Profiling, Hemodynamic

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```
flowchart TD
  filter_dys("(1) Bad LVEF OR (2) low CI AND low HR`")
  type_dys["Dysfunctional"]
  dys_svr_high["consider vasodilators"]
  dys_svr_low["Consider vasoconstrictors"]
  dys_hypoperf["End organ hypoperfusion?"]
  dys_hypoperf_yes["Access SVR"]
  dys_hypoperf_no
  filter_dys -- Yes --> type_dys
  type_dys -- --> dys_hypoperf
  dys_hypoperf -- Yes --> dys_hypoperf_yes
  dys_hypoperf_yes -- SVR > 1200 --> dys_svr_high
  dys_hypoperf_yes -- SVR < 800 AND MAP < 65 --> dys_svr_low
```

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Hepatic Congestion

- Article, VExUS Grading
- LV Diastolic Function
- Echopedia, Diastolic Function
- Hepatic Vascular Pulsatility

FREE Exam

Setup

- Enter patient information
- Attach EKG leads
- Select phased array transducer
- Choose ST UMMC 1 Echo preset

Parasternal long axis (PLAX)

- Qualitative EF assessment (CLIP)
- LVOT diameter (SAVE)
- PLAX, during end systole
- Inner edge to inner edge of aortic at base of aortic valve
- Normal 1.8-2.4 (~BSA, can use as surrogate if unable to measure)
- Color doppler over MV and AoV to look for regurgitation (CLIP)

Parasternal short axis (PSAX)

- Qualitative EF assessment at each level
- Level of papillary muscles (CLIP) - assess RV as well
- Level of mitral valve (CLIP)
- Level of aortic valve (CLIP)
- Color doppler over tricuspid to check for TR (CLIP)

Apical four chamber (A4C)

- Qualitative assessment of RV and LV size (CLIP)
- Color doppler over MV, LA, and LV (CLIP)
- Mitral inflow E-a (SAVE)
    - A4C, mitral valve, PW doppler just inside ventricle
    - Above baseline, measuring flow into the ventricle/towards the probe
    - E = early diastolic filling
    - A = late atrial kick
    - A is just before QRS, E is before A
    - E > A in normal and pseudonormal (super abnormal)
- Mitral annulus TDI (SAVE)
    - A4C, mitral valve, lateral annulus, TDI → PW
    - A’ is just before QRS, E’ is before A’
    - E’ and E occur at the same time point in the cardiac cycle
    - Normal E/E’ >10
- Color doppler over TV (CLIP)
- TR Vmax (SAVE)
    - A4C, CW doppler
    - Can also be done in PSAX, CW doppler, if visible at aortic valve level
    - Only if tricuspid regurgitation is present
    - Surrogate for RVSP/PASP (TR max PG = RVSP + CVP)
- TAPSE (SAVE)
    - A4C, tricuspid valve, lateral annulus, M-mode
    - Estimate visually before measuring
    - Measure peak to valley
    - RV specific, only free wall, no contribution from septum/LV
    - Normal >1.7

Apical five chamber (A5C)

- Collar doppler over LVOT and AoV (CLIP)
- LVOT VTI (SAVE)
    - A5C, aortic valve, PW doppler where LVOT diameter was measured
    - Quantitative surrogate for stroke volume (SV)
    - Trace largest flow away from probe, baseline to baseline
    - Normal 18-24 in euvolemia (approx. 10x BSA)
- Stroke volume variation (SAVE)
    - Using doppler saved for LVOT VTI, need at least 10 beats
    - Decrease sweep speed (25-35 mm/sec) to see multiple beats

    - Measure SV maximum and minimum flow
    - Cannot do in arrhythmia, not validated in low EF
- AoV Vmax
    - A5C, aortic valve, CW doppler
    - If AS, SVV measurement is invalidated
    - Normal <200

Subcostal (SC)

- Evaluate for pericardial effusion (CLIP)
- Oblique view with IVC (CLIP)
- IVC collapsibility (SAVE)
    - SC oblique, M-mode
    - If variability, measure max and min
- Hepatic vein
    - IVC view, PW doppler
    - Drains right atrium/IVC, transduces the pressures of the right side
    - Occurs between two QRS complexes
    - S = ventricular systole, actually seeing atrial diastole
    - D = ventricular diastole, actually seeing atrial systole
    - A = atrial kick, causes small reversal in pressure
- Portal vein
    - IVC view, PW doppler
    - Normal vein, should have continuous flow
    - “Pulsatility” or “to and fro” pattern = volume intolerance

Pulmonary

- Gen Abdomen preset
- 6 locations - upper, mid, and lower on left and right (CLIP x6)
- Evaluation for B lines
- Rating - (0) = absent, (1 zone) = scattered, (>2 zones) = diffuse

Internal Jugular veins (IJ)

- Linear probe, decrease depth to 5cm
- Measure at HOB 0 degrees and then HOB 90 degrees
- Only need one side