Echocardiography On Call

Expectations for on-call fellows regarding after hours echos:

- Perform and provide preliminary interpretation for urgent/emergent indications in which echo data is expected to influence management
- Obtain adequate views to answer the question; you do not have to do a complete echo every time
- You are not expected to perform routine echos, with the exception of donor echos
- If you cannot obtain adequate windows with TTE (sometimes it's impossible) and a question has to be answered, call the TEE attending

Common Emergency Indications

Pericardial Effusion / Cardiac Tamponade

- Things to look for:
  - Tamponade is a *clinical* diagnosis, however the below findings are helpful
  - Respiratory variation of mitral inflow: typically > 30% decrease in the e wave velocity with inspiration, remember to increase the sweep speed when assessing this variable
  - Movement of ventricular/atrial septa leftward with inspiration (visible pulsus)
  - RA systolic collapse: late diastole into systole, > 1/3 of the cardiac cycle → more sensitive, less specific (can be seen in hypovolemia)
  - RV diastolic collapse: more specific than RA collapse
  - LA/LV collapse: very specific, but rare, consider regional tamponade after CT surgery
  - Dilated IVC w/ failure of respiratory collapse (97% sensitive, 40% specific)
  - Ventricles are often underfilled and have high ejection fraction
- Helpful Views:
  - Parasternal long axis: Shows anterior and posterior effusion size
  - Parasternal short axis: right atrial collapse
  - Apical 4 chamber: can see RA/RV/LA collapse, visible pulsus, mitral valve inflow (PW)
  - Subcostal: can see RA/RV/LA collapse, IVC size
  - M-mode can help determine the timing of chamber collapse
- Miscellaneous:
  - Post-operative effusions: often loculated, hemodynamics related to compressed chamber, TEE may be indicated if poor windows
  - RV infarction: localized right heart tamponade, abscession of pulsus

Acute Aortic Dissection

- Mortality for dissection is ~ 1-2% per hour for first 48 hours --> rapid diagnosis is essential
- TTE: 79% sensitivity, 91% PPV for *ascending aorta* → rapid screen but negative/suboptimal findings warrant further evaluation
- If you can’t answer the question, call for TEE or recommend alternative imaging if appropriate
- Things to look for:
  - Ascending Dissection:
    - Dissection flap
- Aortic regurgitation (annular dilation, leaflet prolapse, dissection flap prolapse, secondary causes of aortic disease such as bicuspid valve/Marfan's all make dissection more likely)
- Dilated aortic root
- Pericardial effusion (20-30% of ascending dissections, poor prognosis)
- WMA (especially inferior wall from occlusion of RCA ostium)
- Bicuspid Valve (especially in young patients)
  - Intramural Hematoma
    - Aortic wall thickness > 7mm with no flap, entry tear, or false lumen
    - more common in descending aorta (unlikely to see with TTE)
- Helpful Views:
  - Parasternal long axis: shows aortic valve and annulus/root, proximal ascending aorta, descending thoracic aorta (below LA), AR jet
    - best view for leaflet prolapse
    - Moving up one rib space into high PLAX can show more of proximal aorta
  - Parasternal short: aortic valve, cusps, coronary artery ostia (sometimes)
  - Apical 5 and 3 chamber: aortic valve and root, AR jet
  - Suprasternal notch (long/short axes): arch, origins of brachiocephalic vessels
  - Subcostal: abdominal aorta

**Acute MI/Cardiogenic Shock/Complications of MI**
- Things to look for:
  - Wall motion abnormalities: especially in patients with uninterpretable or equivocal EKGs (LVH, paced) or early presentation when biomarkers may still be normal
    - High sensitivity (except in UA), but only 30% PPV
    - STEMI: affected segments will be akinetic/dyskinetic
  - RV Infarct: usually associated with IMI if hemodynamically significant
    - Dilated hypokinetic RV with apical sparing (supplied by LAD)
    - Dilated RA
    - LV inferior wall hypokinesis
    - TR: usually < 2m/s because RVSP is not increased
    - If hypoxia in setting of IMI consider R→L shunt through PFO
  - Free Wall Rupture: hemopericardium +/- clot
- Pseudoaneurysm may be seen as a neck of communication b/w LV and aneurismal cavity → to-and-fro blood flow seen with color
  - Ventricular Septal Rupture
    - Left-to-right shunt in segment of thin, dyskinetic myocardium
    - CW Doppler of rupture site can estimate RVSP (SBP - gradient = RVSP)
    - Can determine size/extent by comparing pulmonary/systemic flow
    - Subcostal may show inferior VSD
    - Basal VSD: PLAX, apical long, subcostal long
    - Apical VSD: apical four
  - Papillary muscle rupture: posteromedial >> anterolateral due to single blood supply
  - Acute LVOT obstruction: commonly elderly women with basal septal hypertrophy and anterior MI
  - LV thrombus: non-homogenous echo density with distinct margin from underlying akinetic or dyskinetic wall
  - Hypovolemia: small, hyperdynamic LV; small IVC
  - Diastolic function: slower relaxation, lower transmitral gradient
  - Transient ischemia: ↓ E, ↑ DT, ↑ A, ↓ F/A
    - However, may have restrictive pattern with infarction: ↑ E, ↓ DT, ↓ A, ↑ S/A, ↑ F/T; HF more likely with this pattern
- Helpful Views:
  - PLAX: can see ventricular septum, mitral chordae, LVOT, effusion
  - Apical views: can see RV function, VSD, mitral valve/papillaries, diastolic function, LV thrombus, effusion
  - For wall motion and wall rupture may need most views
  - TEE may be needed to fully assess papillary muscles

**PE/Acute RV Strain** (Let’s discuss this one. I think I would keep this directed at acute PE where RV and PASP are usually only mildly elevated due to acute RV pressure overload. You can mention that in patients with chronic PEs or pre-existing pulmonary disease, PA pressures may be significantly elevated.)

- May be difficult to distinguish cor pulmonale (PE) from chronic pHTN
- > 50% of stable patients have no TTE evidence of PE
- Things to look for
  - Dilated RA, RA
  - Hypokinetic RV (sparing of RV apex = McConnell’s sign → 94% specific for PE)
  - RV pressure overload: septum deviated to left (normalizes after anticoagulation therapy)
  - TR with high velocity (reflecting high RVSP, PASP)
  - Lack of inspiratory collapse of IVC
  - Small, hyperdynamic LV (unless concomitant LV pathology)
  - Rarely see thrombi-in-transit
- Helpful Views
  - Apical/Subcostal show RV/RA size and function, septa, TR jet
  - Subcostal shows IVC size
Echo Links:

- Webcasts of Echo Topics from Duke: http://www.echoincontext.com
- Echo Image Database: http://www.echo-web.com
- American Society of Echocardiography: http://www.asecho.org