SDS/PACU CONTINUING EDUCATION SERIES

Cardiac Considerations

Vital Signs

Heart Rate

Respiratory Rate

Blood Pressure

Pulse Ox

Inspection

General Condition

Extremities

Chest

Palpation

Pulses – Carotid, Brachial, Radial, Femoral, Pedal

Cap Refill

Auscultation

S1 and S1 – Normal

S3 and S4 – Abnormal

Family History

Cardiac Conditions

Stroke, Murmurs

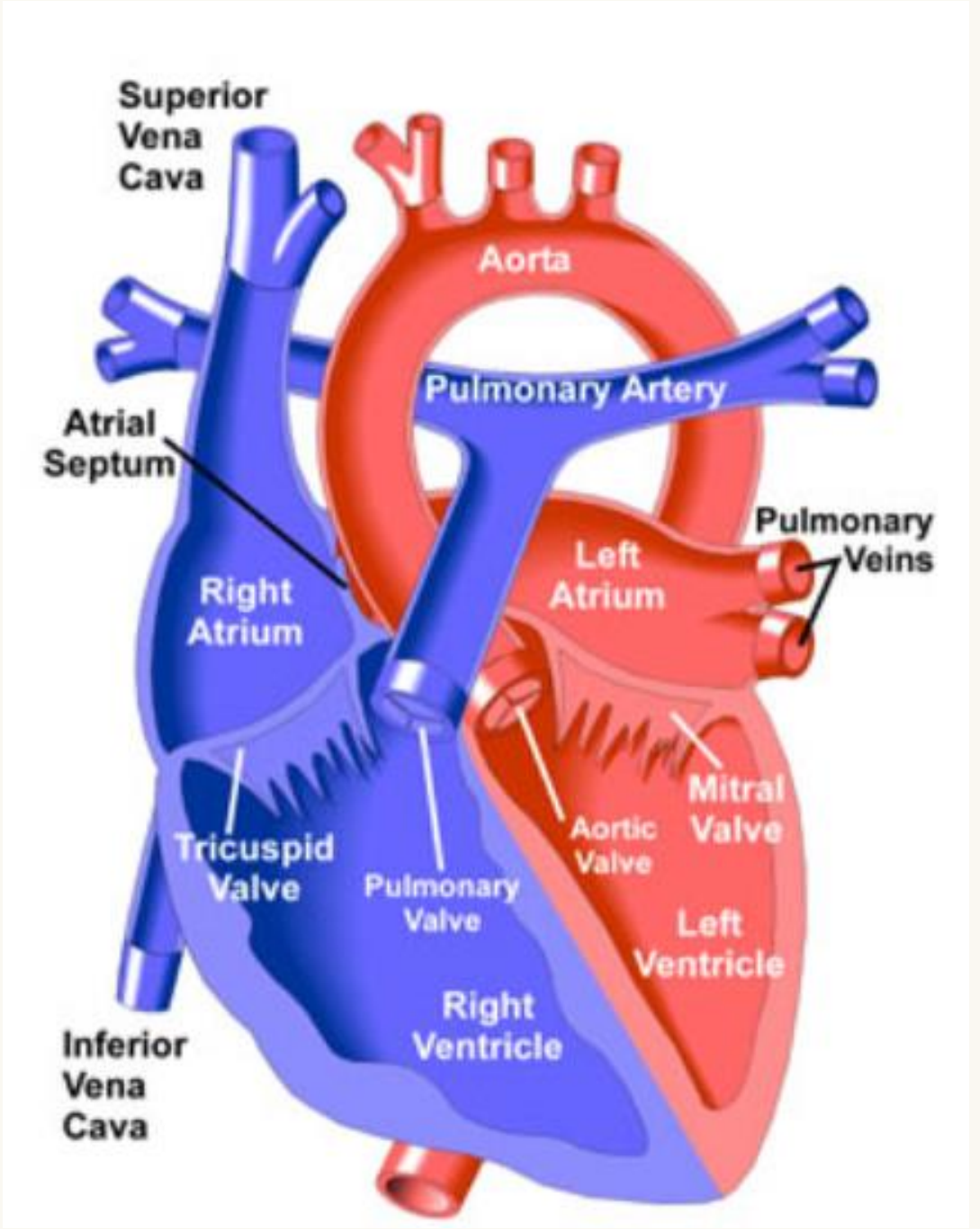
Heart Surgery

Sudden, Unexplained Death

Basic Cardiac Assessment

NORMAL HEART ANATOMY

Before diving into congenital heart defects, it is important to review or familiarize yourself with the anatomy of a normal heart

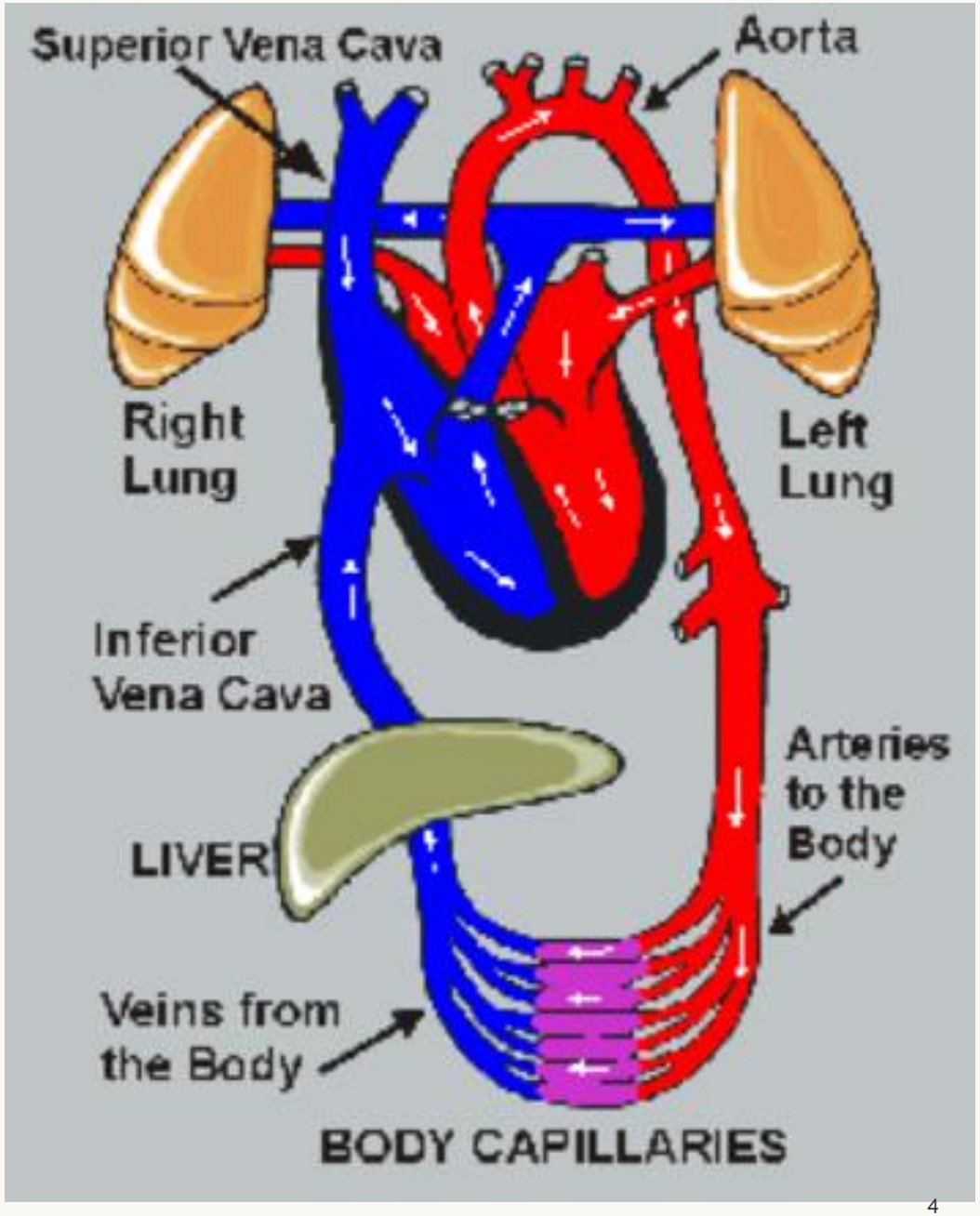


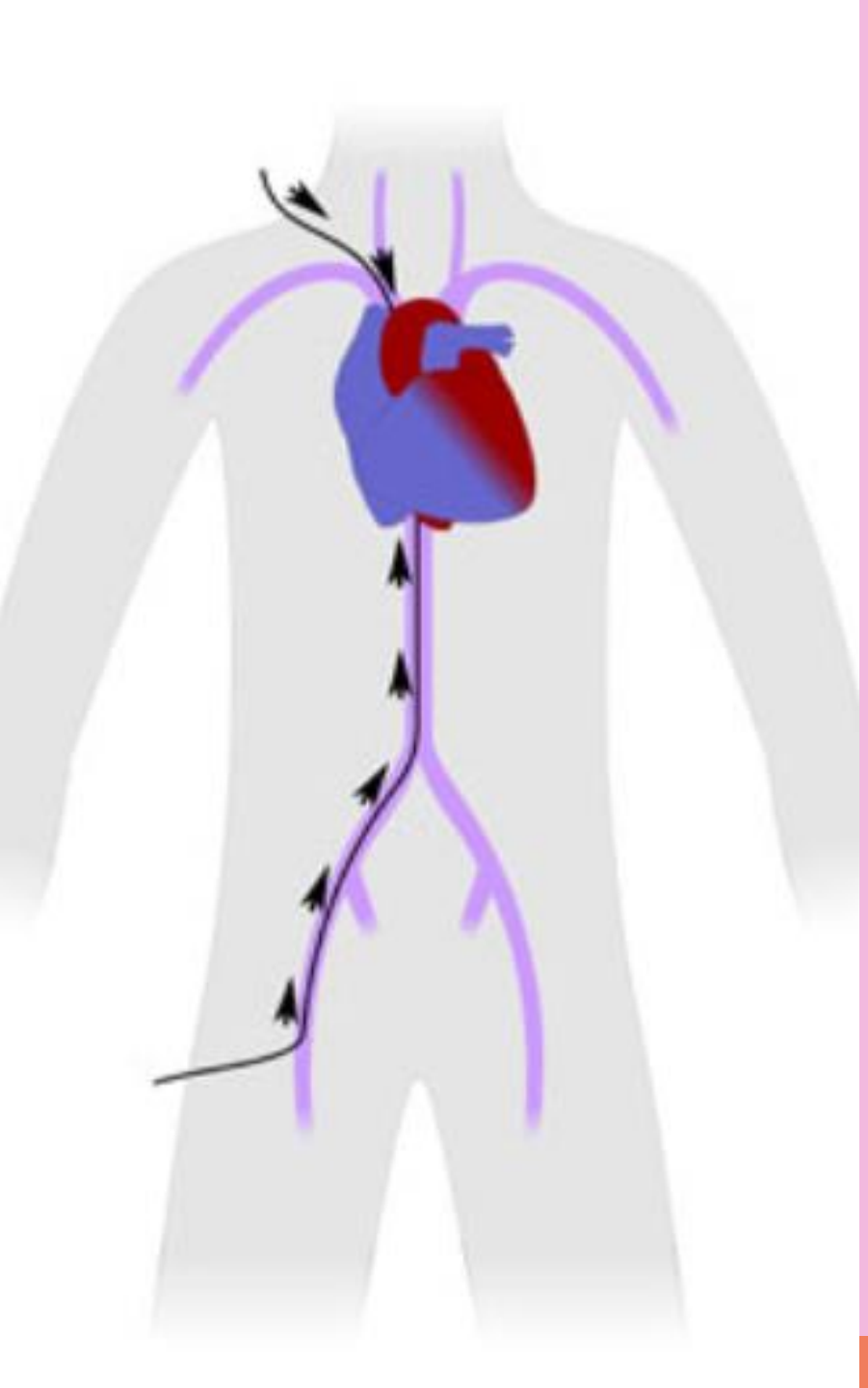
NORMAL BLOOD FLOW

The left atrium receives freshly oxygenated (or red) blood from the lungs. This blood passes through the mitral valve and enters the left ventricle, which is the heart's main pumping chamber. It propels the red blood through the aorta to the arterial system, which carries it to the body's tissues.

After delivering its supply of life-giving oxygen and picking up waste materials along the way, the blood (now known as blue or deoxygenated) enters the venous system & is carried back to the heart. The blood from the lower body enters the right atrium through the vein known as the inferior vena cava; the blood from the upper body enters the right atrium through the superior vena cava.

The right atrium passes the blood through the tricuspid valve into the right ventricle, which pumps it into the pulmonary artery. The pulmonary artery divides into two branches which carry the blood to the right and left lungs. After releasing carbon dioxide as waste material and absorbing a fresh supply of oxygen, this blood is channeled back to the left atrium of the heart by the pulmonary veins and the cycle continues.





Cardiac Catheterization (Diagnostic or Interventional)

Catheterization can evaluate the amount of oxygen in the blood in each chamber of the heart, the blood pressure in each chamber of the heart and pictures can be taken of the heart chambers.

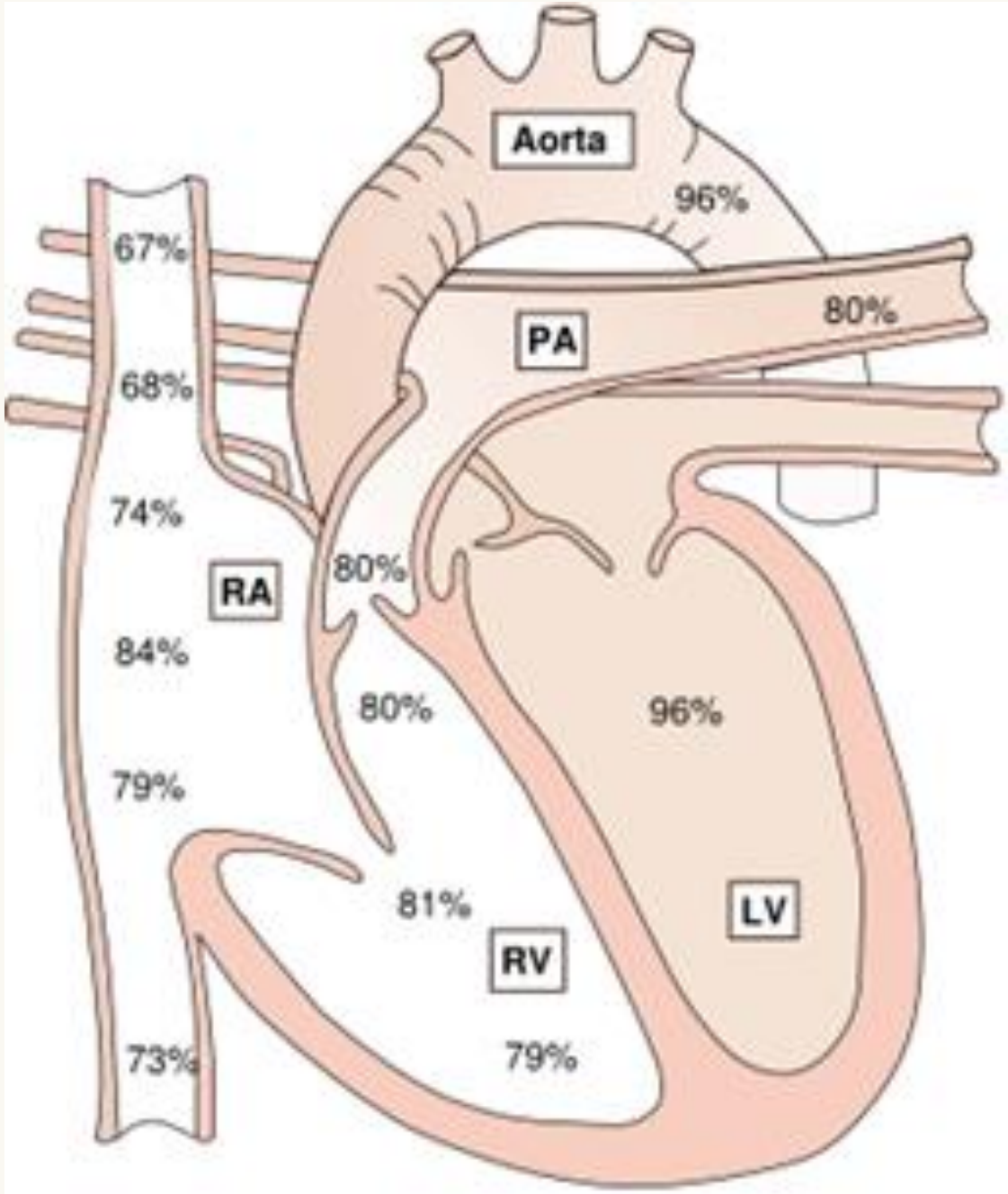
Catheterization with an interventional procedure means that some form of repair will be made through the use of a catheter. Examples are closing holes in the heart, blocking off abnormal blood vessels, as an adjunct to surgery, or EP study and/or ablation.

Common pediatric cath sites:
Internal jugular vein
Femoral vein
Femoral artery
Umbilical vein or artery (Neonates)

CARDIAC CATHETERIZATION: DIAGNOSTIC

- Obtains diagnostic information related to:
  - •Saturation
  - •Hemodynamic / Pressure Evaluation
  - •Angiography
  - •Pulmonary Vascular Resistance

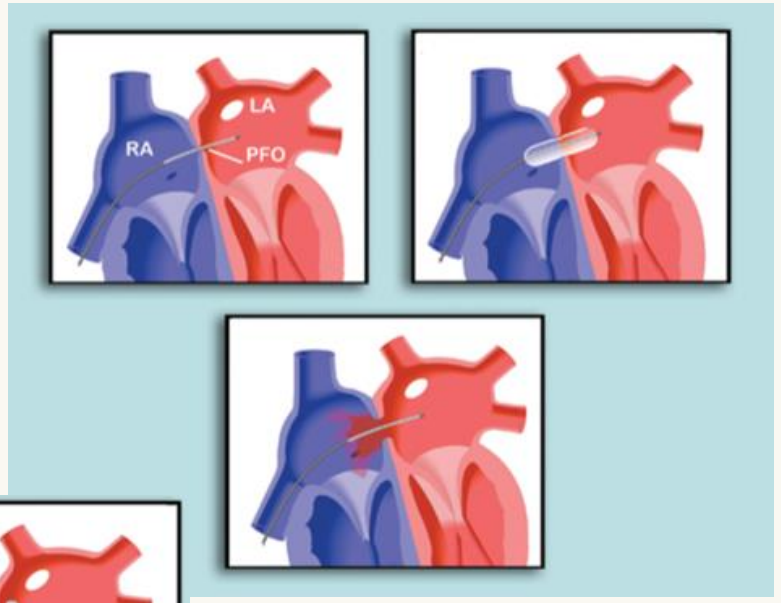
- No intervention is completed
  - Angiography to evaluation shunt
  - Pulmonary hypertension study



CARDIAC CATHETERIZATION: INTERVENTIONAL

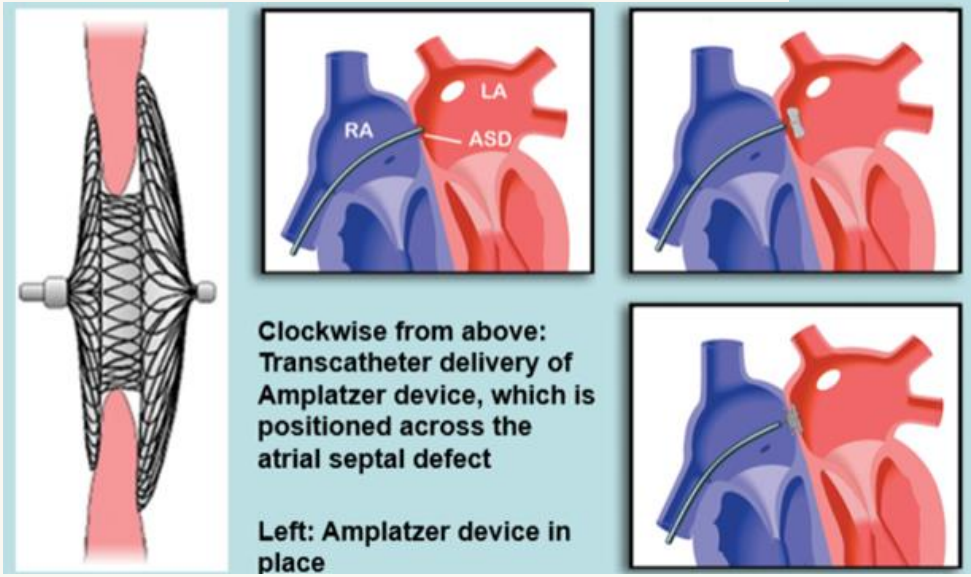
•Intervention is completed during the cath. procedure

•Includes diagnostic portion, followed by intervention:



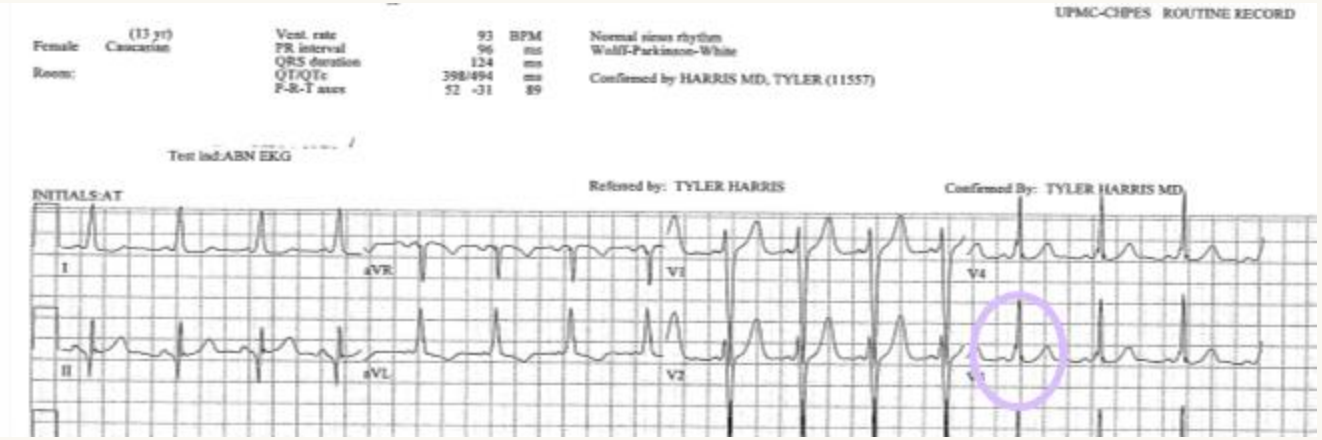
Examples:

•Balloon septostomy
•Balloon dilation of valve or pulmonary artery
•Coiling of collaterals
•Stent of coarctation
•PDA plug or stent
•Device closures



CARDIAC CATHETERIZATION: EP STUDY & ABLATION

- EP Study: procedure to test the electrical system of the heart and determine where arrhythmias are located
- SVT
- WPW



- Ablation: procedure that scars tissues in the heart to block abnormal electrical signals
- Radiofrequency (RF) ablation
- Cryoablation

POST CATH FLAT TIME FOR INTERVENTIONS

Access	Flat Time
Occlusive Device	2 hours
Tegaderm Dressing	4 hours
Pressure Dressing	6 hours

- May be modified at the discretion of the cath physician
- Flat time will be announced at case debriefing and with nursing handoff
- Typically, from sheath removal and not admission to unit
- Extremity (leg) needs to stay straight and HOB flat

POST CATH: REBLEED

- Hold pressure for 5-10 minutes
- Arterial: apply pressure ABOVE the puncture site
- Venous: apply pressure BELOW the puncture site

- **Notify the cath team**
- Sandbags can be utilized to assist with pressure
- Re-dress site with pressure dressing
- Flat time restarted (usually 4-6 hours)

POST CATH: NURSING CARE

- Monitoring of cath sites
- Assess for bleeding, intact dressings, bruising & hematoma formation

- Pulse & perfusion assessment
- Comparison to leg that was not accessed
- Assess for +2 pulses versus weak/thready/no pulse

Q15 minutes x1 hour

Notify the cath team for any change to pulse or perfusion in the affected extremity.

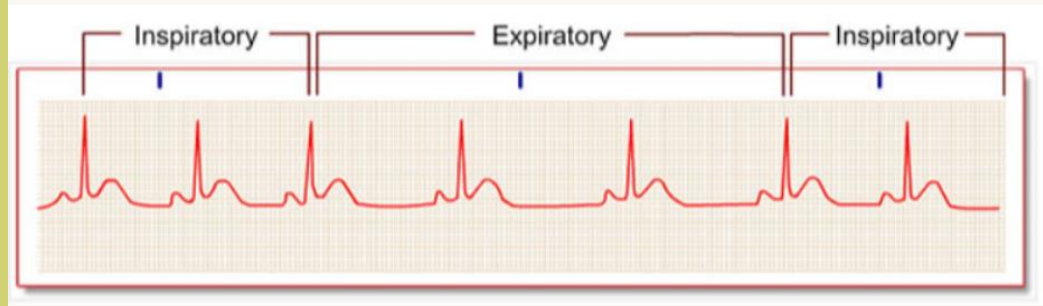
(They will guide you on the pulse loss protocol.)

COMMON ARRHYTHMIAS

Sinus

- Sinus Bradycardia
  - Caused by slow SA node impulse
  - Treatment aimed at treating underlying cause
    - Oxygen/Ventilation support
    - Epinephrine
    - Atropine
- Sinus Tachycardia
  - Frequently normal response to physiological situations
  - Not considered a lethal arrhythmia
- Sinus Arrhythmia
  - Normal variation of cardiac rhythm in response to respiratory cycle

Sinus Arrhythmia



COMMON ARRHYTHMIAS

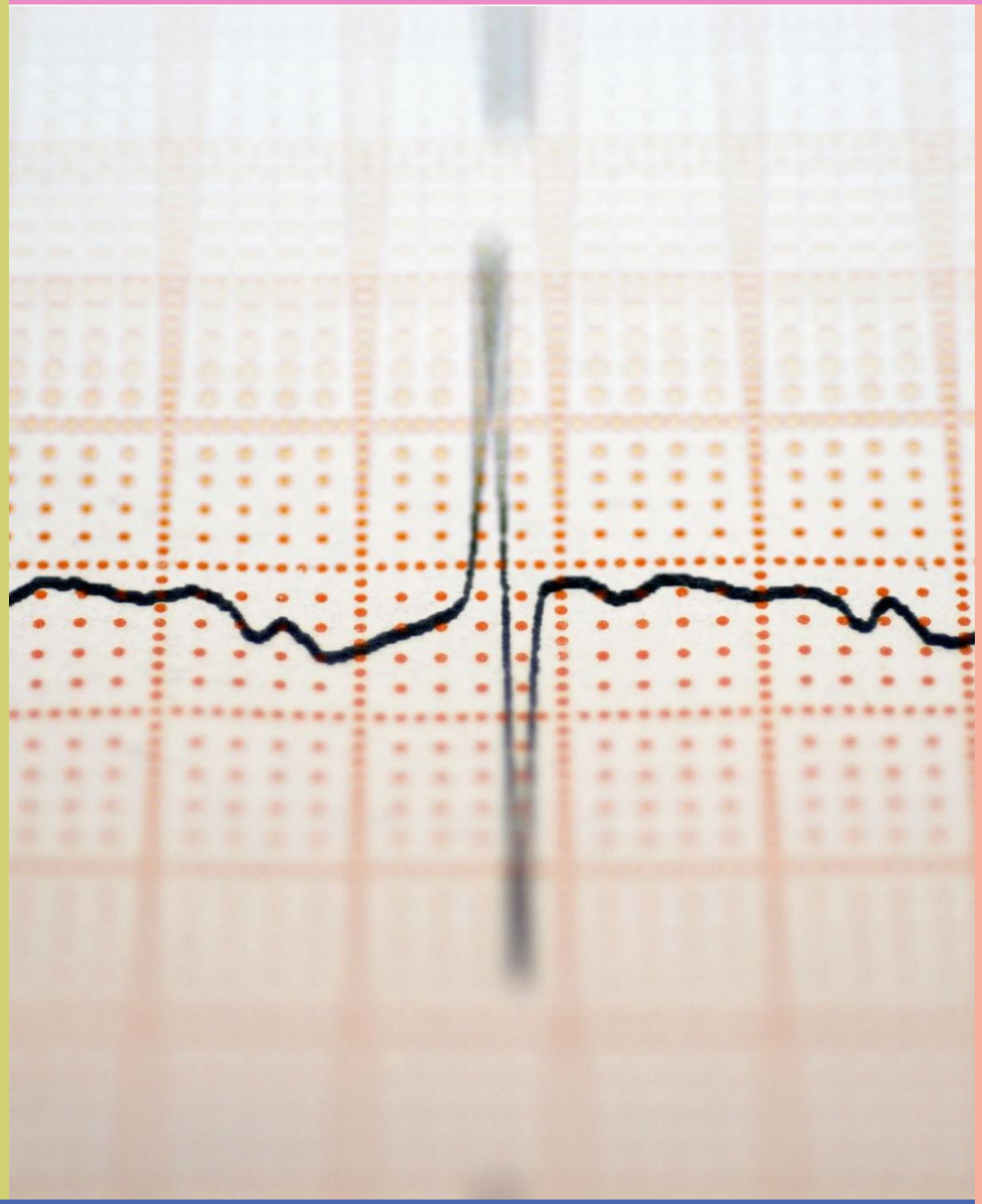
Junctional

- Background:
  - Junctional rhythms originate at the AV node
  - AV node and surrounding structures referred to as AV Junction, which is reason these rhythms are called “Junctional Rhythms”
  - P wave may be missing or inverted depending on when atria depolarizes
- Premature Junctional Complex (PJC)
  - Early complex originating in AV junction before next expected sinus beat
  - Causes include excess caffeine, digoxin toxicity, hypoxia, or post-op cardiac surgery

Premature Junctional Complex

COMMON ARRHYTHMIAS

- Ventricular
  - Asystole
    - PALS/ACLS
    - Epinephrine every 3-5 minutes
    - High-Quality CPR
  - Ventricular Fibrillation
    - PALS/ACLS
    - Defibrillation per PALS/ACLS Guidelines
  - Monomorphic Ventricular Tachycardia
    - Palpable Pulse – Adenosine or Cardioversion
    - Pulse with Poor Perfusion – Cardioversion (0.5-1J/kg)
    - No Pulse – PALS/ACLS, CPR, Epinephrine, Cardioversion



CONGENITAL HEART DISEASE PRINCIPLES

Acyanotic vs. Cyanotic Heart Disease

•Acyanotic Heart Disease
•Left-to-right shunting lesions
•Acyanotic disease with increased pulmonary blood flow
•Acyanotic disease with ventricular outflow tract obstruction

•Cyanotic Heart Disease
•Right-to-left shunting lesions
•Mixing of blood entering systemic circulation
•Cyanotic disease with decreased pulmonary blood flow
•Cyanotic disease with increased pulmonary blood flow

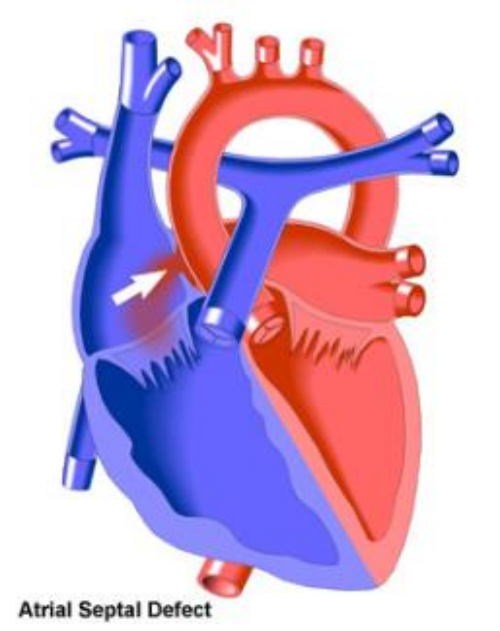
*Cardiac output (CO)= Heart rate (HR) x Stroke volume (SV)

*Stroke volume consists of preload, contractility, and afterload

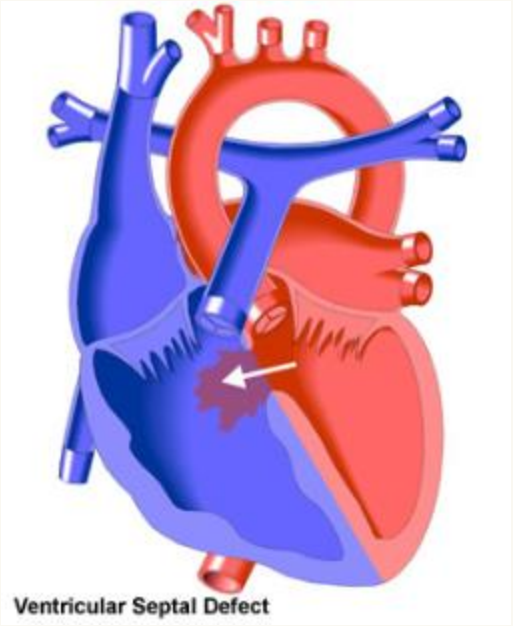
*Blood will flow from areas of high pressure to low pressure

*In a normal heart, the left side has greater pressure than the right side

ACYANOTIC HEART DISEASE EXAMPLES:

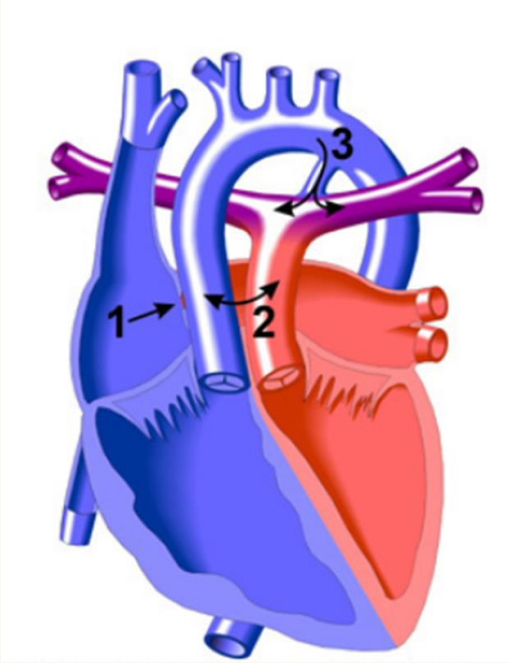


Atrial Septal Defect (ASD): A hole in the atrial septum, or muscle wall, that separates the upper chambers of the heart, the right and left atria (singular = atrium). Because of the lower pressure in the right atrium, this hole typically allows oxygenated blood from the lungs to move, or shunt, from the left into the right atrium. This blood proceeds into the right ventricle, which pumps it back to the lungs rather than to the body.

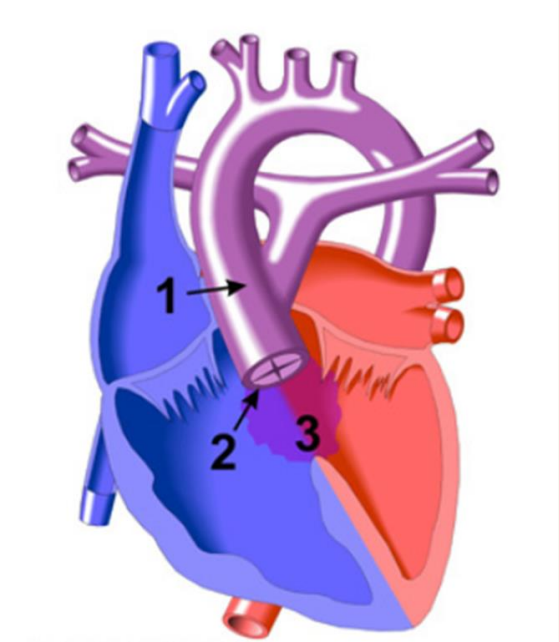


Ventricular Septal Defect (VSD): A hole in the ventricular septum - the muscular wall that separates the right and left ventricles, or main pumping chambers, of the heart.
This opening allows the movement, or "shunting," of blood between the ventricles. Most commonly, oxygenated blood from the left ventricle enters the right ventricle because there is greater pressure in the left ventricle and the resistance in the lungs is significantly lower than in the body tissues. This is known as a "left to right shunt."

CYANOTIC HEART DISEASE EXAMPLES:

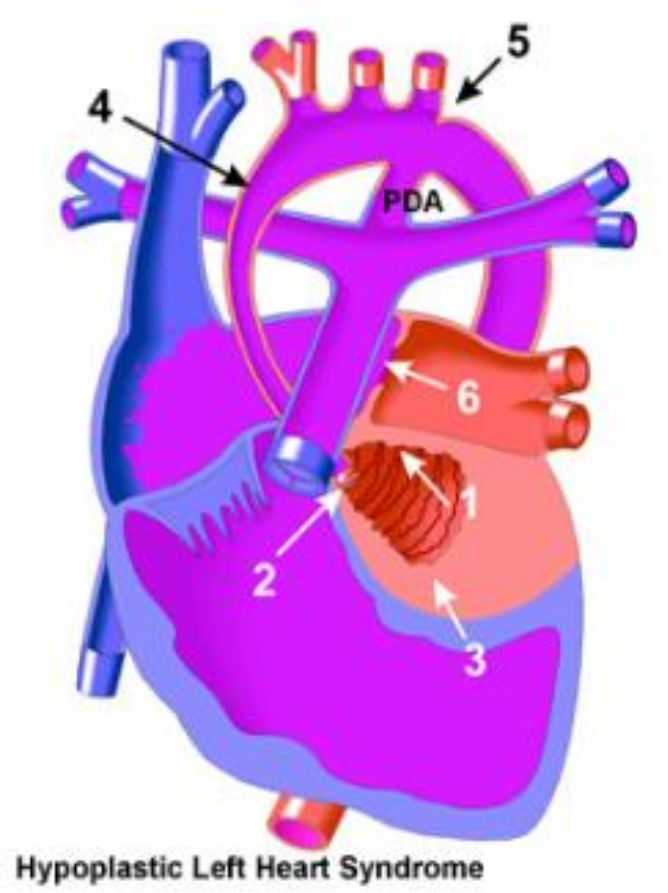


Transposition of the Great Arteries (D-TGA): The two main arteries (aorta and pulmonary artery) are connected to the wrong chambers of the heart. the aorta leaves the right ventricle (RV) and takes blue (unoxygenated) blood to the body while the pulmonary artery (PA) leaves the left ventricle (LV) and takes red (oxygenated) blood to the lungs. This defect will require surgery, usually in the first week of life.

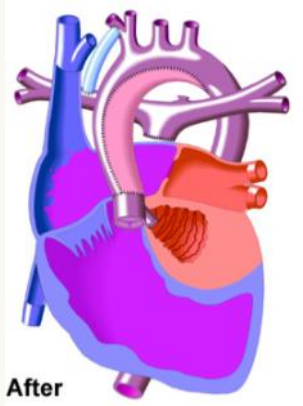


Truncus Arteriosus: The two large arteries that leave the heart, the aorta and the pulmonary artery, are combined in one large vessel, known as the Truncus Arteriosus.. This vessel carries blood to the lungs as well as to the body.

HYPOPLASTIC LEFT HEART SYNDROME

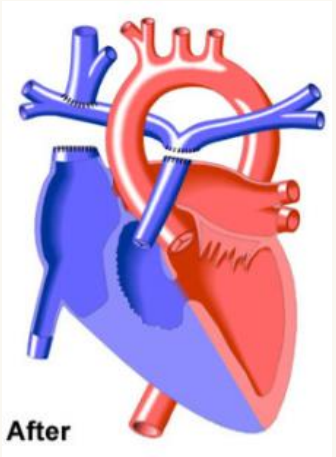


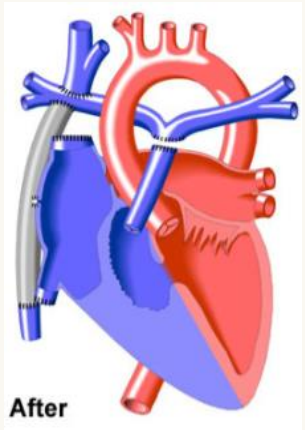
Hypoplastic Left Heart Syndrome



Stage 1: Norwood
Expected saturations: 75%-85% Surgery completed as a newborn. An aorta is constructed using the base of the pulmonary artery. A shunt is placed from a branch of the aorta to the pulmonary artery, providing pulmonary blood flow. These patients will recover in the ICU.

Stage 2: Glenn
Expected saturations: 80%-90% Surgery completed at approx. 3-6 months. The shunt is now removed and the superior vena cava is connected to the pulmonary artery, providing pulmonary blood flow.





Stage 3: Fontan
Expected saturations: >90% Surgery completed at approx. 2-4 years old. The inferior vena cava is also connected to the pulmonary artery. Now all desaturated systemic venous blood will flow directly to the pulmonary arteries & lungs.

UPMC RESOURCES

- PLS Pediatric Assessment: The Cardiovascular System
- PLS Arrhythmia Recognition: Junctional
- PLS Arrhythmia Recognition: Sinus
- PLS Arrhythmia Recognition: Ventricular
- Cardiac Catheterization (PTC-RN616): Click Here

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