

Cardiac Bypass Cheat Sheet

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Setup Checklist

- +/- large dose narcotic/benzos
- Phenylephrine bolus syringes
- Epi 10 mcg/mL bolus syringes
- Nicardipine bolus and gtt
- TXA/amicar
- Calcium chloride
- Heparin bolus
- Carrier fluid
- Epi vs dobutamine gtt
- Neo vs vasopressin gtt
- Precedex gtt
- Cerebral oximetry
- 2nd IV setup
- Pre-induction arterial line
- Introducer sheath
- +/- Swan
- Ultrasound
- TEE
- Epicardial pacer box

Pre-Op

- Type and screen + crossmatch
- Place arterial line

Induction

Gradual, pathology dependent

Pre-Bypass

CVC +/- Swan, 2nd IV
 TXA/amicar bolus + infusion
 Baseline ABG + ACT
Hold lungs for "virgin sternotomy"
Minimal IVF to lessen hemodilution

Cannulation

Reduce SBP to 90-100 before aortic cannulation to decrease risk of dissection

Bypass

Stop ventilator once full CPB
 MAP 60-70, rSO₂ > 50-55%
 Ensure perfusion starts inhaled anesthetic

Coming off Bypass

Assess/treat bypass coagulopathy
 -- send platelet + fibrinogen levels @ 34 C (pre-emptive)
 -- reverse with protamine off bypass
 -- send ACT, ABG, PT/PTT, fibrinogen, CBC s/p reversal

Support the heart

-- pressors ready
 -- pacer box ready
 -- CaCl 15 min after x-clamp removal (*avoid stone heart*)

Resuscitation

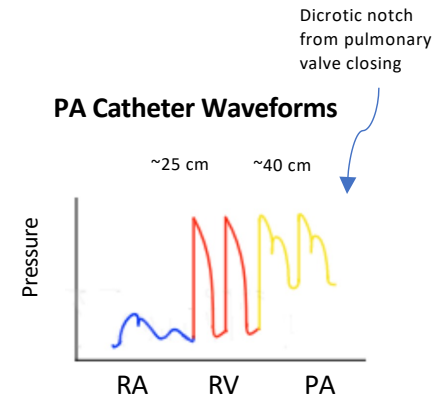
-- Adequate product/albumin in room

Post-Bypass

Continue resuscitation
 OG tube
 Sedation for transport

Myocardial O₂ Supply/Demand

| O ₂ supply | O ₂ demand |
|---------------------------|-----------------------|
| Heart rate | Heart rate |
| BP diastolic | Contractility |
| CaO ₂ | Wall tension |
| SpO ₂ *Hb*1.34 | |



PA Catheter Waveforms

Right Heart Failure

- Trigger: ↑ RV afterload, volume overload, RCA air embolism
- Presentation: narrowing CVP to diastolic PAP step-off
- Treatment: epi/dobut bolus

Upper Doses

| Medication | Bolus | Drip |
|----------------|----------------|----------------------|
| Epinephrine | 10 mcg | 0.02-0.08 mcg/kg/min |
| Norepinephrine | ~10 mcg | 0.02-0.1 mcg/kg/min |
| Dobutamine | NA | 2.5 - 7.5 mcg/kg/min |
| Dopamine | NA | 2-10 mcg/kg/min |
| Ephedrine | 5-10 mg | NA |
| Phenylephrine | 100 mcg | 0.3-1 mcg/kg/min |
| Milrinone | 12.5-25 mcg/kg | 0.125-0.5 mcg/kg/min |
| Vasopressin | 1 unit | 0.03-0.06 units/min |

$$SVR = \frac{80 * (MAP - CVP)}{Q} \quad \text{Normal: } 800-1500 \text{ dyn/s/cm}^5$$

Downer Doses

| Medication | Bolus | Drip |
|---------------|-------------|-------------------|
| Esmolol | 20-40 mg | 50-300 mcg/kg/min |
| Nicardipine | 100-200 mcg | 2-15 mg/hr |
| Nitroglycerin | 20-50 mcg | 0.5-10 mcg/kg/min |
| Clevidipine | -- | 1-16 mg/h |
| Nitroprusside | -- | 0.5-10 mcg/kg/min |

Correcting Coagulopathy

Kcentra (II, IX, VII, X) *Empiric dose 2500 units*

| Pre-treatment INR | 2-4 | 4-6 | > 6 |
|---|-----|-----|-----|
| Dose* of Kcentra (units* of Factor IX) / kg body weight | 25 | 35 | 50 |

NovoSeven (rVIIa) *Empiric dose 20-40 mcg/kg*

Fibrinogen (Riastap) *Empiric dose 2g*

$$\text{mg/kg dose} = \frac{\text{Target level (mg/dL)} - \text{measured level (mg/dL)}}{1.7 \text{ (mg/dL per mg/kg body weight)}}$$

DDAVP = *0.3 mcg/kg, peak 20 min, Q12h, rapid tachyphylaxis*

| Lesion | Pathophysiology | Management | Pressor & Inotrope | Reference Values |
|--------------------------------------|--|--|-------------------------|---|
| Mitral Regurgitation, Chronic | <ul style="list-style-type: none"> High LV preload → LV dilation, gradual LV dysfunction High LA volume → LA dilation, AF +/- pHTN | <p>Fast – HR normal to slightly high <i>Shorter systole decreases time for regurgitation, shorter diastole prevents LV overload</i></p> <p>Forward – minimize SVR <i>Less resistance to forward flow</i></p> | Ephedrine Dobutamine | <p><u>Moderate</u></p> <ul style="list-style-type: none"> 30-50% regurgitation Vena contracta 3-7 mm |
| Mitral Regurgitation, Acute | <ul style="list-style-type: none"> Overloaded, distended LV Blood backs up into lungs → pulmonary edema | <p>Fast & Forward + Diuresis</p> | Dobutamine | <p><u>Severe</u></p> <ul style="list-style-type: none"> >50% regurgitation Vena contracta > 7 mm |
| Aortic Stenosis | <p style="text-align: center;">$BP = Q \times SVR$</p> <ul style="list-style-type: none"> Limited SV → limited Q, can't compensate for ↓ SVR LVH → LV susceptible to ischemia (↑ O₂ demand, ↓ CPP) | <p>"Goldilocks HR" – 60-70 <i>Too fast ↑ O₂ demand, causing ischemia</i> <i>Too slow = poor Q</i></p> <p>Sinus rhythm <i>Preload already limited, need atrial kick</i></p> <p>Maintain Coronary Perfusion Pressure</p> | Phenylephrine | <p><u>Mild</u></p> <ul style="list-style-type: none"> MG < 20 mm Hg Vmax 2-3 m/s AVA > 1.5 cm² <p><u>Moderate</u></p> <ul style="list-style-type: none"> MG 20–40 mm Hg Vmax 3-4 m/s AVA 1-1.5 cm² <p><u>Severe</u></p> <ul style="list-style-type: none"> MG > 40 mm Hg Vmax > 4 m/s AVA < 1 cm² <p><i>Consider "low-flow AS" (CI < 3)</i></p> |
| Mitral Stenosis | <ul style="list-style-type: none"> Increased left atrial pressure → left atrial dilation, AF +/- pHTN Diminished LV preload | <p>Slow-normal HR – 50-70 <i>Ensures adequate LV preload</i></p> <p>Sinus Rhythm <i>Supports adequate LV preload</i></p> <p>Euvolemia <i>Hypervolemia risks pulmonary edema</i> <i>Hypovolemia → underfilled LV</i></p> | Phenylephrine | <p><u>Mild</u></p> <ul style="list-style-type: none"> MG < 5 mm Hg <p><u>Moderate</u></p> <ul style="list-style-type: none"> MG 5-10 mm Hg <p><u>Severe</u></p> <ul style="list-style-type: none"> MG >10 mm Hg |
| Coronary Artery Disease | Coronary perfusion pressure = $Bp_{diastolic} - LVEDP$ | <p>Slow-normal HR – < 80 <i>Minimizes myocardial O₂ demand</i></p> <p>Adequate diastolic BP</p> | Phenylephrine | |