- Chapter 26
- The Child with a Cardiovascular Disorder
- Objectives
- Distinguish the difference between the cardiovascular system of a child and an adult.
- List the general signs and symptoms of congenital heart disease.
- Differentiate among patent ductus arteriosus, coarctation of the aorta, atrial septal defect, ventricular septal defect, and tetralogy of Fallot.
- Discuss six nursing goals relevant to the child with heart disease.
- Objectives *(cont.)*
- List the symptoms of rheumatic fever.
- Discuss the prevention of rheumatic fever.
- Discuss hypertension in childhood.
- Differentiate between primary and secondary hypertension.
- Objectives *(cont.)*
- Identify factors that can prevent hypertension.
- Recognize the manifestation of Kawasaki disease and the related nursing care.
- Describe heart-healthy guidelines for children older than 2 years.
- Cardiovascular System
- Signs Related to Suspected Cardiac Pathology
- Failure to thrive and/or poor weight gain
- Cyanosis, pallor

- Visually observed pulsations in the neck veins
- Tachypnea, dyspnea
- Irregular pulse rate
- Clubbing of fingers
- Fatigue during feeding or activity
- Excessive perspiration, especially over forehead
- Congenital Heart Disease
- Occurs in approximately 8 out of 1,000 births
- 50% of these infants show signs/symptoms within the first year of life
- Can be caused by genetic, maternal, or environmental factors
  - Not a problem for the fetus because of the fetal-maternal circulation
  - At birth, the infant's circulatory system must take over and provide the child's oxygen needs
- Congenital Heart Disease *(cont.)*
- Of the congenital anomalies, heart defects are the principal cause of death during the first year of life
- Diagnostic studies vary from noninvasive, such as an electrocardiogram, to invasive, such as angiogram
- Once diagnosis is confirmed, most cardiac defects require surgical intervention
- Congenital Heart Disease *(cont.)*
- Classification
- Two categories
  - Cyanotic

- Acyanotic

- Blood always flows from area of high pressure to an area of low pressure and it also takes the path of least resistance

- Congenital Heart Disease *(cont.)*

- Physiologically, defects can be organized into lesions that
  - Increase pulmonary blood flow
  - Obstruct blood flow
  - Decrease pulmonary blood flow

- A *shunt* refers to the flow of blood through an abnormal opening between two vessels of the heart

- The Normal Heart and Various Congenital Heart Defects

- Congenital Heart Disease *(cont.)*

- Defects that increase pulmonary blood flow
  - Blood returns to the right ventricle and recirculates through the lungs before exiting the left ventricle through the aorta

- Some defects that increase pulmonary flow are
  - Atrial septal defect
  - Ventricular septal defect and patent ductus arteriosus

- The oxygenated blood recirculates to the lungs, and cyanosis is rare

- Nursing Tip

- In congenital heart disease, cyanosis is *not* always a clinical sign

- Restrictive Defects

- Restriction usually from some form of stenosis of the vessel

- Coarctation of the aorta
  - Narrowing or constriction of the aortic arch or of the descending aorta
  - Hemodynamically, increased pressure proximal to the defect and decreased pressure distally

- Coarctation of the Aorta
- Characteristic symptoms
- Marked difference in the blood pressure and pulses of the upper and lower extremities
- May not develop symptoms until late childhood
- Treatment is dependent upon type and severity of the defect
- Best time for surgical intervention is between 2 and 4 years of age
- Coarctation of the Aorta *(cont.)*
- If left untreated
  - Hypertension
  - Congestive heart failure
  - Infective endocarditis may occur
- After surgery, the nurse should observe for
  - Hypertension
  - Abdominal pain associated with nausea and vomiting
  - Leukocytosis
  - GI bleeding or obstruction
- Treatment includes
  - Antihypertensive drugs
  - Steroids
  - NG tube for decompression of the stomach
- Defects that Decrease Pulmonary Blood Flow

- Occurs when a congenital heart anomaly allows blood that has not passed through the lungs (unoxygenated blood) to enter the aorta and general circulation
- Cyanosis caused by the presence of unoxygenated blood in the circulation is a characteristic feature of this type of congenital heart anomaly
- Tetralogy of Fallot
- Four defects
  - Stenosis or narrowing of the pulmonary artery
    - Decreases blood flow to the lungs
  - Hypertrophy of the right ventricle
    - Enlarges because it must work harder to pump blood through the narrow pulmonary artery
  - Dextroposition of the aorta
    - The aorta is displaced to the right and blood from both ventricles enters it
  - Ventral septal defect (VSD)
- Tetralogy of Fallot *(cont.)*
- Cyanosis increases with age
- Clubbing of fingers and toes
  - Due to chronic hypoxia
- Child rests in a "squatting" position to breathe more easily by altering systemic venous return
- Prevalent symptoms include
  - Feeding problems
  - Failure to thrive
  - Frequent respiratory infections

- Severe dyspnea on exertion
- Polycythemia develops to compensate for the lack of oxygen

- Paroxysmal Hypercyanotic Episodes
- Known as *Tet spells*
- Occur during the first 2 years of life
- Spontaneous cyanosis, respiratory distress, weakness, and syncope occur
- They can last up to a few hours and are followed by lethargy and sleep
- Place child in knee-chest position when Tet spell occurs
- Tet Position
- Diagnosis
- Diagnosis confirmed by chest X-ray that shows a typical boot-shaped heart
- Additional tests include
  - EKG
  - 3-D echocardiography
  - Cardiac catheterization
- Complications and Treatments
- Complications
  - Cerebral thrombosis caused by polycythemia, especially if dehydration occurs
  - Iron-deficiency anemia due to decreased appetite and increased energy required to suck or eat
  - Bacterial endocarditis can occur
- Treatment

- Designed to increase pulmonary blood flow to relieve hypoxia

- Surgery
  - In some cases, IV prostaglandin E therapy can open a constricted ductus arteriosus and allow for oxygenation of the body until surgery is performed

- Defects that Cause Mixed Pathology

- Hypoplastic left heart syndrome
  - Underdevelopment of the left side of the heart
  - Usually results in an absent or nonfunctional left ventricle and hypoplasia of the ascending aorta
  - Can be diagnosed before birth and infant is placed on a heart transplant list early

- Defects that Cause Mixed Pathology *(cont.)*

- Hypoplastic left heart syndrome *(cont.)*
  - Initial survival depends on a patent foramen ovale and ductus arteriosus to provide a pathway for oxygenated blood to the general body system
  - Symptoms include
    - A grayish-blue color of the skin and mucous membranes
    - Signs of CHF
    - Dyspnea
    - Weak pulses
    - Cardiac murmur

- General Treatment and Nursing Care

- Assorted medical and surgical treatments are currently available

- After the procedure, the nursing care involves
  - Monitoring vital signs

- Observing for thrombosis formation
- Neurovascular checks of the limb
- Emotional support to child and family

- General Treatment and Nursing Care *(cont.)*
- Instruct parents that children with congenital heart disease should avoid competitive sports because the pressure for a team win can interfere with the child's need to stop activity if specific symptoms arise
- Nutritional guidance aimed at preventing anemia and promoting optimal growth and development
- Vacations to high altitudes or very cold environments may cause adverse responses in a child who is already hypoxic or has cardiac problems
- Acquired Heart Disease
- Occurs after birth
- May be a complication of a congenital heart disease or a response to respiratory infection, sepsis, hypertension, or severe anemia
- *Heart failure* is a decrease in cardiac output necessary to meet the metabolic needs of the body
- Congestive Heart Failure (CHF)
- Manifestations depend on the side of the heart affected
  - Right side of the heart moves unoxygenated blood to the pulmonary circulation
    - A failure results in the backup of blood in the systemic venous system
  - Left side of heart moves oxygenated blood from the pulmonary circulation to the systemic circulation
    - Failure results in backup into the lungs
- Congestive Heart Failure (CHF) *(cont.)*
- When body tries to compensate

- Peripheral vasoconstriction occurs
- Results in cold and/or blue hands and feet
- Tachycardia
- Tachypnea

- Safety Alert
- Early signs of CHF in infants that should be reported
  - Tachycardia at rest
  - Fatigue during feedings
  - Sweating around scalp and forehead
  - Dyspnea
  - Sudden weight gain
- CHF Goals of Treatment
- Goals
  - Reduce the work of the heart
  - Improve respiration
  - Maintain proper nutrition
  - Prevent infection
  - Reduce the anxiety of the patient
  - Support and instruct the parents
- CHF and Nursing Care
- Organize care so that infant is not unnecessarily disturbed
- Feed early if crying and late if asleep

- Feedings are small and frequent
- Oxygen is administered to relieve dyspnea
- Medications are given as prescribed, after dosages are checked for safety
- Accurate recording of intake and output
- Rheumatic Fever (RF)
- Systemic disease involving the joints, heart, central nervous system, skin, and subcutaneous tissues
  - Belongs to a group of disorders known as *collagen diseases*
- Common feature is destruction of connective tissue
  - Scars mitral valve in the heart
- Peak incidence is 5 to 15 years of age
  - More prevalent in winter and spring
- Autoimmune disease occurring as a complication of an untreated group A beta hemolytic streptococcus infection of the throat
- Manifestations of RF
- Modified Jones Criteria
- Minor criteria
  - Fever
  - Arthralgia
  - Previous history of rheumatic heart disease
  - Elevated erythrocyte sedimentation rate
  - Leukocytosis
  - Altered PR interval on electrocardiogram
  - Positive C-reactive protein

- A positive diagnosis of RF cannot be made without the presence of two major criteria or one major and two minor criteria, *plus* a history of streptococcal infection
- Modified Jones Criteria *(cont.)*
- Major Criteria
  - Carditis
  - Polyarthritis
  - Erythema marginatum
  - Chorea
  - Subcutaneous nodules
- Treatment of RF
- Antimicrobial therapy initially, then followed by chemoprophylaxis monthly for a minimum of 5 years
- Rest
- Relief of pain and fever
  - Antiinflammatory agents
  - Steroids
  - Aspirin
- Management of cardiac failure, should it occur
- Nursing Care of RF
- Care should be organized to ensure as few interruptions as possible to prevent tiring the patient
- Special attention should be given to skin and back care; good oral hygiene; and small, frequent feedings

- If dental therapy is needed, prophylactic antimicrobial treatment is required before the procedure
- Prevention of RF
- Prevention of infection and prompt treatment of group A beta-hemolytic streptococcal infections
- Nurse stresses importance of completing all antimicrobial therapy as prescribed
- Systemic Hypertension
- More prevalent during childhood and adolescence
- Significant hypertension (HTN) is considered when measurements are persistently at or above the 95th percentile for patient's age and sex
- Primary, or essential, HTN implies that no known underlying disease is present
- When the cause of hypertension can be explained by a disease process, it is known as secondary
  - Renal, congenital, vascular, and endocrine
- Systemic Hypertension *(cont.)*
- Heredity, obesity, stress, and poor diet and exercise patterns are some of the contributing factors to the development of HTN
- HTN more prevalent in children whose parents have high blood pressure
- Systemic Hypertension *(cont.)*
- Treatment and nursing care involve
  - Nutritional counseling
  - Weight reduction
  - Age-appropriate program of aerobic exercise
  - Adolescents should be counseled concerning the adverse effects of drugs, alcohol, and tobacco on blood pressure

- Focus of treatment of secondary HTN is the underlying disease causing the elevated blood pressure
- Nonpharmacological Approach to HTN
- Aerobic exercise
- Reduce sedentary activities
- Weight reduction
- Dietary management
- Adequate intake of potassium and calcium
- Avoid smoking and those who smoke
- Hyperlipidemia
- Refers to excess lipids (fat and fatlike substances in the blood)
- Lipoproteins contain lipids and proteins and include
  - *Low-density lipoproteins* (LDL) contain low amounts of triglycerides, high levels of cholesterol, and some protein
    - Carries cholesterol to the cells, which aids in cellular metabolism and steroid production
  - *High-density lipoproteins* (HDL) contain low amounts of triglycerides, little cholesterol, and high levels of protein
    - Carries cholesterol to the liver for excretion
- Hyperlipidemia *(cont.)*
- Children with two consecutive blood cholesterol levels exceeding 170 mg/dL should be followed closely and offered nutritional guidance
  - Parental history of cholesterol levels exceeding 240 mg/dL or a family history of early cardiac death (under age 55 years) should have their cholesterol levels tested
- Dietary intake of no more than 300 mg of cholesterol per day and no more than 30% total dietary calories from fat are recommended

- Children younger than 2 years of age should not have a fat-restricted diet, because calories and fat are necessary for CNS growth and development

- Kawasaki Disease (KD)
- Also known as *mucocutaneous lymph node syndrome*
- Leading cause of acquired cardiovascular disease in the U.S.
- Usually affects children younger than 5 years of age
- May be a reaction to toxins produced by a previous infection with an organism such as Staphylococci
- Not spread from person to person
- Kawasaki Disease (KD) *(cont.)*
- Diagnosis is made by clinical signs and symptoms, no specific lab studies
- KD causes inflammation of the vessels in the cardiovascular system
  - Weakens the walls of the vessels
- Often results in an aneurysm (an abnormal dilation of the wall of a blood vessel)
  - Aneurysms can cause thrombi (blood clots) to form, which can be life-threatening
- Kawasaki Disease (KD) *(cont.)*
- Manifestations
  - Onset is abrupt with a sustained fever
    - As high as 104º F (40º C)
    - Does not respond to antipyretics or antimicrobials
    - Fever lasts for more than 5 days
  - Conjunctivitis without discharge
  - Fissured lips
  - A "strawberry tongue"

- Inflamed mouth and pharyngeal membranes
- Enlarged nontender lymph nodes

- Kawasaki Disease (KD) *(cont.)*
- Erythematous skin rash develops
- Swollen hands and desquamation (peeling) of the palms and soles
- Child is very irritable
- May develop signs of cardiac problems
- Kawasaki Disease (KD) *(cont.)*
- Treatment
  - IV gamma globulin, if given early, can prevent the development of coronary artery pathology
  - Salicylate therapy for antithrombus properties
  - Warfarin therapy may be prescribed if aneurysms are detected
- Kawasaki Disease (KD) *(cont.)*
- Nursing care
  - Symptomatic and supportive
  - Parent teaching should be reinforced concerning need to postpone active routine immunizations for several months after the administration of immune globulin, which is an immunosuppressant
  - Long-term, low-dose aspirin therapy may be prescribed
    - Compliance may be a problem for any long-term regimen in which medications must be taken when the child feels "well."
- Question for Review
- How does the squatting (Tet) position relieve dyspnea?

- Review
- Objectives
- Key Terms
- Key Points
- Online Resources
- Review Questions