Post-Cardiac Surgery Evaluation

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Look Touch Listen

- Temperature, pulse, respiratory rate, & blood pressure
- Note the skin as pink, cyanotic, or pale
- Extremities for warmth & good perfusion
- Pulses palpable, increased, or decreased
- Breath sounds, wheezes, or rales
- Precordial activity, murmurs, or rubs
- Liver size
Check Monitoring + Lines & Tubes

- EKG monitor
- Pulse oximeter
- Arterial line for blood pressure & blood samples
- Central venous pressure monitoring
Check Monitoring + Lines & Tubes

- Pulmonary artery line if pulmonary hypertension
- Temporary epicardial pacemaker wires
- Foley catheter
- Chest tubes & mediastinal tubes
- Nasogastric tube
Check Monitoring + Lines & Tubes

- Endotracheal tube size & proper placement
- Ventilation for stable, physiological blood gases
- Wean from ventilation & extubate quickly
Meds - Inotropes

- Judicious use

- Dopamine
  - Low dose dopamine can improve renal blood flow

- Dobutamine
  - Not improve renal flow like low dose dopamine

- Milrinone
  - Weak inotrope with vasodilation and afterload reduction
Meds - Inotropes

 Calcium

- Low ionized Ca++ myocardial systolic dysfunction
- High ionized Ca++ may cause diastolic dysfunction

 Epinephrine

- Especially for low CO and bradycardia
- Excessive tachycardia may impair cardiac output
Meds - Vascular Resistance

- Norepinephrine
  - Increase systemic vascular resistance (SVR) for hypotension & vasodilation

- Systemic vasodilators
  - Nitroprusside and nitroglycerin decrease afterload improve CO but hypotension
Fluid Balance

- Early fluid restriction
- Diuresis with IV furosemide (Lasix)
- Capillary leak
  - Pulmonary edema
  - Peripheral edema
  - Gastrointestinal edema
  - Myocardial edema
  - Prolongs LOS
Fluid Balance

I & O

Input

- Maintenance IV
- Fluid from IV drips
- Volume expanders
- Blood products
- Oral intake if any
Fluid Balance

I & O

Output

- Urine
- Bleeding
- Chest tube drainage
- Insensible loss
- Nasogastric tube loss if any
**Fluid Balance**

- **Urine output**
  - > 1 cc/kg/hour
  - Low urine output can herald low cardiac output or renal insufficiency
  - Quickly investigate possible causes of low urine output
  - Renal insufficiency may require peritoneal dialysis

- **Bleeding from chest tubes**
  - Significant if flow exceeds > 10 cc/kg/hour

- **I & O need frequent assessments**
  - Aim for net negative I & Os, if not hypotensive
  - A net positive I & O promotes capillary leak
Pain Management

Pain

- Tachycardia and hypertension negatively impact cardiac output

Medications

- Fentanyl
- Morphine
- Hydrocodone/acetaminophen
- Codeine/acetaminophen
Post-op Testing

- Chest X-ray
  - Pneumothorax & pleural effusions
  - Central venous line placement
  - Intracardiac lines
  - Endotracheal tube placement
  - Chest tube placement
Post-op Testing

- Chest X-ray
  - Pacing wires
  - Heart size
  - Pulmonary vascular markings
  - Pulmonary parenchyma
  - Mediastinal evaluation
Post-op Testing

- EKG
  - Arrhythmias (later)
  - Ischemic changes
  - Metabolic changes
  - Bundle branch block
Inverted T waves in the left precordial leads (V5, V6)
Post-op Testing

Echocardiogram

- Transesophageal (TEE)
  - Intraoperative guide surgeon

- Transthoracic approach
  - Cardiac function & diastolic filling
  - Residual defects
  - Detect pericardial effusions
Pericardial effusion
Post-op Testing

Laboratory values

- Desirable lactate < 2, if rising then low CO
- CBC
- Electrolytes sodium, potassium, chloride
- Arterial blood gas
Post-op Testing

Laboratory values

- PT, PTT, ACT, platelets
- Glucose
- Calcium & magnesium
- BUN & creatinine
- Liver function tests
Early Complications

★ Bleeding

★ options for bleeding
   - Protamine to correct heparinization
   - Platelets, fresh frozen plasma, or cryoprecipitate
   - Consider aminocaproic acid (Amicar)
   - Return to the OR, if bleeding persists
Early Complications

Low Cardiac Output

- Inadequate ventilation
  - Endotracheal tube (ET) too small
  - ET tube plug or displacement
  - Pleural effusions, & pneumothorax
  - Capillary leak & pulmonary edema
  - Diaphragmatic paralysis
Early Complications

Low Cardiac Output

℞ options for inadequate ventilation

- Change ET tube if too small or plugged
- Decompress pleural effusions or pneumothorax
- Diuresis for pulmonary edema
- Paralyzed diaphragm
- Persistent chylothorax
Early Complications

Low Cardiac Output

- Myocardial dysfunction
  - Ischemia from CPB or surgical technique
  - Hypocalcemia, especially post CPB
  - Hypocalcemia with chromosome 22q11 deletion
  - Hypomagnesemia
  - Thromboembolic event or air embolism
Early Complications

Low Cardiac Output

℞ options for myocardial dysfunction

🔹 Adjust inotropic support
🔹 Decrease afterload
🔹 Correct electrolyte abnormalities, especially calcium
🔹 May need ECMO or ventricular assist devices
Early Complications

Low Cardiac Output

Cardiac tamponade

- Signs of tamponade
- Increased central venous pressure
- Pulsus paradoxus of > 20 mm Hg on art line tracing or cuff blood pressure

℞ options for tamponade

- Open the chest to relieve tamponade
- Immediate pericardiocentesis
- Pre-procedure fluid bolus
Early Complications

Arrhythmias

Causes

- Electrolyte
- Hypoxia & hypercapnea
- Acidosis
- Medications
- Surgery
Early Complications

Arrhythmias

- Fast
  - Sinus tachycardia: pain, fever, hypovolemia, excess cathechols
  - Junctional ectopic tachycardia
  - Supraventricular tachycardia
  - Ventricular tachycardia
SVT
Supraventricular Tachycardia

HR = 300 ÷ 1.2 = 250
The HR is 250 bpm
Narrow QRSs

25 mm/sec  10 mm/mV
VT
Ventricular Tachycardia

HR = \( \frac{300}{1.5} = 200 \)
The HR is 200 bpm
Wide QRSs

25 mm/sec  10 mm/mV
Response to Adenosine in a Patient with Atrial Flutter
Postoperative Junctional Ectopic Tachycardia
Early Complications

Arrhythmias

- **Slow**
  - Sinus node dysfunction
  - Atrioventricular block

- **Irregular**
  - Ectopics
  - Frequently from indwelling lines
  - No antiarrhythmics if hemodynamically insignificant
Post-Cardiac Surgery
**PACs**
Premature Atrial contractions

The abnormal P waves appear earlier than expected.

The narrow QRSs that follow the PACs are similar to the normal QRSs.
PVCs
Premature Ventricular contractions

The abnormal QRSs appear earlier than expected

The premature QRSs are wide and very different from the normal QRSs
Early Complications

Residual defects

- Left-to-right & right-to-left shunts
- Pressure from residual stenotic lesions
- Atrioventricular valve regurgitation
- Semilunar valve regurgitation

R options for residual defects

- Pharmacological adjustments
- Return to OR to repair residual defects
- Interventional cardiac catheterization
Early Complications

- Pulmonary hypertension
  - Especially in Down syndrome
  - Especially postoperative large VSD or PDA
  - Any condition with preoperative pulmonary HTN

- Rx options for pulmonary hypertension
  - Hyperventilation
  - Sedation
  - Nitric oxide
  - Other pulmonary vasodilators
Early Complications

🌟 Systemic hypertension

🌟 Hypotension is more common
🌟 Occasionally following coarctation repair

🌟 RX options for systemic hypertension

🌟 Nitroprusside
🌟 Other IV antihypertensives
🌟 Residual CoA may need return to OR or later balloon angioplasty
Early Complications

- Other organ systems complications
  - Intracranial hemorrhage, stroke, or air embolism
  - Liver dysfunction or shock liver
  - Renal failure from ATN
  - Gastrointestinal bleeds, perforation, or NEC

- Rx options for organ system complications
  - Organ specific interventions
Early Complications

* Infections
  * Sepsis
  * Preoperative illness magnified after bypass
  * From wound & line infections

* Rx options for infections
  * Antibiotics
  * Debridement & abscess drainage
THANK YOU!

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