Caring for the Child and Family with Cardiac Dysfunction

NUR2261

CHAPTER 27

- Monitor I&O for cardiac output and fluid monitoring

Classifications

- Cyanotic

versus

- Acyanotic

- Lesions of increased pulmonary pressure

Versus

- Lesions of decreased pulmonary pressure:

- Cyanotic: Deoxygenated blood moves from right to left side of the heart through an openings or defects along the aorta
- Acyanotic: Oxygenated blood moves from left to right then to lungs along holes of the left and right atrium

Transition to Extra-uterine Life

- Ductal System vascular resistance increases
- Ductas Arteriosus constricts
  - closes within 10 to 15 hours of birth
- Foramen Ovale closes
- Left ventricle enlarges due to increased pressure

- Ventricles are the same size at birth
- Left ventricle is twice as large as the right ventricle at 2 months
- Ductal system vascular resistance increases after the cord is cut
- Foramen ovale closes which is stimulated by increase in BP on the left side of the heart

Normal Heart

- Blood flow-needs to become extra-uterine
- Valves- need to allow for proper blood flow
- All structures adjust to extra-uterine life in sync with the lungs and respiratory effort.

- Systemic circulation: oxygenated bond to hemoglobin and transported to tissues

Level One Nursery

Is This Baby Sick? This Baby develops failure to thrive

- Circumoral Cyanosis? Decreased perfusion, tachycardia results
- Decreased Perfusion?
- Tachypnea and tachycardia with "work"

Nurse will:

- Take four extremities blood pressure-look for pulse pressure and the MAP Reflects GA
- Observe MAPS and pulse pressure
- Report changes from admission of infant
- Pre and post ductal pulse ox

- Hemocrit: >60%
- Hemoglobin: >20
  - These levels are dangerous and indicate thrombolike disorders especially if baby is dehydrated

Level II Nursery

- Echo
- Abg's
- Cardiac monitor
  - Oxygen
- Referral to Cardiologist

- Possible transfer to level III
- Report changes in cardiac status
- The infant may be prone to SVT Adenosine

- CO = Volume of blood ejected from the left ventricle each minute
- Heart fully develops at approx 5 years of age
- Cardiac stimulants:
  - Norephinephrine
  - Caffeine

Level III Nursery

Care of the cath lesion
prevent hemorrhage and infection
Care for the open heart patient
Hemodynamics is at risk
Fluid and electrolyte balance (K+)
Teach family about subsequent surgeries

- Educate parents on what to expect
- Cardiac Cath will determine what exactly is wrong prior to surgery
- Congenital Defects develop first at appox. 8 weeks of age:
  - Environmental:
    - Alcohol use by Mother
    - Tobacco use by Mother
    - Rubella or Viral Infections while pregnant
    - Advanced maternal age of mother
  - Genetics

Increased Pulmonary Pressure

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

- Monitor Vital Signs and O2 Sat
- Heart murmurs are 1st indicator of Congenital Heart Defects

Increased Pulmonary Blood Flow Defects

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

- Monitor:
  - Vital Signs and O2 Sat
  - Hemocrit
  - Hemoglobin
  - Cap Refills

Patent Ductus Arteriosus
PDA

- Persistent fetal circulation may show up…
- Very common in preterm infants
- Can be closed with medication, devices, or surgery
- Prognosis is good after closure.

- Increased HR
- Increased RR
- Increased Metabolic Rate
- Increased Pulmonary Blood Flow
- If lesion becomes larger and doesn't close, CHF and possible death will occur

Atrial Septal Defects
ASD

- Opening in atrial septum that permits left-to-right shunting of blood
- Opening may be small or large
- Very common heart defect
- Closure: Spontaneous, devices, or surgery
- Prognosis good if ASD is closed early.

- Assess parents ability to cope. They may feel guilty and anxious
- Offer support groups for patients and families
- Genetic counseling may be warranted if future pregnancies are planned

Ventricular Septal Defects
VSD

- Opening in ventricular septum permits left-to-right shunting of blood
- Most common heart defect
- Closure: Small VSDs may close spontaneously – surgery isn't needed.
- Prognosis: good

- Encourage feeding to promote growth (Max 20-30 minutes) to save energy consumption
- Frequent hand washing is essential
- Fever increased metabolic rate and O2 demands
- If openings will not close, Open Heart Surgery will be needed

Evaluation

- Cardiac output sufficient to meet demands
- Oxygenation is adequate
- Intake and output are balanced
- Child demonstrated weight gain
- Evidence of decreased anxiety

- Educate parents on how to monitor signs and symptoms and when to call physician.
  - Example:
    - Cap Refill
      - Assess tissue perfusion
    - Pulse Ox
    - Pulses
    - Weight
      - Measure urinary output
    - LOC
    - Skin Color

Planning
Implementation

- Maintain oxygenation and myocardial function
- Promote rest
- Foster development
- Provide adequate nutrition
- Provide emotional support
- Discharge planning and teaching

- Pain Management
- Promote deep breathing and cough
- Activity encouraged with rest periods

Decreased Pulmonary Blood Flow Defects

- Pulmonic Stenosis (PS)
- Tetralogy of Fallot (TOF)
- Pulmonary or tricuspid atresia

- Tetralogy of Fallot is the benchmark

Pulmonary or Tricuspid Atresia

- Right side of heart or tricuspid valve not developed
- PDA provides blood to pulmonary artery, and
- Foramen Ovale provides blood to left side of heart
- Repair:
  - Surgical
- Prognosis:
  - Right ventricular dysfunction is common

- Surgical repair necessary:
  - cyanosis after birth
  - loud murmur
  - dyspnea
- Feeding is tiredsome

Decreased Pulmonary Pressure

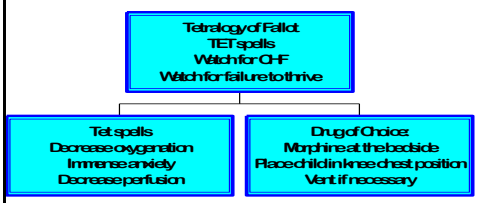
Tetralogy of Fallot

1. Hole between the right and left ventricles
2. Narrowing of the pulmonary outflow tract
3. Aorta shifted to R ventricle
4. R. Ventricular hypertrophy

- Squatting reduces CO by decreasing venous return from the lower extremities

2. Narrowing of the pulmonary out flow tract
3. Aorta shifted to the right ventricle
4. Right ventricular hypertrophy

Tetralogy of Fallot



- Frequent hospitalized
- Monitor failure to thrive
- 4 Defects involved:
  - Pulmonary Stenosis
  - Right Ventricular Hypertrophy
  - VSD
  - Colactation of Aorta

Lesions Which Obstruct Systemic Blood Flow

- Hypoplastic Left Heart
- Coarctation of the Aorta
- Aortic Stenosis

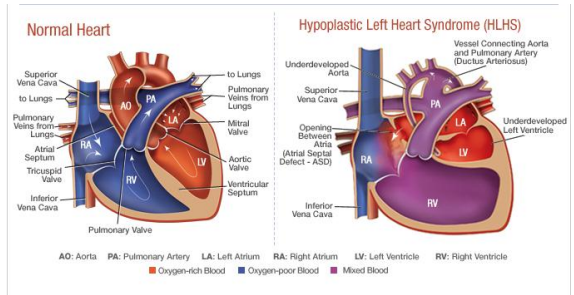
- Hypoplastic Left Heart is the benchmark

Hypoplastic Left Heart

HLHS

- Absence of mitral and aortic valves
- Abnormally small aorta
- Severe heart defect
- Prostaglandin E1 to maintain PDA
- Treatment options
  - Comfort care
  - Norwood procedure (three-staged palliation)
  - Heart transplantation
  - Pros and cons of each option

- Cyanosis to the lips and nails
- Fatal without early intervention
- Require open heart surgery



- Diagnosed:
  - echocardiogram
  - ECG
  - Pulse Ox
  - Cath
  - Cardiac MRI

HLHS
Prognosis

- Without surgery, death within days
- Norwood procedure
  - Survival rates improving
  - First stage has highest mortality
  - Long-term survival unknown
- Transplantation
  - 63% of infants waiting for donor heart die while waiting
  - Lifespan of transplanted heart
  - Immunosuppression required

- Left side of the heart is under developed
- Left side of the heart is responsible to pumping blood through aorta

Assessment

- Growth is critical
- Nutritional intake
- Psychosocial considerations
- Observe for s/s of deterioration
  - ~Poor feeding
  - ~Lack of participation
  - ~Dis-engagement
  - ~The baby just doesn't choose to be "bothered."

- Monitor feeding and lack of bonding
- Growth milestones are crutial

Planning
Implementation

- Administer medications
- Promote rest, nutrition, and growth
- Maintain metabolic demands and oxygenation
- Provide emotional support

- Palliative care is difficult for parents and support will be needed
- Child is sick and appears ill

Provide Education Regarding Home Care

- Feeding strategies - may require nasogastric tube feedings
- Prevent infectious diseases
  - Hand washing
  - Minimize exposure to infection
  - RSV prophylaxis
- When to notify physician
  - Fever
  - Poor feeding
  - Vomiting, diarrhea
  - Other s/s of impending loss of the child.

- Proper hand washing to minimize infection
- Educate parents to monitor:
  - fever
  - edema
  - difficulty in breathing
  - cyanosis
  - when to contact physician for assistance

Congestive Heart Failure

CHF

- Congenital heart defects can lead to CHF
  - cardiac output cannot keep up with circulatory or metabolic demands
- Decreased heart contractility
- Poor feeding
- Fewer wet diapers
- Diaphoresis
- Distal edema
- Late sign: Respiratory complications

- Promote adequate nutrition and rest is essential
- Digoxin an Lasix are prescribed
  - Potent and must be administered carefully to avoid toxicity

Oxygenation

- Pulse oximetry:
  - Amount of oxygen available for tissue delivery
- Normal versus hypoxic levels
- Response to chronic hypoxia:
  - Polycythemia
- The baby will "head bob" when feeding,
  - will huff and puff

- Semi Fowlers position to promote maximum oxygenation (45 degrees)

Late Signs of CHF

- Respiratory symptoms
  - Tachypnea, nasal flaring, retractions
  - Cough, crackles
- Tachycardia
- Generalized fluid overload
- Cardiomegaly
- Anxiety/"worried look"

- May express anxiety or worried look as they struggle to breath

digoxin (Lanoxin) Alert

- Infants rarely receive more than 1ml
- If the nurse has more than a ml in a syringe
  - the calculation is probably wrong
- Mom needs to give the exact amount
- Report weight gain/loss to the cardiologist

- Lethal dose is 20-50 x above the maintenance dose taken all at once

Lanoxin Toxicity

- Bradycardia
- Dysrhythmias
- Nausea
- Vomiting
- Anorexia

- Observe for toxicity;
  - HR
  - Rhythm
  - N/V
  - Diarrhea
- Check serum levels

Diuretic Therapy

TABLE 48–1 Drugs Used to Treat Congestive Heart Failure

Drug	Action
Digoxin	Increases myocardial contractility improving systemic circulation
Furosemide	Rapid diuresis
Thiazides Chlorothiazide (suspension) Hydrochlorthiazide (tablets)	Maintenance diuresis, decreases absorption of sodium, water, potassium, chloride, and bicarbonate in renal tubules
Spironolactone	Maintenance diuresis (potassium-sparing)
ACEI (angiotensin-converting enzyme inhibitor)	Promotes vascular relaxation and reduced peripheral vascular resistance
Propranolol	Increases contractility
Carvedilol	Improves left ventricular function, promotes vasodilation of systemic circulation for chronic heart failure and dilated cardiomyopathy.

Cardiac Surgery

- Maintain respiratory status
- Chest tube
- Monitor fluids
- Minimal stimulation
- Emotional support/education

Other Cardiac Issues

- Endocarditis
- Kawasaki Disease
- Hyperlipidemia
- Rheumatic Disease
- Systemic Circulatory Diseases
- Drive through disease!

Infective Endocarditis

- Definition: Infection of the cardiac muscle
- Risk factors
  - Congenital heart defect
  - Rheumatic heart disease/strep infection secondary to strep toxin
  - Central venous catheters
- Etiology: Bacteria, enterococci, or fungi

Infective Endocarditis Clinical Manifestations

- Fever
- Fatigue, muscle aches
- New or changing murmur
  - tachycardia/
  - irregular heart rhythm
- Signs of congestive heart failure
- Unusual Symptom:
  - splinter-like discoloration under the fingernails

- Audible Murmurs

Infective Endocarditis Treatment

- Antibiotics, antifungals
  - 2- to 8-week therapy
- Treat congestive heart failure if present
- Assess valve damage
  - surgical valve replacement may be needed
- Unusual sign
  - Splinter-like hemorrhages under the fingernails-may reappear!

Infective Endocarditis Nursing Management

- Administer medications
  - Monitor blood levels for some antibiotics
- Monitor for signs of congestive heart failure
  - Assess for embolism
- Promote developmental activities
  - The child may not "feel" like playing…

- Administer full course of medication
- Encourage parents to play with child and provide frequent rest periods

Nursing Diagnosis

- Ineffective Breathing Pattern
- Acute pain
- Risk for imbalanced fluid volume
- Risk for infection
- At risk for repeat episodes
  - secondary to poor antibiotic follow-through, and
  - weakening of the cardiac structures.

Rheumatic Fever

- Definition: toxin in strep attacks multiple systems
- Etiology: Group A beta-hemolytic streptococci
- Clinical manifestations
  - Heart
  - Joints
  - Brain
  - Skin

Inflammation

- Arthritis DOES affect children

Rheumatic Fever Treatment

- Antibiotics to eradicate strep infection
- Aspirin to treat cardiac, inflammation
- Steroids
- Long-term antibiotic prophylaxis for invasive procedures.
- Most children recover fully
  - BUT, may suffer some cascade of the disease for life…

Rheumatic Fever Nursing Management

- Prevention
- Monitor temperature
- Bed rest
- Administer medications
- Home teaching

- Prevention:
  - throat cultures
  - full course of antibiotics
  - hand washing is essential
- Monitor Temperature to prevent seizures due to increased fevers

Kawasaki Disease

Clinical manifestations

Three stages of illness

- 1st phase = Fever
  - Conjunctiva hyperemia
  - Cervical lymph node enlargement
- 2nd phase = Peeling rash
  - Cracking skin (lips, fingers, toes)
- 3rd phase = Vasculitis
  - Coronary artery aneurisms

- Hands and feet may become swollen

- Usually occurs in kids less than 5 yrs of age
- Skin
- Lymph Nodes (neck area)
- Mouth
- Disease is unknown
- Symptoms:
  - irritability
  - diarrhea
  - pain
  - coughing
  - vomiting
  - abdominal pain
  - runny nose

Kawasaki Disease Diagnostics

- Chest x-ray
- Echocardiogram
- Electrocardiogram
- Urinalysis - may show pus in the urine or protein in the urine
- Complete blood count
- C-reactive protein (CRP)
- ESR (Sed Rate)
- Serum albumin
- Serum transaminase

- Most recover within a few days
- Affects asians more predominantly

Kawasaki Disease Treatment

- Intravenous immunoglobulin
- Aspirin
  - Anti-inflammatory dose initially
  - Anti-platelet dose after fever decreases
  - Heart issues
- Monitor for coronary artery aneurisms

- Monitor Vital Signs
- Monitor EKG
- Monitor for Coronary Artery Aneurisms

Kawasaki Disease Nursing Management

- Administer medications as ordered
- Promote comfort
- Home teaching -decrease stress
- Antibiotics prophylactically for invasive procedures

- If cardiac involvement, its a life long issue

Circulatory Updates

Pediatric Hyperlipidemia

- Childhood Nutrition to Lower Heart Disease
- Gene Therapy - New Frontier
- Take the Cholesterol Quiz

Cholesterol Level Guidelines for Children

Cholesterol levels in Children and Adolescents Aged 2-19 Years			
Cholesterol	Acceptable mg/dL	Borderline mg/dL (may require moderate changes to diet)	High mg/dL (may require changes in diet and possible drug treatment)
Total cholesterol	Less than 170	170-199	200 or greater
LDL cholesterol	Less than 110	110-129	130 or greater

Kawasaki Disease (pg 866-867)

- ✓ Mucocutaneous lymph node syndrome
- ✓ Multi-system disease affecting cardiovascular system
- ✓ Cause unknown
- ✓ Defective immune response to infectious process maybe responsible
- ✓ Not congenital or contagious
- ✓ Acute phase consists of diffuse vasculitis causing long term cardiovascular problems
- ✓ One long term sequel of disease is aneurysm formation in arterial vessels
- ✓ Aneurysm concerning coronary artery most worrisome

Signs and Symptoms

- ✓ No specific test but CBC, ESR, electrocardiogram, echocardiogram help to confirm diagnosis
- ✓ Diagnosis based on symptoms
- ✓ Persistent fever (>5 days spiking to 104 F)
- ✓ *Skin rash*
- ✓ *Unilateral lymphadenopathy >15cm in diameter*
- ✓ *Edema and erythema of hands and feet with eventual peeling of skin*
- ✓ *Irritation and inflammation of the mouth with 'strawberry tongue', erythema, and cracking of lips*
- ✓ *Conjunctivitis without exudates*
- ✓ Kawasaki diagnosis made if fever is present with 4 out of 5 of above symptoms (in italic)
- ✓ Diagnosis can be made for children with fewer than 4 symptoms if a vessel aneurysm is present

Nursing Care

- ✓ Administer IVIG (IV immunoglobulin) and ASA (aspirin) for anti-inflammatory purpose
- ✓ Steroids, plasma exchange, cytotoxic agents are other treatments used if IVIG and ASA are not effective
- ✓ Tell family that frequency of follow up visits is determined by initial episode and how fast initial treatment was delivered
- ✓ Children often undergo dobutamine (Dobutrex) or exercise stress test to assess vascular response to exercise
- ✓ Small number of children require coronary bypass surgery or cardiac transplantation
- ✓ In presence of aneurysm formation, nurse is aware that treatment is same as for patient with thrombus formation

Kawasaki → mucocutaneous lymph node syndrome that affects CV system

- defective immune response to infectious process causes it → leads to vasculitis that causes l ong term CV problems

- NOT congenital or contagious

-can cause aneurysms, myocarditis or rhythm disturbances

S/S: If pt has 4 out of 5 signs the Dx could be made

- skin rash

-cervical lymphadenopathy (unilateral) greater than 1.5 mm

-edema & erythema of hands/feet with eventual peeling of skin

- irritation & inflammation of the mouth with "strawberry tongue", erythema & cracking lips

-Conjuctivitis w/o exudates

Dx: Either 4 out of 5 signs OR a fever with 4 fewer than 4 symptoms in presence of vessel aneurysm

Nursing Care: Administer IVIG and Aspirin; other tx steroids, plasma exchange, cytoxic agents

-if aneurysm formation & clot occurs → tx with thrombolytics or long term Coumadin or Plavix may be used to prevent formation

-curve btwn 10-40 will suggest back brace

-curve greater than 40 will suggest surgery

Nursing Care:

-Bracing & exercise are usual tx for mild cases → brace worn 23 hours/day (remove to shower)

- t-shirt under brace to protect skin

-major problem with brace is body image

-surgery is best when pulmonary function is compromised → anterior approach first & then 1 week later posterior approach → halo traction

-Postop → vitals/neuro check Q1-2 hrs → child may need blood transfusion → PCA pump for pain → monitor O2 sat → NG at low suction & D/C when bowel sounds become present again → may have chest tube → incentive spirometer, CPT, TC & DB, assess s/s infection

- prevent constipation with foods high in fiber, fluids → add foods high in iron, folate, vit C

-activity restrictions 6-9 months postop → no bike riding, roller blading, skiing, mowing lawn, lifting more than 10 lbs

-head should not be lifted more than 30 degress w/o jacket brace