, pleural effusion tends to be posterior; should be seen throughout cardiac cycle
- PW = pulse wave doppler (at point); CW – continuous wave doppler= picks fastest signal in the line of the doppler signal
- -Must see RV and LV from multiple views!
- -May see moderator band in RV (prevents overdistension, carries part of RBB); Crista terminalis near RAA
- MR – vena contracta >0.3cm, flow reversal pulm vein, jet 0.25-0.5 area of LA, PISA present
- Heart may be further down if on positive pressure, COPD
- E-point septal separation (EPSS) – PLAX view, distance f/ ant mitral leaflet to septum in early diastole; use MMode > 7mm, EF likely <30%;sensitive, not specific

