Cardiovascular Dysfunction

Maternal Child Nursing Care
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Baptist Health School of Nursing
NSG 3026A: Children’s Health
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Two Types of Cardiac Defects

- Congenital
  - Anatomic-abnormal function
- Acquired
  - Disease process
    - Infection
    - Autoimmune response
    - Environmental factors
    - Familial tendencies

Assessment of Cardiac Function

Health History
- Poor Feeding
- Tachypnea
- Mother’s History
Assessment of Cardiac Function

- Inspection
  - Failure to thrive
  - Color
  - Chest Deformities
  - Pulsations
  - Respiratory Excursion
  - Clubbing
  - Abdomen
  - Heart Rate/Rhythm
  - Heart Sounds

Character of Heart Sounds: Murmurs

- Classification of Murmurs
  - I: Very faint, heard only after listener has "tuned in"; may not be heard in all positions.
  - II: Quiet, but heard immediately after placing the stethoscope on the chest
  - III: Moderately loud.
  - IV: Loud, with palpable thrill.
  - V: Very loud, with thrill. May be heard when stethoscope is partly off the chest.
  - VI: Very loud, with thrill. May be heard with stethoscope entirely off the chest.

Diagnostic Evaluation

- Chest X-ray
- Electrocardiography
- Echocardiography
- Cardiac Catheterization
- Interventional Cardiac Catheterization
Echocardiography

- Techniques
- Noninvasive
- Painless
- Stressful

Interventional Cardiac Catheter Procedures in Children

- Transposition of great vessels
- Some complex single-ventricle defects
- ASD
- Pulmonary artery stenosis

Pre-procedural Care

- Nursing Assessment
- Height, Weight
- Allergies
- S/S Infection
- Methods of Sedation
Post-procedural Care

- Cardiac Monitor
- Temperature and Color of extremity
- Vital Signs
- Monitor Dressing
- Direct pressure if bleeding occurs

Critical Thinking Exercise

- 4 year old with tetralogy of Fallot recovering from cardiac catheterization begins vomiting and bleeding (p. 1557).
- Priorities of Nursing Care
- Nursing Interventions

Congenital Heart Disease (CHD)

- Incidence: 5 to 8 per 1000 live births
  - About 2 or 3 of these are symptomatic in first year of life
  - Major cause of death in first year of life (after prematurity)
  - Most common anomaly is VSD
  - 28% of children with CHD have another recognized anomaly (trisomy 21, 13, 18, )
Causes of CHD

- Chromosomal/genetic = 10%-12%
- Maternal or environmental = 1%-2%
  - Maternal drug use
    - Fetal alcohol syndrome, risk of CHD
  - Maternal illness
    - Rubella in 1st 7 wk of pregnancy
    - CMV, toxoplasmosis, other viral illnesses
  - IDMs = 10% risk of CHD (VSD, cardiomyopathy, TGA most common)
- Multifactorial = 85%

Overview

- Normal Fetal Circulation
  - Patent Ductus Arteriosus
  - Foramen Ovale
- Post-Natal Circulation
  - Physiologic Events:
    - Increase in Systemic Circulation Pressures
    - Decrease in Lung Resistance

Normal Fetal Heart

- SVC, Ao, duct, LPA, RPV, PA, LA, LV, RV, RA, AoD, IVC, placenta
Fetal Circulation Structures

- Umbilical vein, umbilical arteries
- Foramen ovale
- Ductus arteriosus
- Ductus venosus

Heart = Pump

How the Heart Works

- Right Side to Lungs
- Left Side to Body
- Normally low oxygen blood entering the right side of the heart stays on the right side.
- Oxygen rich blood stays on the left side of the heart where it is pumped to the body.

**Traditional Categories of CHD**

- **Acyanotic**
  - Atrial Septal Defect
  - Ventricular Septal Defect
  - Patent Ductus Arteriosus
  - Coarctation of the Aorta
  - Aortic Stenosis
  - Pulmonic Stenosis

- **Cyanotic**
  - Tetralogy of Fallot
  - Pulmonary Atresia
  - Transposition of Great Vessels
  - Hypoplastic left heart

**Congenital Heart Defects**
Newer Classification of CHD

- Hemodynamic characteristics
  - Increased pulmonary blood flow
  - Decreased pulmonary blood flow
  - Obstruction of blood flow out of the heart
  - Mixed blood flow

Increased Pulmonary Blood Flow Defects

- Abnormal connection between two sides of heart - either the septum or the great vessels
- Increased blood volume on right side of heart
- Increased or decreased pulmonary blood flow
- Defects include:
  - Atrial septal defect
  - Ventricular septal defect
  - Patent ductus arteriosus

Hemodynamics with Increased Pulmonary Blood Flow
Defects with Increased Pulmonary Blood Flow

- Atrial Septal Defect
- Ventricular Septal Defect
- Patent Ductus Arteriosus

Patients present with signs and symptoms of Congestive Heart Failure.

Atrial Septal Defect (ASD)

- Abnormal pathway b/t right and left ventricles causing shunting and fluid excess (volume overload)
- Can result in CHF
- Loud holosystolic murmur
- Typically asymptomatic until CHF develops
- Risk for endocarditis and PV obstruction
Patent Ductus Arteriosus (PDA)

- Failure of the fetal artery connecting the aorta and pulmonary artery to close within the first few weeks of life
- Allows blood to flow from the higher-pressure aorta to the lower pressure pulmonary artery, causing left-to-right shunting
PDA cont.

- The amount of left-to-right shunting depends upon the size of the PDA and the relative resistances of the systemic and pulmonary circulations.
- Results in increased pulmonary artery blood flow as well as left atrial and left ventricular overload.
- A large PDA can result in systemic organ hypoperfusion.

Atrioventricular Canal Defect (AVC)

Obstructive Defects

- Anatomic Narrowing (Stenosis)
- Valvular
- Subvalvular
- Supravalvular
Obstructive Defects

- Coarctation of the aorta
- Aortic stenosis
- Pulmonic stenosis

COA

Aorta - Largest artery

Structure of the Aorta:
- Arch
- Ascending Aorta
- Root
- Coronary Arteries
- Descending Aorta
- Abdominal Aorta
- Thoracic Aorta
- Celiac Artery
- Superior Mesenteric Artery
- Renal Arteries
- Inferior Mesenteric Artery
Coarctation of the aorta

- Increased pressure proximal to the defect (head and upper extremities)
- Decreased pressure distal to the obstruction (body and lower extremities)

Coarctation Repair

- Normal
- Coarctation
- Repair Step #1
- Completed Repair

Aortic Stenosis
Pulmonic Stenosis

Decreased Pulmonary Blood Flow Defects
- Obstruction of pulmonary flow + Anatomic Defect
- ASD or VSD
- Hypoxic
- Cyanotic

Hemodynamics with Decreased Pulmonary Blood Flow Defects
Most Common Decreased Pulmonary Blood Flow Defects

- Tetralogy of Fallot
- Tricuspid atresia

Tetralogy of Fallot

- Includes 4 defects: ventricular septal defect, pulmonic stenosis, overriding aorta, and right ventricular hypertrophy
- As the severity of right ventricular outflow tract obstruction increases, right to left shunting of blood occurs through the VSD resulting in cyanosis
Tetralogy of Fallot (TOF)
- Four separate yet intertwined problems
  - Pulmonary Stenosis
  - Ventricular septal defect (VSD)
  - Overriding aorta
  - Right ventricular hypertrophy
- This is a CYANOTIC CHD
- Typically seen with Downs children
- ASD can also occur (must have the ASD to encourage circulation and oxygenation)

Tetralogy cont.
- These 4 defects lead to a reduced blood flow to the lungs and the mixing of oxygen-rich and oxygen-poor blood in the heart. This causes the babies to appear cyanotic, especially during exertion (feeding)
- If left untreated will usually cause death by age 20
- Must be repaired surgically, usually in 2 stages, when the child is very young

Nursing and medical management (TOF)
- Diagnosis: CXR shows boot shaped heart (RV large), EKG shows RVH, ECHO
- If Ductus arteriosis closes cyanosis develops IV Prostaglandin in infancy (keep ductus open)
- Monitor labs CBC (blood can thicken)
- Initial surgery in infancy then progressive surgeries depending on hypoxic events
- Can have hypercyanotic spells
Tricuspid Atresia

Palliative Tricuspid Atresia Repair

Mixed Defects
- Transposition of great vessels
- Total anomalous pulmonary venous connection
- Hypoplastic heart syndrome
  - Right
  - Left
Hypoplastic Left Heart

Congestive Heart Failure

Definition: Congestive heart failure (CHF) is a condition in which the heart cannot pump enough oxygenated blood to meet the needs of the body's other organs.

Pathophysiology of CHF

- Right-Sided Failure
- Left-Sided Failure
**Congestive Heart Failure**

- Therapeutic Goals
  - Improve Cardiac Function
  - Remove Excess Fluids
  - Decrease Cardiac Demands
  - Improve Oxygenation

**Improve Cardiac Function**

- Increase contractility
- Decrease Afterload
- Digitalis Glycosides

**Remove Excess Fluid**

- Diuretics
- Fluid Restriction
- Sodium Restriction
- Potassium Supplements
Decrease Cardiac Demands
- Bed Rest
- Reduce Effort of Breathing
- Sedation
- Treat Infections

Improve Tissue Oxygenation
- Humidified Oxygen
- Oxygen Hood
- Nasal Cannula

Nursing Care Management of CHF
- Nursing Care Plan (p. 1576)
- Goals (p. 1571)
Improve Cardiac Function: Digoxin Administration

- Correct Dosage
- Apical Pulse
- Infants (>90-110 bpm)
- Young Children (>70 bpm)
- Older Children (>60 bpm)
- Signs of Toxicity
- Parental Teaching

Afterload Reduction: ACE Inhibitors

- Monitor Blood Pressure
- Serum Electrolytes
- Renal Function

Decrease Cardiac Demands

- Rest
- Feeding
- Minimize Stress
Reduce Respiratory Distress

- Assessment
- Positioning
- Oxygen Administration

Maintain Nutritional Status

- Caloric Needs
- Fatigue with Feeding
- Gavage Feeding
- Added Calories

Promote Fluid Loss

- Record I & O's
- Weights
- Serum Potassium Levels
- Fluid Restriction
- Sodium Restriction
Support Child and Family
- Reduce Anxiety
- Frequent Communication
- Reassurance
- Family Teaching
- End Stage CHF

CHF: Evaluate Interventions
- Monitor Heart Rate
- Monitor Nutrition
- Monitor I/O
- Monitor Weight
- Family Concerns

Hypoxemia
- Hypoxemia
- Hypoxia
- Cyanosis
- Eisenmenger Complex (syndrome)
Hypoxemia: Therapeutic Management
- Polycythemia
- Clubbing
- Squatting
- Hypercyanotic Spells
- Neurologic Complications

Hypoxemia: Nursing Care Management
- Treatment of Hypercyanotic Spells
  - Oxygen
  - Morphine
  - Hydration
  - Nurse Assessment

Care of Family and Child with CHD
- Care before Repair
- Care after Repair
- Family Adjustment
- Educate Family
- Family Coping
- Prepare for Surgery
Preparations for Surgery

- Environment
- Procedures
- Postoperative Care

Postoperative Care

- Observe Vital Signs
- Maintain Respiratory Status
- Monitor Fluids
- Rest and Activity
- Comfort and Emotional Support

Acquired Cardiovascular Disorders

Infectious and Inflammatory Cardiac Disorders
Bacterial (Infective) Endocarditis

- Pathophysiology
- Diagnostic Evaluation
- Therapeutic Management
- Nursing Care Management

Rheumatic Fever

- RF
  - Inflammatory disease occurs after Group A Beta-hemolytic streptococcal pharyngitis
  - Infrequently seen in U.S.; big problem in Third World
  - Self-limiting
    - Affects joints, skin, brain, serous surfaces, and heart
  - Rheumatic heart disease
    - Most common complication of RF
    - Damage to valves as result of RF

Clinical Manifestations of RF

- Carditis
- Polyarthritis
- Erythema marginatum
- Subcutaneous nodules
Prevention of RHD

- Treatment of streptococcal tonsillitis/pharyngitis
  - Penicillin G—IM x 1
  - Penicillin V—oral x 10 days
  - Sulfa—oral x 10 days
  - Erythromycin (if allergic to above)—oral x 10 days

- Treatment of recurrent RF
  - Same as above

Hyperlipidemia

- Identify kids at risk and treat early
- Treatment: dietary
  - Restrict intake of cholesterol and fats
- If no response to diet→Rx
  - Colestipol (Colestid)
  - Cholestyramine (Questran)

Cardiac Dysrhythmias

- Variable heart rate
- Diagnostic Evaluation
- Bradycardia
- Tachycardia
- Conduction disturbances
Pulmonary Artery Hypertension
- PAD defined
- Supportive Care
- Causes
- Clinical Manifestations
- Therapeutic Management

Cardiomyopathy
- Etiology
- Dilated
- Hypertrophic
- Restrictive
- Management

Heart Transplantation
- Orthotopic transplant
- Heterotopic transplant (piggyback)
- Organ donation issues
- Nursing Management
Hypertension in children

- Essential Hypertension
- Secondary Hypertension
- Etiology
- Clinical Manifestations

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Hypertension in Children

- Diagnosis
- Therapeutic Management
- Diagnostic Management

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Kawasaki disease

- Definition
- Etiology
- Pathphysiology
Kawasaki Clinical Manifestations

- Diagnostic Criteria (Box 48-11, p. 1593)
- Acute Phase
- Subacute Phase
- Convalescent Phase

Kawasaki: Cardiac Involvement

- Complications
- Therapeutic Management
- Prognosis
- Nursing Care

Kawasaki Disease Treatment

- IVIG
- ASA 80-100 mg/kg/day—fever
- Then 3-5 mg/kg/day—antiplatelet
Shock
- Hypovolemic
- Distributive
- Cardiogenic
- Clinical manifestations
- Therapeutic Management
- Nursing Management

Emergency Treatment: Shock
- Ventilation
- Fluid Administration
- Cardiovascular Support
- General Support

Anaphylaxis
- Definition
- Clinical manifestations
- Therapeutic Management
- Nursing Management
Toxic Shock Syndrome (TSS)

- Diagnostic evaluation
- Criteria (Box 48-14, p. 1598)

Toxic Shock Syndrome (TSS)

- Diagnostic evaluation
- Therapeutic management
- Nursing considerations
- Criteria for definition of TSS