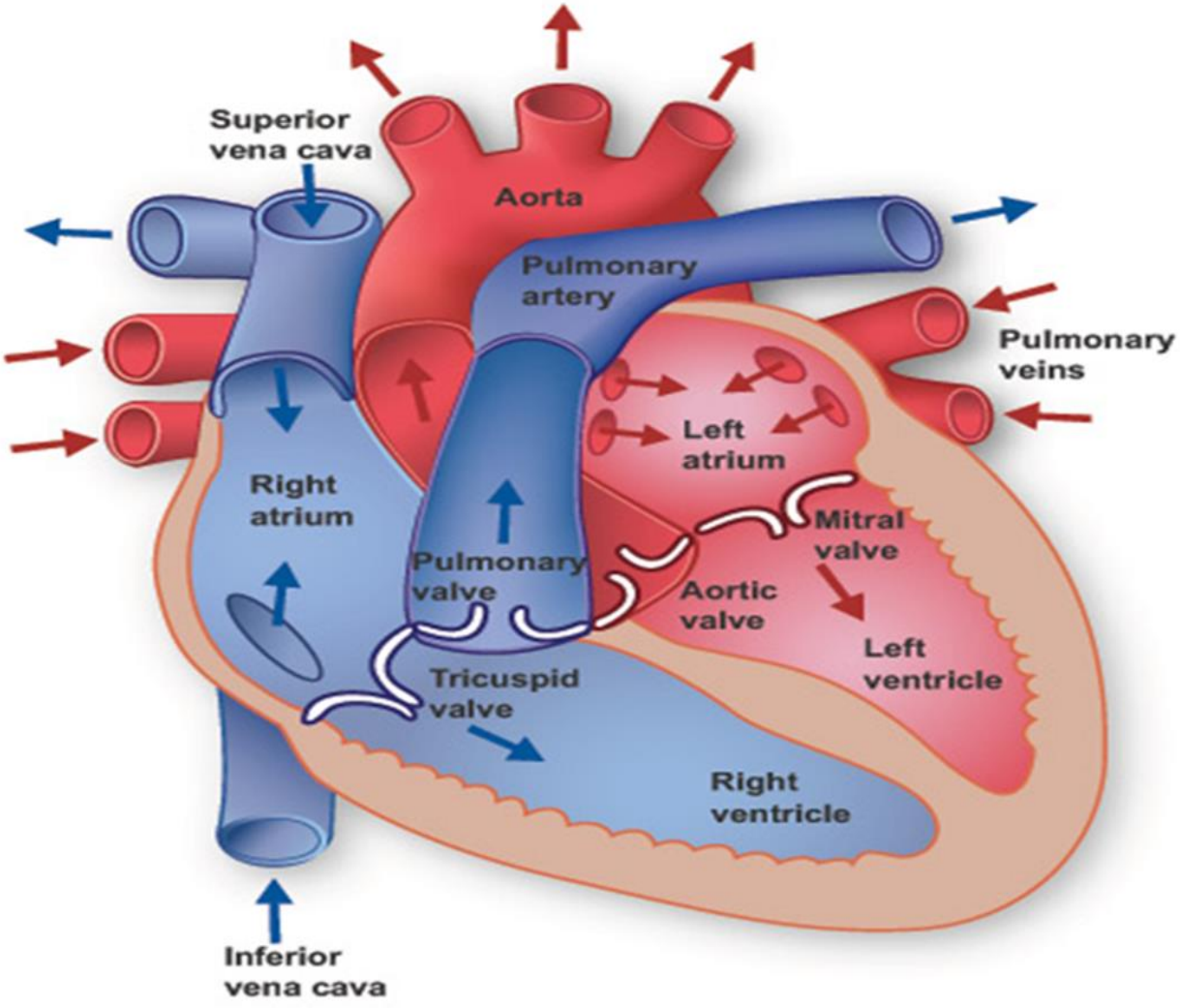
CHILD WITH A CARDIAC CONDITION

Linnard-Palmer & Coats

Chapter 31

Cardiovascular Circulation Review



Congenital vs. Acquired Disorders

- Congenital
  - About 1 in 170 live births
  - Genetic origin
  - Link to maternal infection
  - One or multiple defects

- Acquired
  - Can develop in a “normal” heart or one with a congenital defect
  - Increased Pulmonary Flow → CHF
  - Obstructed Outflow → Cardiomyopathy
  - Poor diet, no exercise → HTN, HLD

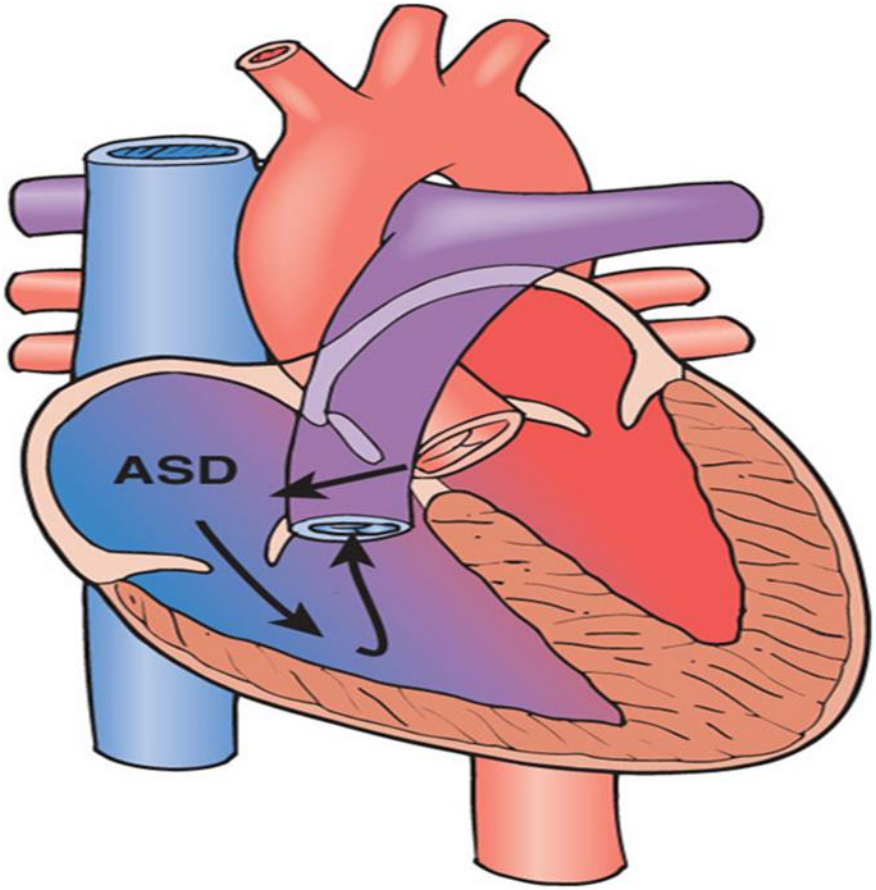
Congenital disorders result in:

- Increased pulmonary flow
- Obstruction of flow from the ventricles
- Decreased pulmonary flow
- Mixed blood flow

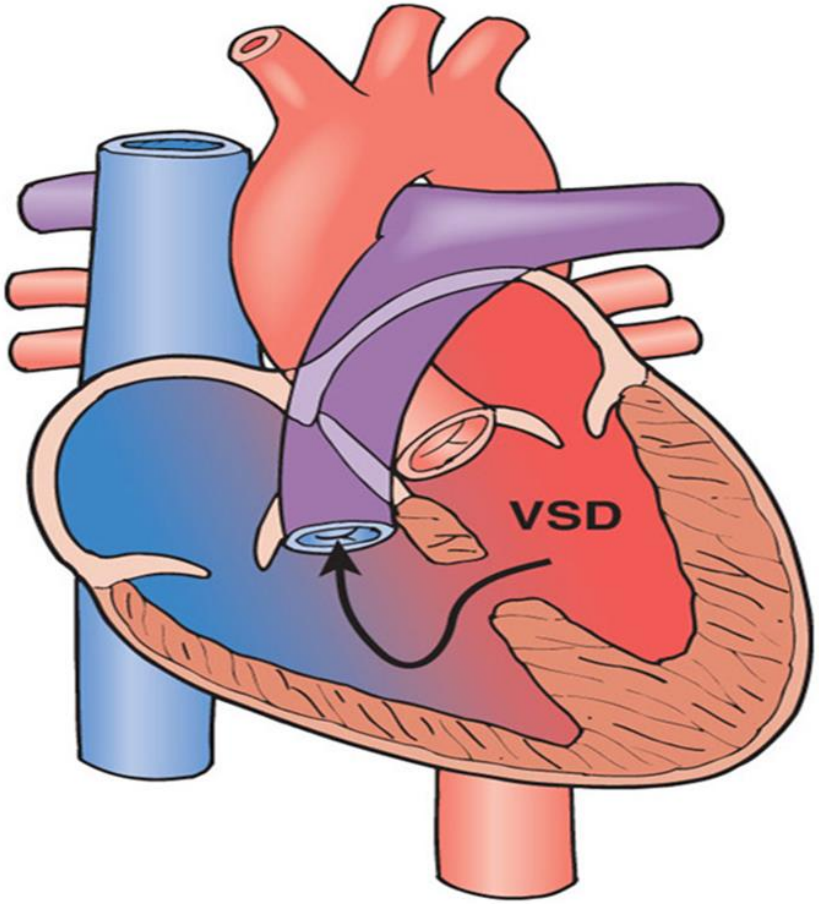
CHD: Increased Pulmonary Flow

- Atrial Septal Defect (ASD)
- Ventricular Septal Defect (VSD)
- Patent Ductus Arteriosus (PDA)

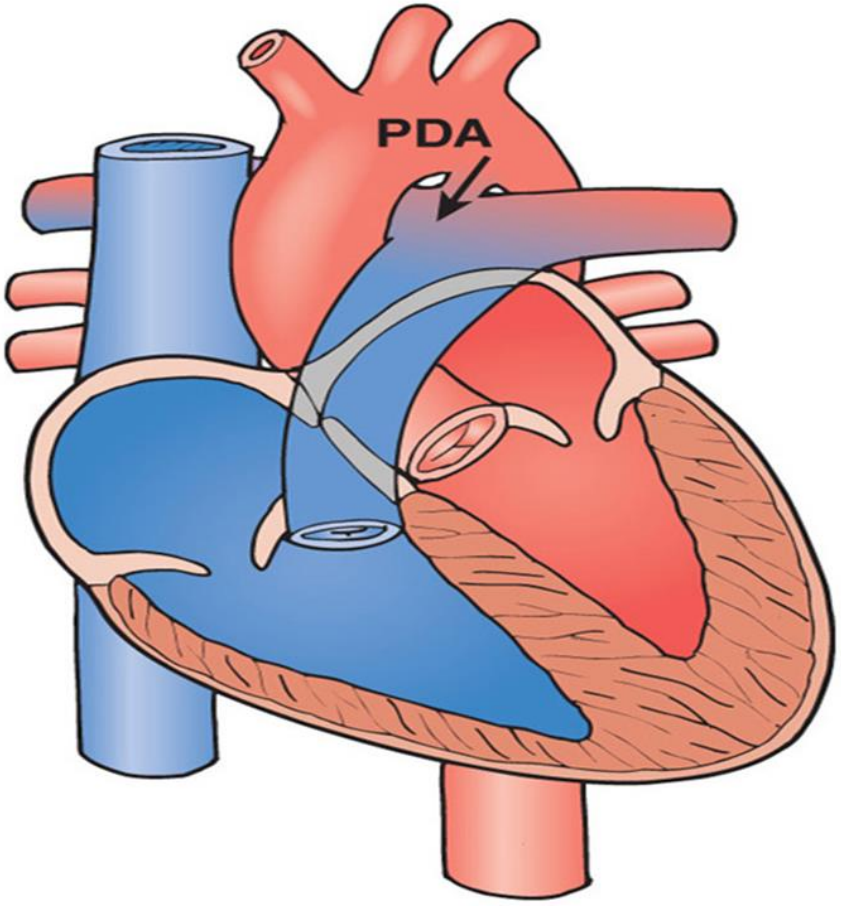
Atrial Septal Defect



Ventricular Septal Defect



Patent Ductus Arteriosus



Prostaglandin E (PGE1)

- Dilates blood vessels
- Inhibits clotting

- Allows a patent flow of blood through the ductus arteriosus and maintains perfusion
  - It keeps the ASD, VSD, or PDA open while awaiting interventions

Disorders with Increased Pulmonary Flow (ASD, VSD, PDA)

Assessment

- Wide range of murmurs
- SOB
- Poor feeding/weight gain
- Tire easily
- Recurrent respiratory infections
- Tachypnea, “wet” breath sounds
- May have few or no symptoms

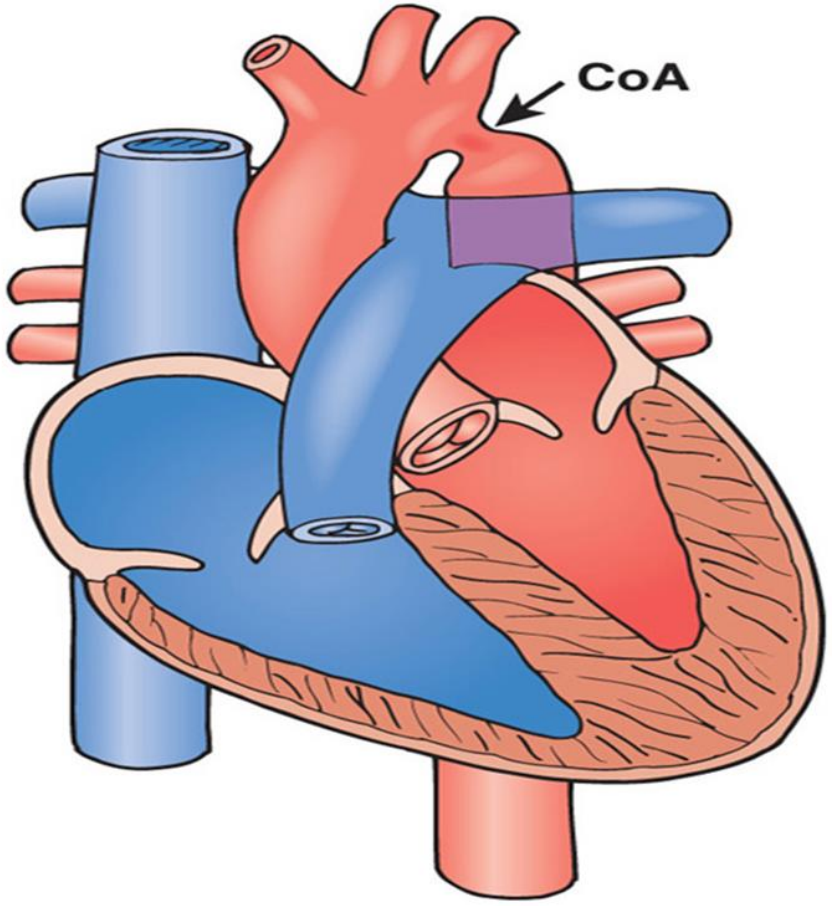
Management/Interventions

- Monitor/encourage small, frequent feedings
- Monitor for S&S of CHF
- Maintain diuretic therapy
- Strict I&O
- Monitor urine output
- Daily weights
- Family/caregiver support
- https://www.youtube.com/watch?v=1rH-lcKukiM

Obstruction of flow from the Ventricles

- Coarctation of the Aorta (COA)
- Aortic Stenosis (AS)
- Pulmonary Stenosis (PS)

Coarctation of the Aorta



Obstructive Disorders COA

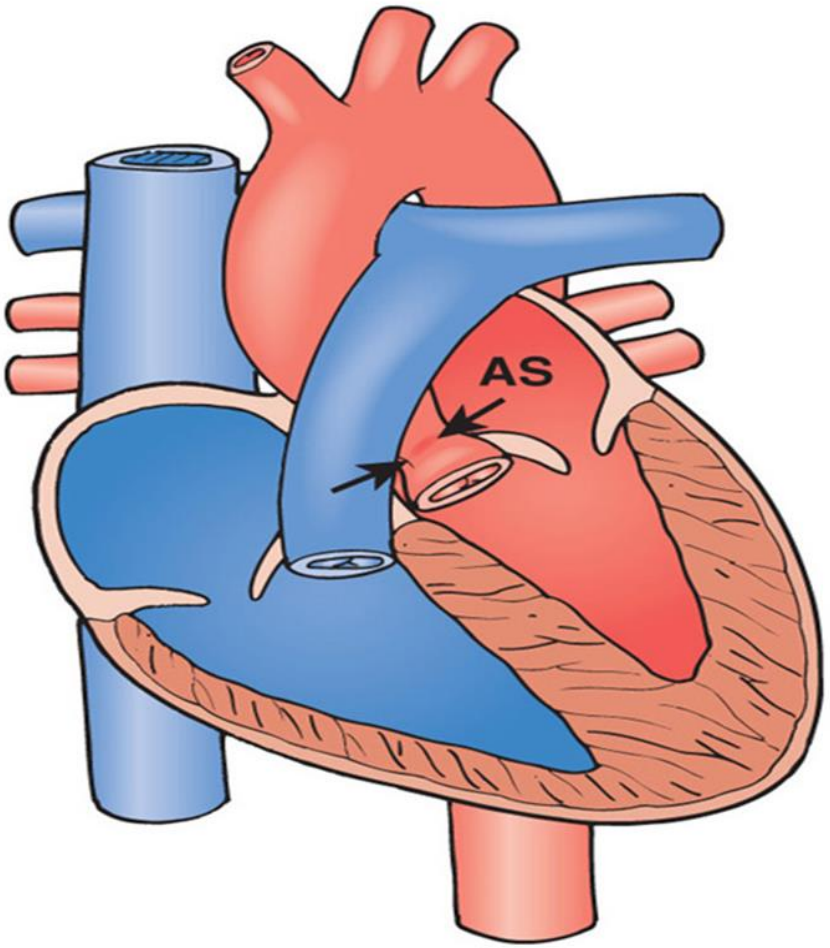
Assessment

- Few symptoms
- Decreased femoral pulses
- Higher BP in upper extremities
- Headache
- SOB
- S&S of CHF
- Poor feeding, growth

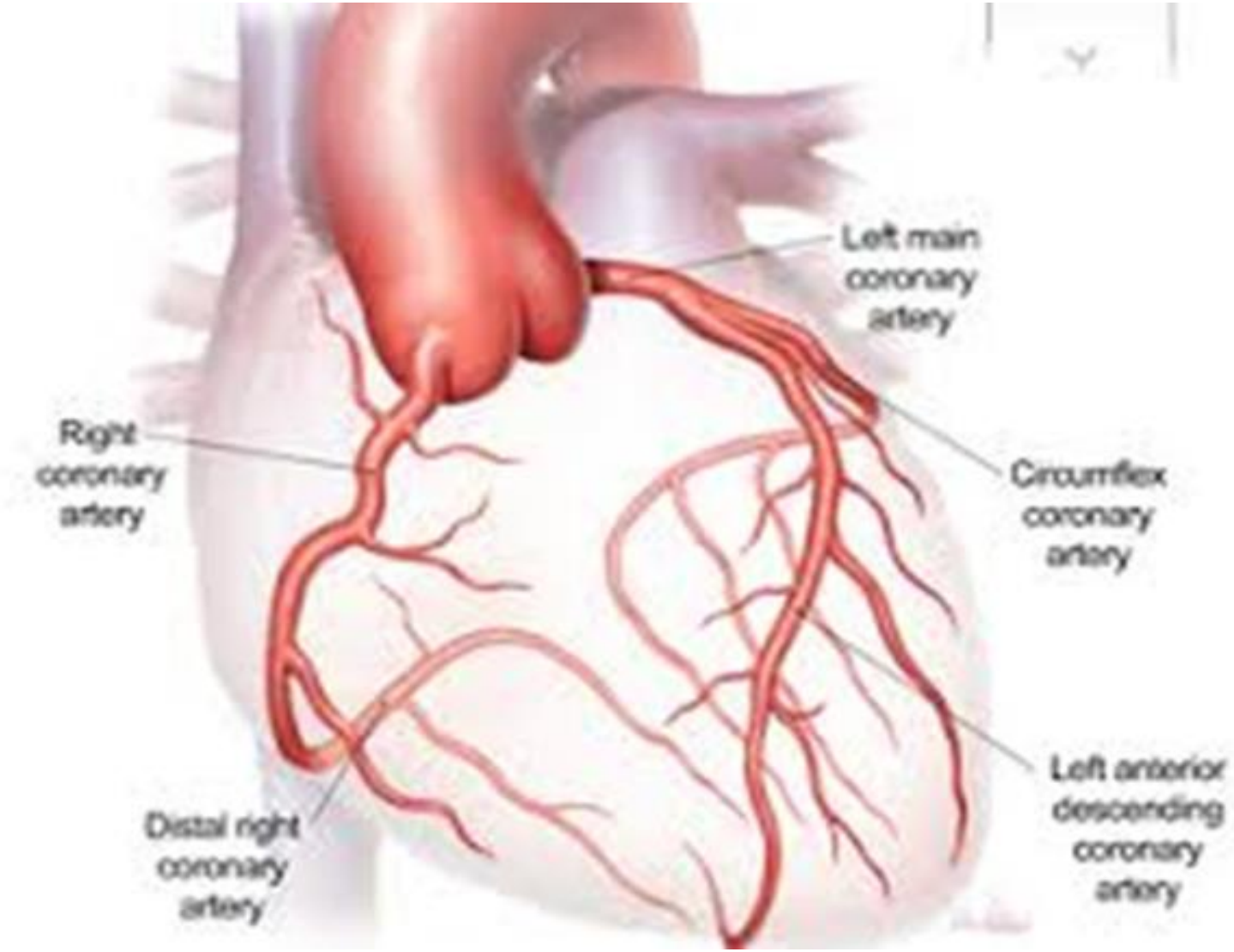
Management/Interventions

- Medications (diuretics, antiarrhythmics)
- Monitor perfusion
- Four extremity BPs
- Postsurgical care (for cardiac catheterization, if necessary-bleeding, circulation, infection)
- Family Support

Aortic Stenosis



Coronary Arteries



Aortic Stenosis

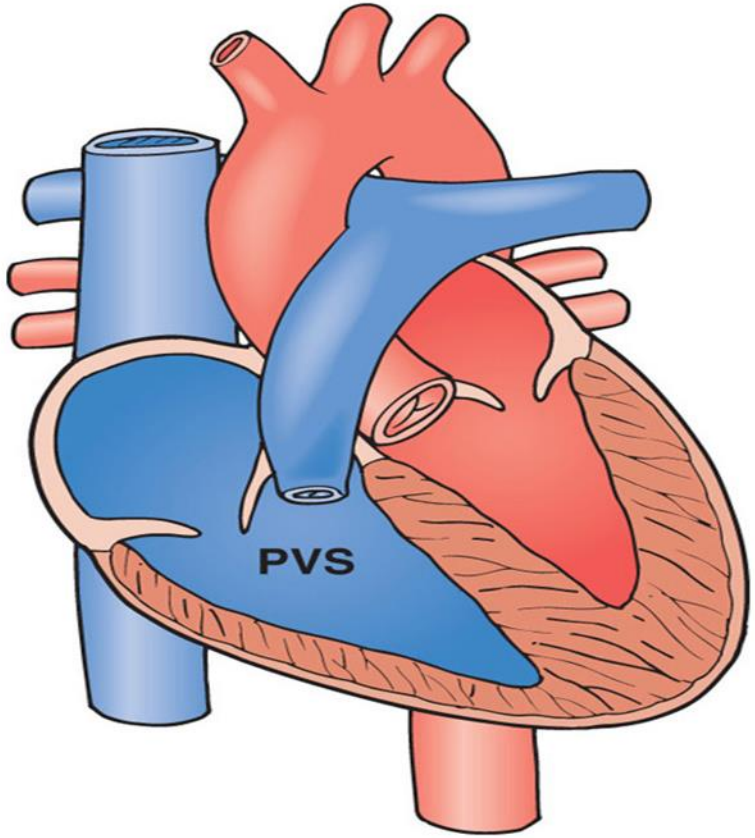
Assessment

- Chest pain
- Fatigue
- SOB, exercise intolerance
- Syncope
- Decreased systolic pressure, narrow pulse pressure
- Increased workload
  - LV enlarged

Management/Interventions

- Monitor for signs of CHF
- Maintain prostaglandin E drip
- Post-care for catheterization or balloon valvuloplasty
- Promote calm environment

Pulmonary Stenosis



Pulmonary Stenosis

Assessment

- Increased workload of the right ventricle
  - RV enlarged
- SOB, cyanosis
- Hepatomegaly
- Murmur

Management/Interventions

- Promote calm environment to decrease oxygen demand
- Monitor BP
- Post care for cardiac cath or valvuloplasty

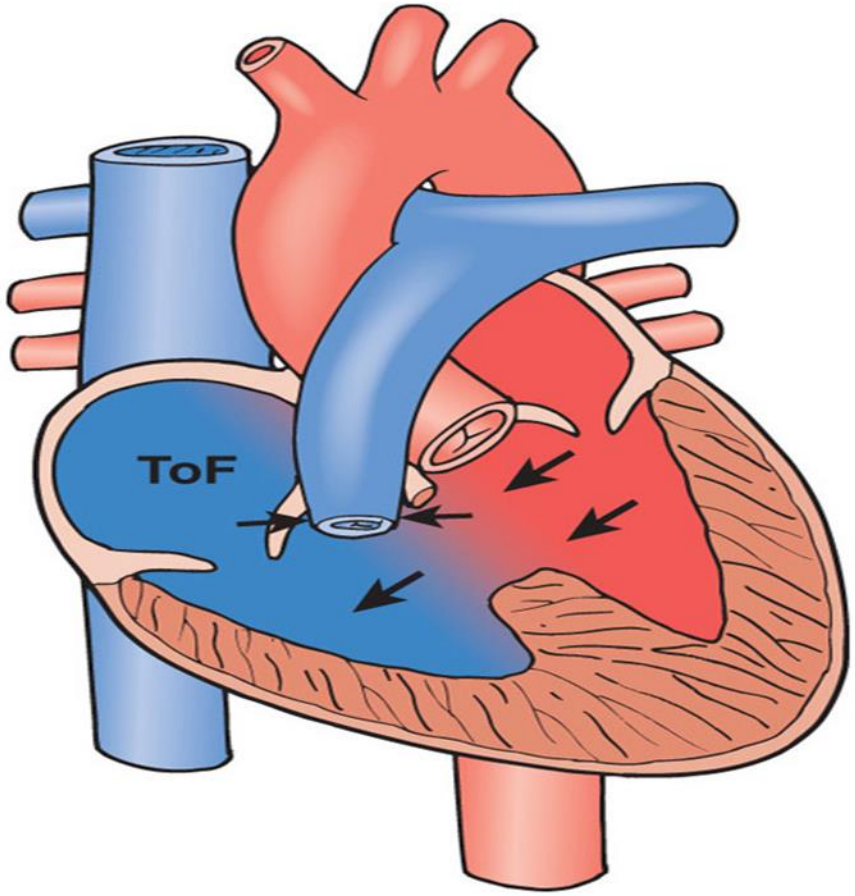
Decreased Pulmonary Flow

- Tetralogy of Fallot (TOF)
- Tricuspid Atresia (online ppt)

Decreased Pulmonary Flow: Tetralogy of Fallot

- Tetralogy of Fallot (TOF) 4 separate defects
  - Ventricular septal defect (VSD)
  - Obstructive right ventricular outflow – pulmonary stenosis
  - Overriding aorta lies directly over the VSD
    - Allows oxygenated blood to flow to body
  - Secondary thickening (hypertrophy) of the right ventricle due to restricted outflow

Tetralogy of Fallot



TOF

Assessment

- Right to left shunting
- “Tet” spells
- Tachypnea
- Dyspnea with exertion
- Increased cyanosis with irritability and crying
- Irritability increases from lack of oxygen
- Polycythemia, Clubbing of fingers
- Poor growth

Management/Interventions

- **Cluster care**
- Prevent inconsolable crying
- Decrease agitation with medications
- Provide oxygen
- Prostaglandin E drip to keep PDA open
- Prepare family for possibility of surgeries

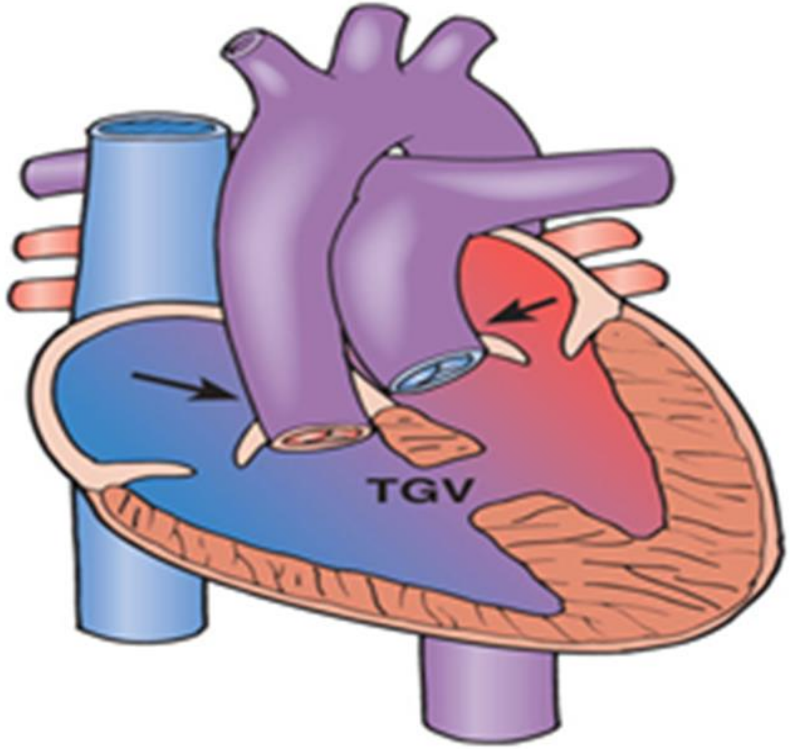
Mixed Flow Disorders

- Transposition of the Great Arteries (TGA)
- Hypoplastic Left Heart Syndrome (HLHS)

Transposition of the Great Arteries

- Aorta and pulmonary artery are switched
- Aorta receives deoxygenated blood and pumps it to the body
- Pulmonary artery receives oxygenated blood, which goes back to the lungs

Transposition of the Great Vessels



TGA

Assessment

- Profound cyanosis, esp. with crying
- Clubbing
- SOB, S&S of CHF
- Poor feeding

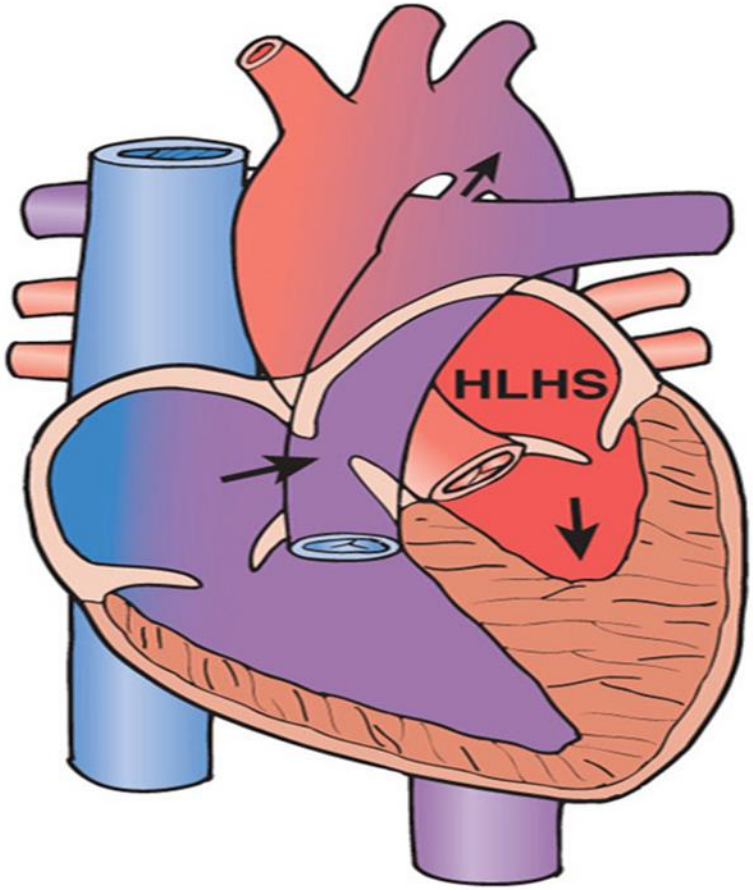
Management/Interventions

- Can be seen on echo prior to birth
- Immediate prostaglandin E drip
- ACE inhibitor
- Monitor oxygen saturation
- Atrial septastomy to create hole in atrial septum
- Post-op care following Jatene atrial switch procedure
- Education regarding follow-up care

Hypoplastic Left Heart Syndrome (HLHS)

- Second most common congenital defect
- Underdeveloped left side of heart, aortic valve, left ventricle, and mitral valve
- If PDA is open, blood reaches aorta through it
- Symptoms appear rapidly when PDA closes

Hypoplastic Left Heart Syndrome



Hypoplastic Left Heart Syndrome

Assessment

- Usually asymptomatic until the PDA closes
- Ashen color
- Difficulty breathing
- Difficulty feeding
- If untreated, usually fatal within a few months

Management/Interventions

- infusion
- Caregiver education regarding seriousness
- Prep for Norwood three-stage procedure
- Prepare family for possible need for transplant

Acquired Heart Disease/Disorders

- Develops during childhood
  - Cardiomyopathy
  - Congestive Heart Failure
  - Hyperlipidemia
  - Hypertension
  - Rheumatic Heart Disease (fever)
  - Bacterial (infective) Endocarditis
  - Kawasaki Disease

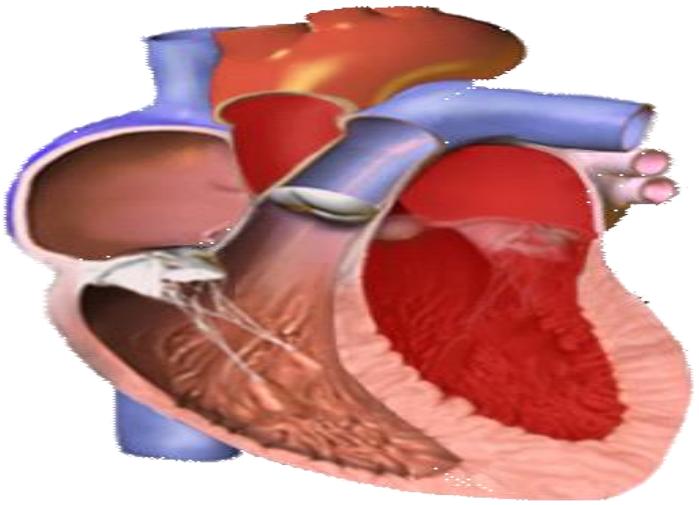
Acquired Heart Disease

- History and Physical Examination
  - Inspection
  - Palpation
  - auscultation
- Diagnostic Evaluation
  - ECG
  - Echocardiogram
  - Cardiac catheterization

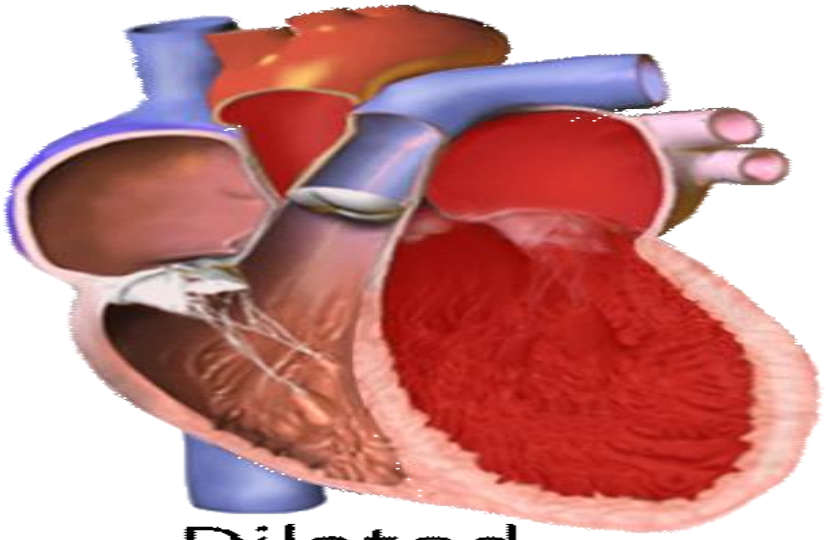
Cardiomyopathy

- Ventricles affected, become enlarged, thickened, stiff
- Three types:
  - Dilated- enlarged heart, weak and ineffective pump. Decreased contractility.
  - Hypertrophic- hypertrophy of heart muscle, exercise intolerance, leaky valves
  - Restrictive- rare in children. Muscle becomes rigid, fails to relax. Fatigue, SOB

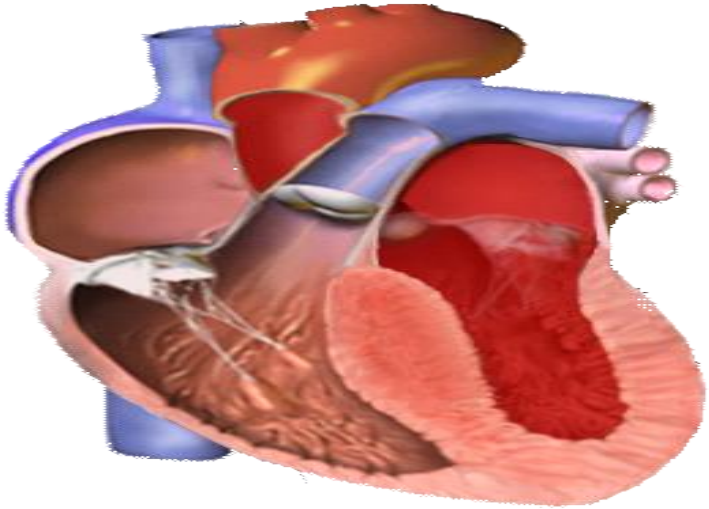
- Cardiac output goes down
- Cardiac workload goes up



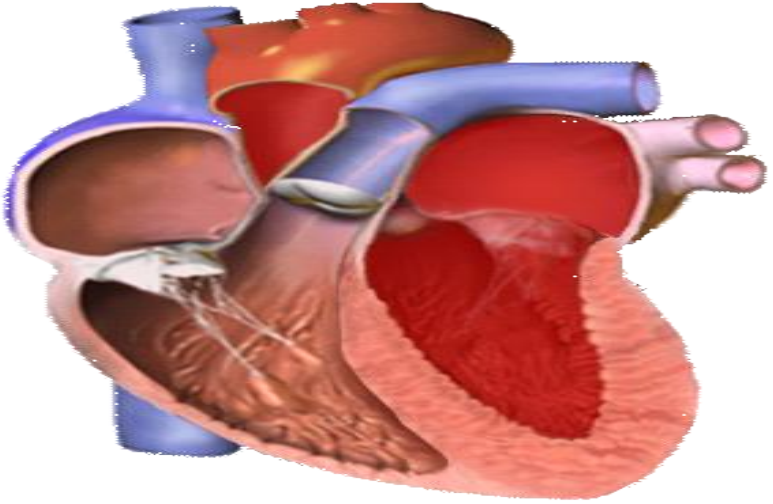
Normal



Dilated



Hypertrophic



Restrictive

Cardiomyopathy

Assessment

- S&S of CHF
- Fatigue w/ **eating/activities**
- Hepatomegaly
- Frequent colds, pneumonia
- Diaphoresis when **eating**
- Weight loss
- **Dizziness**
- **Dysrhythmias**

Management/Interventions

- IV fluids, anticoagulation therapy, diuretics
- Monitor VS and heart rhythm
- Medications- Inotropes
  - Positive
  - Negative
- Education

Congestive Heart Failure (CHF)

- Heart cannot supply enough oxygenated blood to meet the metabolic needs of the body, either at rest or at work.
- Right-sided heart failure
  - RV cannot pump sufficient blood into the PA
  - Increased pressure in RA and venous system
- Left-sided heart failure
  - Blood backs into left atrium and pulmonary veins
  - Increased lung congestion

CHF

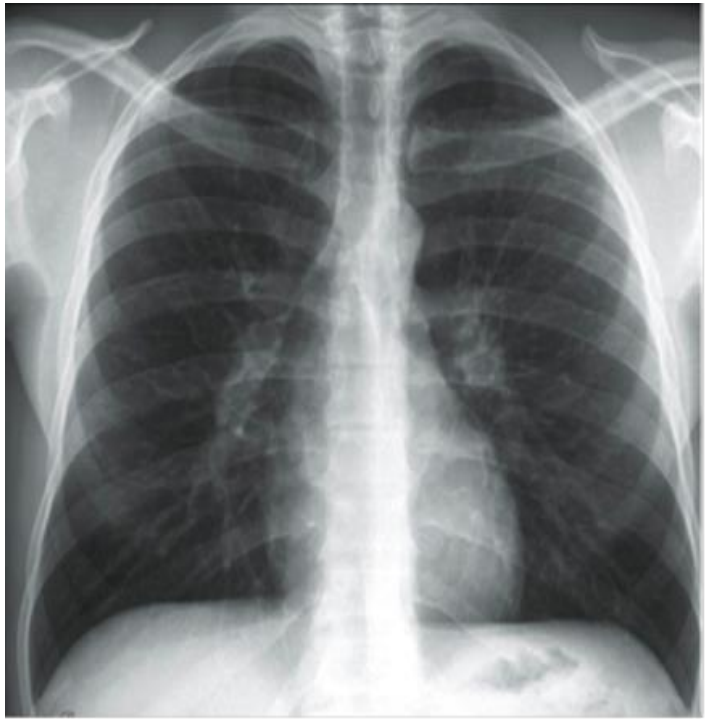
Assessment

- Edema of the face, hands, and feet
- Weight gain
- Tachypnea, SOB
- Fatigue
- Poor appetite, growth
- Diaphoresis with minimal activity
- “Wet” lung sounds

Management/Interventions

- Reduce the workload of the heart (diuretics)
- Anti-arrhythmics (digoxin)
- Inotropes
- Restrict activity
- Improve oxygenation
- Monitor I&0
- Patient/family education
  - Restrict sodium
- https://www.youtube.com/watch?v=mhYeO2fwSps

Which lungs do you want?



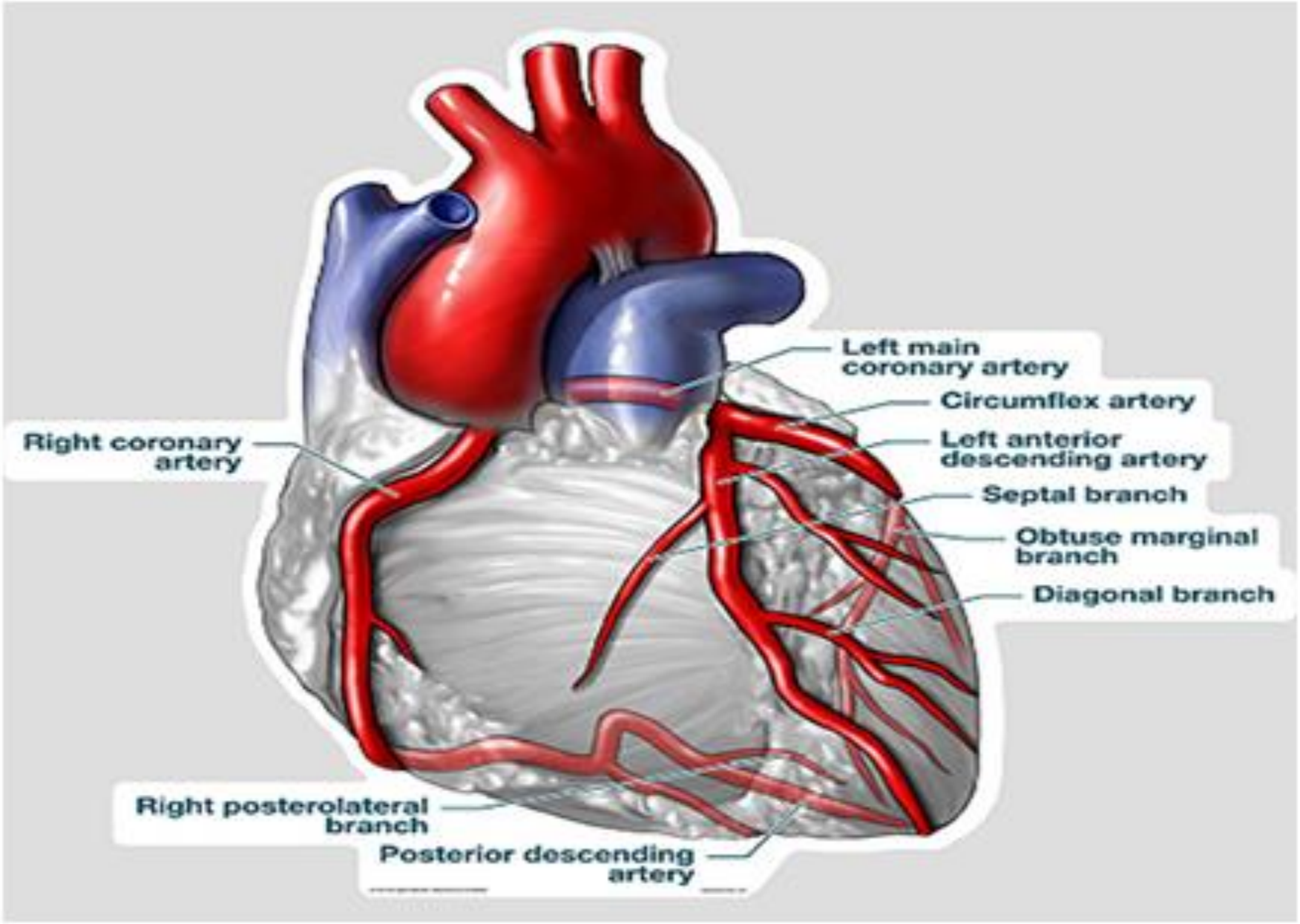
CHF – Digoxin Safety

- Take apical pulse for a full minute. Hold if below 60 or above 100
- Administer at the same time every day. Do not double up for a missed dose
- Frequent monitoring of potassium
- Notify physician for weight gain of > 2lb./day
- Monitor for S&S of digoxin toxicity:
  - Anorexia
  - NVD
  - Visual disturbances (halos).

Hyperlipidemia

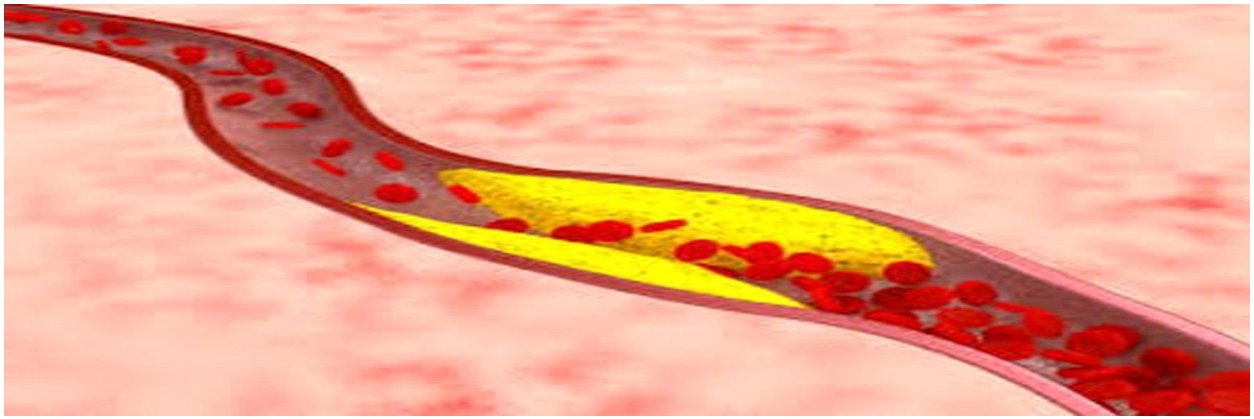
- High cholesterol in the blood (significant risk factor for cardiovascular disease)
  - High concentration of low-density lipoprotein (LDL)(>130 = increased risk)
  - Low concentration of high-density lipoprotein (HDL)
- Controllable factors (should be addressed throughout life)

- Non-controllable factors


Left main coronary artery
Circumflex artery
Left anterior descending artery
Septal branch
Obtuse marginal branch
Diagonal branch
Right coronary artery
Right posterolateral branch
Posterior descending artery

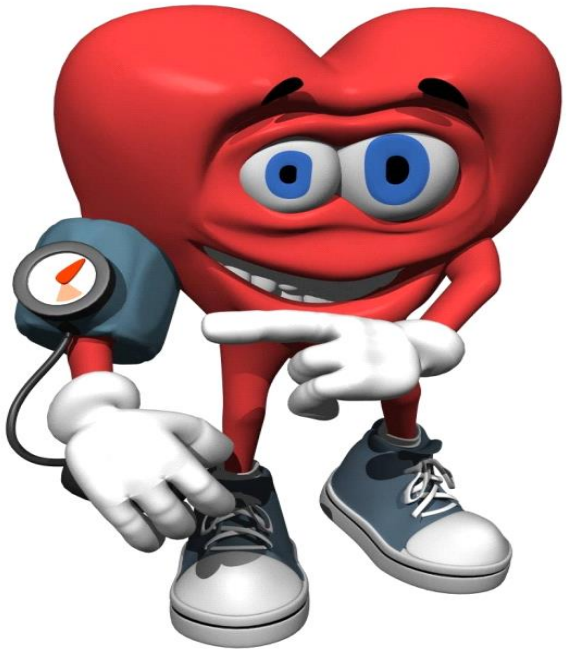
Hyperlipidemia

- Identify children at risk and treat early
  - Lipid screening
  - Comorbid with HTN, diabetes, inactivity, overweight, and smoking
- Treatment
  - American Heart Association's Step 2 diet recommendations
  - 20% of calories from fat, 7% from saturated
  - Control manageable factors
  - Statins and niacin for hereditary factors



Hypertension (HTN)

- Dependent on age, gender, and weight
- Dx. is made from multiple readings
  - Normal SBP for infants 70-90 mm Hg
  - Adolescents reach adult levels
  - Routine monitoring begins around age 3
- Table on pg. 565



- Primary- patient<10, no other problems/causes
- Secondary- related to underlying condition

HTN

Assessment

- Family history
- Nosebleeds
- Vision problem
- Fatigue
- Behavioral or school performance changes

Management/Interventions

- Encourage routine exercise
- Encourage weight loss if indicated
- Control hyperlipidemia
- Dietary education
  - Decrease sodium
  - Decrease saturated fats, TFA's, and carbohydrates
  - Increase fiber
- Medications
  - Anti-hypertensives
  - Diuretics

Rheumatic Fever/Rheumatic Heart Disease

- Rheumatic Fever
  - Inflammatory disorder
  - Caused by Group A strep throat infection or Scarlet fever
  - Affects connective tissues
    - Causes carditis (inflammation of the myocardium), painful arthritis, fever, rash, and subcutaneous nodules

- If untreated or under treated, the infection leads to rheumatic fever, which causes long-term damage to the heart and valves – rheumatic heart disease

Rheumatic Heart Disease

- Develops 2-3 weeks after the initial infection
- Bacterial or fungi clumps travel to the lungs, brain, kidneys, and other organs
  - Antibodies are produced in response to this, and lesions develop in the heart and joints
- Diagnosis: Modified Jones Criteria
  - 2 major criteria, or
  - 1 major and 2 minor criteria

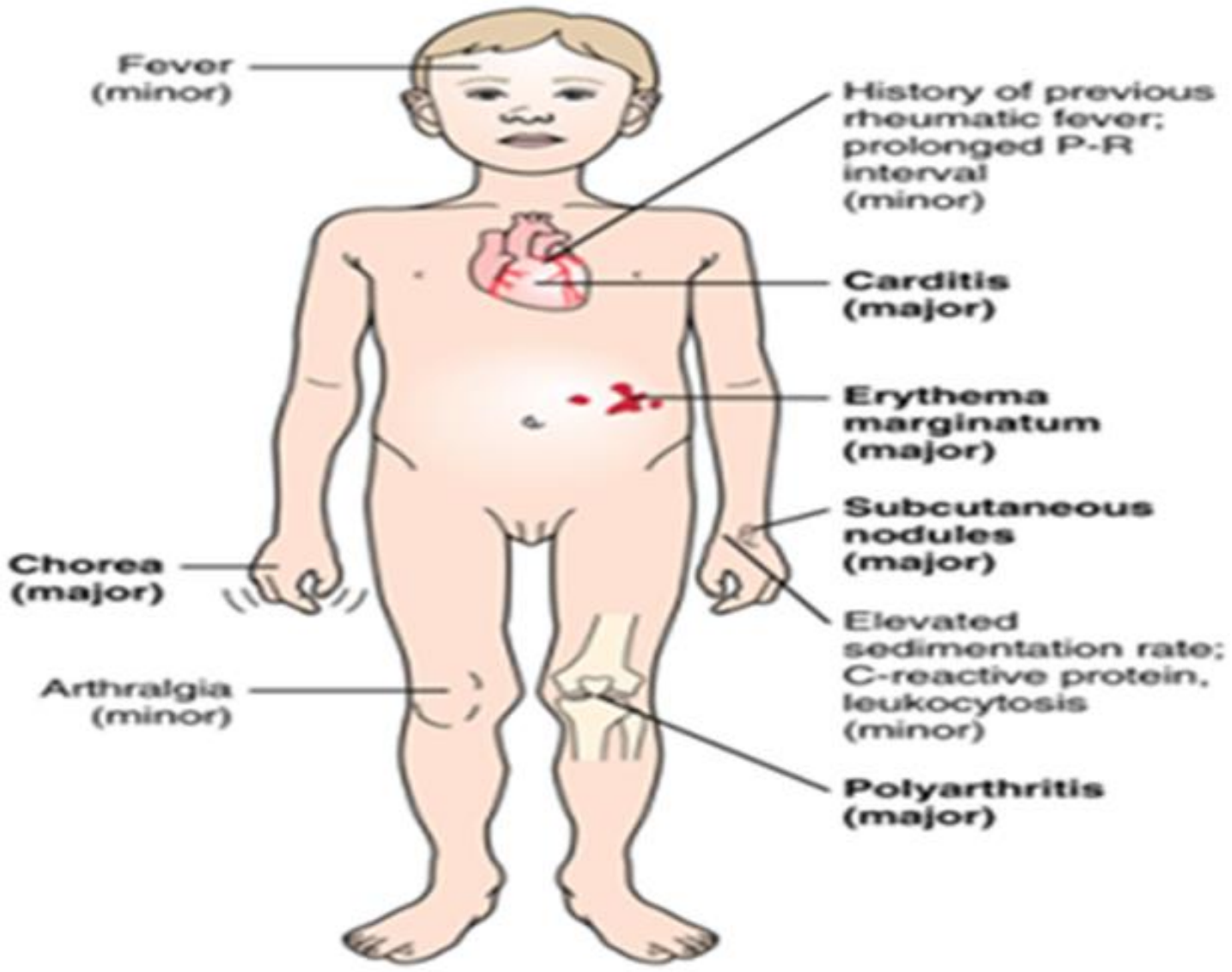
Modified Jones Criteria

Major Criteria

- Polyarthritis (multiple areas)
- Carditis
- Subcutaneous nodules
- Non-pruritic rash (trunk or arms)
- Chorea (involuntary, non-purposeful movements of arms, legs, face)

Minor Criteria

- History of rheumatic heart disease (immunity does not occur)
- Elevated C-reactive protein
- Low-grade fever (>99F)
- Evidence of heart block


Fever
(minor)
History of previous rheumatic fever; prolonged P-R interval
(minor)
Carditis
(major)
Erythema marginatum
(major)
Subcutaneous nodules
(major)
Chorea
(major)
Elevated sedimentation rate; C-reactive protein, leukocytosis
(minor)
Arthralgia
(minor)
Polyarthritis
(major)
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Rheumatic Heart Disease

- Long-term oral antibiotic therapy will be needed
- Additional medications can be needed for years
- Prophylactic antibiotic therapy prior to dental procedures
- Follow-up appointments

- Stress to parents the importance of compliance with these medications and follow-ups

Bacterial Endocarditis

- Lining of the heart is damaged
  - Circulating bacteria, inflammatory cells, clots adhere, proliferate
  - *Streptococci, staphylococcus* common initial cause
- Subacute Bacterial Endocarditis (SBE)
  - Infection of the lining of the heart
  - Early diagnosis/treatment prevents progression
  - Primarily flu-like symptoms > 2 weeks
  - More common in those with heart defects

- Early diagnosis; cure rate almost 100%
- Late diagnosis; mortality rate up to 25%

SBE

Assessment

- Risk factors:
  - CHD
  - Central venous catheters
  - IV medication use
  - Post-op complications
  - Rheumatic fever

Management/Interventions

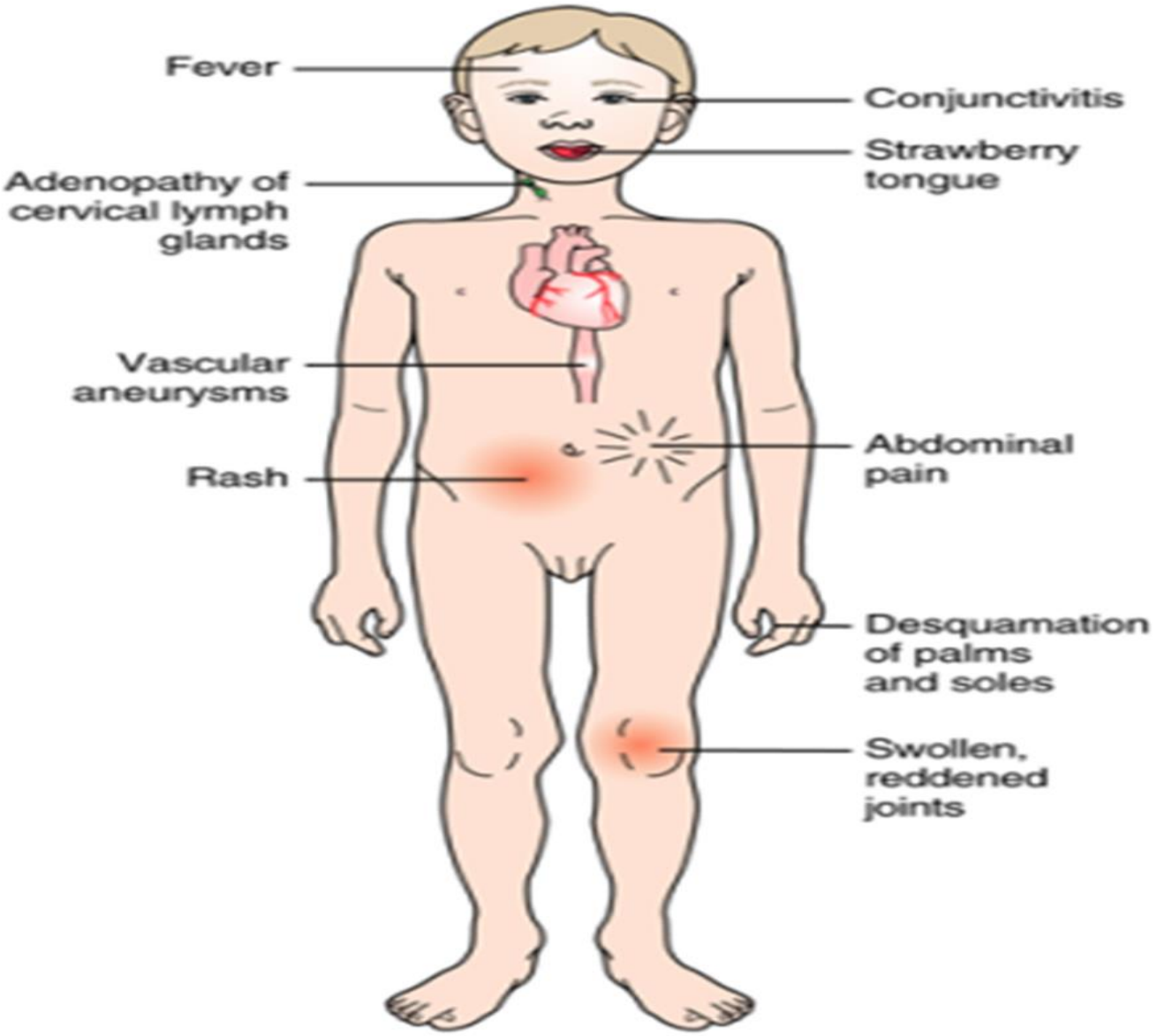
- IV antibiotics for 8 weeks
- Subsequent antibiotics for dental/surgical procedures required
- Patient/family teaching regarding prophylactic antibiotic therapy

Kawasaki Disease

- AKA Mucocutaneous lymph node syndrome
- Leading cause of acquired heart disease
- Infant develops polyarthritis leading to acute inflammation of the vasculature
  - This can lead to: CA aneurysms, scarring and stenosis of CAs, and MI
- Thought to be caused by a viral or infectious organism

Kawasaki Disease Symptoms

- Fever >38.5 C (100.3 F)
- Bilateral conjunctivitis
- Painful joints
- Red lips, strawberry tongue
- Enlarged lymph nodes, cervical lymphadenopathy
- Nonspecific groin rash
- Edematous and red hands and feet
- Increased WBC
- Extreme irritability
- Cardiac involvement
- Mimics scarlet fever (diffuse rash)


Fever
Conjunctivitis
Strawberry tongue
Adenopathy of cervical lymph glands
Vascular aneurysms
Abdominal pain
Rash
Desquamation of palms and soles
Swollen, reddened joints
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Kawasaki Disease

Assessment

- Through exclusion
- CBC
  - Increased WBC (leukocytosis)
  - Increased platelets (thrombocytosis)
- Unresolved fever
- Echo to R/O CA aneurysms

Management/Interventions

- ASA/anti-inflammatories to decrease inflammation
- ASA may be continued
- **IV gamma globulin** to prevent aneurysms
- Promote safety

Congenital heart defects (CHDs)are classified by which of the following? **Select all that apply.**

- 1) Cyanotic defect.
- 2) Acyanotic defect.
- 3) Defects with increased pulmonary flow.
- 4) Defects with decreased pulmonary flow.
- 5) Mixed defects.
- 6) Obstructive defects.
- 7) Pansystolic murmurs.

The nurse is caring for a child who has undergone a cardiac catheterization. During recovery, the nurse notices the dressing is saturated with bright red blood. The nurse's first action is to :

- 1) Call the interventional cardiologist.
- 2) Notify the cardiac catheterization laboratory that the child will be returning.
- 3) Apply a bulky pressure dressing over the present dressing.
- 4) Apply direct pressure approximately 1 inch above the puncture site.

For the child with hypoplastic left heart syndrome, which drug may be given to allow the patent ductus arteriosus (PDA) to remain open until surgery?

- _____

Which are the most serious complications for a child with Kawasaki disease (KD)? **Select all that apply.**

- 1) Coronary thrombosis.
- 2) Coronary stenosis.
- 3) Coronary artery aneurysm.
- 4) Hypocoagulability.
- 5) Decreased sedimentation rate.
- 6) Hypoplastic left heart syndrome.

The following are examples of acquired heart disease. **Select all that apply.**

- 1) Infective endocarditis.
- 2) Hypoplastic left heart syndrome.
- 3) Rheumatic heart disease.
- 4) Cardiomyopathy.
- 5) Kawasaki disease (KD).
- 6) Transposition of the great vessels.

The school nurse has been following a child who comes to the office frequently for vague complaints of dizziness and headache. Today, she is brought in after fainting in the cafeteria following a nosebleed. Her BP is 134/90, and her radial pulses are bounding. The nurse suspects she has:

- 1) Transposition of the great vessels.
- 2) Coarctation of the aorta (COA).
- 3) Aortic stenosis (AS).
- 4) Pulmonic Stenosis (PS).

During play, a toddler with a history of tetralogy of Fallot (TOF) might assume which position?

- 1) Sitting.
- 2) Supine.
- 3) Squatting.
- 4) Standing.

The nurse is caring for an eight year-old girl whose parents indicate that she has developed spastic movements of her extremities and trunk, facial grimace, and speech disturbances. They state it seems worse when she is anxious and does not occur while sleeping. The nurse questions the parents about which recent illness?

- 1) Kawasaki disease (KD).
- 2) Strep throat.
- 3) Malignant hypertension.
- 4) Atrial fibrillation.

Your patient was born with Tetralogy of Fallot 30 minutes ago. You have an order to start a Prostaglandin E1 infusion. Patient weight is 3500 grams. Your supply is 500 mcg. in 250 mL. What will you set your IV pump at per hour? **(round to one decimal place).**

Add 500 mcg PGE1 to:	To get a final infusion rate of:
25 mL	0.005 mL/kg/min
50 mL	0.01 mL.kg/min
100 mL	0.02 mL/kg/min
250 mL	0.05 mL/kg/min

The end…….