NURS 143
Health Alterations II
Cardiovascular
& Hematological Systems

Objectives

- Use the nursing process to organize the care of children and adults with stable, recuperative or chronic health states.
- Conform to legal and ethical principles in relationships with individuals and families.
- Use therapeutic techniques to facilitate communication with the health-care team, individuals and families.
- Use theory based knowledge to analyze rationales for making clinical judgments.
- Organize care by setting priorities and seeking assistance as needed.
- Select experiences that strengthen clinical performance

Chronic illness defined

- Illness lasting a long time

Identify some chronic issues related to the cardiovascular & hematological system
Chronic Illness

- Requires collaboration
- Care management
  - Patient
  - Family
  - Health Care team
- Healthcare delivery system
  - Patient-centered care individual needs, values, preferences
  - Interdisciplinary teams
  - Self-management

Managing Chronic Illnesses

- Self-regulation/care
- Care giver concern
- Stigma
- Nursing management outside the hospital
- Advocacy role of the nurse
- Ethical-legal issues

Safety: improving medication management for older adults

- BEER (gerontologist) risk-benefit appropriateness of medications
- Institute of Medicine (IOM) deaths from medical errors
- Chronic conditions compared with medications prescribed
- Financial burden & under/over medicated
- Side effects & interactions & adverse drug reactions
  - Renal function: digoxin, aminoglycosides, antibiotics, radiographic contrast media, ACEI, NSAIDS
- Hospital admissions
  - Constipation, falls, depression, immobility, confusion
Safety risk reduction
- Pre-poured pill boxes
- Voice activated instructions
- Medication list
- Once-a-day dosing
- Lab studies
- Monitor side effects
- Lower dosing

Hypertension
- Prevention, early detection
- Management of early disease
- Prevent complications
- Interventions
- Define hypertension

What would happen if a person with hypertension is not diagnosed early?
Which risk factors are modifiable?
Why is hypertension the “silent killer”?

Joint National Committee on Prevention, Detection, Evaluation of HTN

- Normal
  - SBP <120 DBP <80
- Pre-hypertension
  - SBP 120-159
  - DBP 80-89
- Hypertension
  - SBP ≥ 140 DBP ≥ 90
- Stage I
  - 140-159/90-99
- Stages 2 & 3
  - ≥ 160/ ≥ 100
**RAAS**

- Renin-Angiotension-Aldosterone System
- Renin produced → Angiotensin I
- Angiotensin II (vasoconstrictor)
- Aldosterone
- Retain Na+H2O → BP

**Vessel Changes**

- Sclerosed
- Tortuous
- Narrowed
- Decreased elasticity
- Atherosclerosis

**Organ Damage**

- Heart
- Brain
- Eye
- Kidney
Labile hypertension

- BP fluctuates abruptly and repeatedly
  - Emotional stress
  - Headache
  - Tinnitus
    - Relaxation techniques
    - Remove stress trigger
    - Anti-anxiety medications

| BP control | <120/80 |
| Diabetes/CKD < 130/80 |
| Lipid management | LDL < 100 mg/dl optimal |
| Omega-3 fatty acids |
| Niacin, garlic |
| Smoking cessation | 1-800-noBUTTS |
| Weight management | BMI 18.5-24.5 |
| DASH |
| Potassium-rich foods |
| Daily aerobic exercise 30 minutes |
| Weight training |

| Waist circumference | Males < 40 “ |
| Females < 35 “ |
| Diabetes Management | Non-diabetic Fasting blood glucose ≤ 100mg/dl |
| Diabetic Fasting blood glucose ≤ 126mg/dl |
| HgA1c < 7% |
Stepped-care Therapy

- Life Style Modifications
- Pharmacologic Therapy
- Hypertension Guidelines

Pharmacological Goals

- Decrease cardiac workload
- Decrease \( O_2 \) demand
- Decrease preload (volume)
- Decrease afterload (resistance)
- Increase contractility

Pharmacology

- Diuretics
- Angiotensin Converting Enzyme Inhibitors (ACEI)
- Beta blockers
- Calcium Channel blockers
- Angiotensin Receptor blockers
- Alpha-adrenergic blockers
Diuretics

**Thiazides**
- Hydro/chlor/thiazide
  - ↓ fluid volume
  - hypotension
  - Hypokalemia (dry mouth, thirst, weakness, tachycardia, muscle weakness)
  - Hyperuricemia (gout)
  - Hyperglycemia

**Loop**
- Furosemide (lasix)
- Bumetanide (Bumex)
  - ↓ fluid volume rapidly
  - Hypokalemia
  - Renal failure
  - Hearing loss
  - Thrombocytopenia
  - Hyperglycemia
  - Neutropenia
  - anemia

**Potassium sparing**
- Spironolactone (aldactone)
  - ↓ fluid volume sparing potassium
  - Hyperkalemia

**Angiotensin converting Enzyme Inhibitor**
- ACEI
  - Captopril (capoten)
  - Lisinpril (zestril)
  - Benazepril (lotensin)
    - Blocks conversion angiotensin I to angiotensin II (potent vasoconstrictor)
    - Diabetes - decrease nephropathy & neuropathy
    - Non-productive persistent cough
    - Neutropenia
    - Hyperkalemia
    - angioedema

What should the nurse monitor when the client is receiving this medication?

What should the nurse include on the teaching plan when the client is receiving this medication?
Beta blockers

- Propanolol (inderal)
- Atenolol (tenormin)
- Metropolol (lopresor, toprol)
  - Blocks sympathetic nervous system
    - Bradycardia
    - Fatigue
    - Heart failure
    - Mask hypoglycemic symptoms
    - Insomnia
    - Sexual dysfunction

What do these names have in common?

What should the nurse include on the teaching plan when the client is receiving this medication?

Calcium channel blockers

- Verapamil (calan, isoptin)
- Diltiazem (cardizem)
- Nisoldipine (sular)
  - Inhibits calcium ion influx during cardiac depolarization
  - Promotes vasodilation, relaxes coronary smooth muscle
  - ↓ conduction from SA→AV node
    - Headaches
    - Hypotension
    - Tachycardia

We are used when I experience angina pectoris, hypertension, Atrial fibrillation, PVCs.

Angiotensin Receptor blockers

- Valsartan (diovan)
- Losartan (cozaar)
  - Blocks vasoconstrictor & aldosterone producing effect on angiotensin II
    - Cough
    - Hypotension
    - Anorexia
    - Lithium toxicity
    - Hyperkalemia
    - Hepatitis
    - Renal failure
Alpha-adrenergic blockers

- Terazosin (hytrin)
- Doxazosin (cardura)
- Prazosin (minipress)
  - Peripheral vasodilator
  - Orthostatic hypotension
  - Palpitation
  - Fatigue, weakness
  - Diarrhea, emesis
  - Caution in elderly

Measurements

- Systolic/Diastolic
- Pulse Pressure = SBP minus DBP (<40 shock, >40 resistance) change in pressures during contraction
- Mean Arterial Pressure = 1/3 PP plus DBP (77-97) >60mm/Hg to sustain organ/tissue perfusion average pressure inside blood vessels

The Cardiac System

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Blood flow

- Right Atrium
- Tricuspid Valve
- Right Ventricle
- Pulmonic Valve
- Pulmonary Arteries
- Pulmonic Veins
- Left Atrium
- Mitral Valve
- Left Ventricle
- Aortic Valve
- Aorta

Cardiac Conduction System

- SA Node
- AV Node
- Bundle of His
- Left Bundle Branch
- Right Bundle Branch
- Purkinje Fibers

Sinus Node
- Atrium
- Left Bundle Branch
- AV Node
- Bundle of His
- Right Bundle Branch
- Ventricles
Cardiac Conduction & EKG & Heart sounds

Ventricles contract
AV valves close
“lub”

Ventricles relax
P & Aortic valves close
“dub”

Normal Sinus Rhythm

Normal Sinus Rhythm
NSR

- Rhythm - Regular
- Rate - 60-100
- P Wave - Visible before each QRS complex
- Signal originates from the SA node

Normal Sinus Rhythm

Cardiac Output = Stroke Volume x Heart Rate

- Preload
  - Ventricular volume at the end of diastole
  - Dependent on venous blood return to body
  - Position change
- Contractility
  - Ability to contract in absence of changes in preload/afterload
  - SNS influence
- Afterload
  - Resistance to ventricular ejection
  - Dependent on diameter of arterioles (narrow → ↑ afterload)
Cardiac Output

Cardiac Output = Stroke Volume X Heart rate
- 4 – 8 Liters Minute
- **Cardiac Index** = 2.5 – 4.0 L/minute
  - < than 2.5Lmin./mm² = inadequate perfusion of body tissues

Cardiac Functioning in Pediatrics

- Oxygen requirements high for first 8 weeks of life (↑ metabolic rate- growth requirements, heat production, physical activity, ↑ work of breathing)
- Cardiac output depends almost completely on heart rate until the heart muscle is fully developed at age 5
- exercise, fever, anxiety → ↑ metabolic rate → ↑ CO → ↑O₂ → tachycardia
- Most common cause of pediatric bradycardia is Severe hypoxemia

The challenge

<table>
<thead>
<tr>
<th>The nurse takes a BP on a client POD #1. The BP is 160/92. The nurse should</th>
<th>The nurse is preparing to administer lisinopril. The nurse should</th>
</tr>
</thead>
<tbody>
<tr>
<td>The nurse needs to administer lovenox. The recommended dose is 1mg/kg every 24 hours. The client weighs 176.</td>
<td></td>
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</tbody>
</table>
Laboratory & Diagnostic Studies

- CBC
  - WBC
  - Hgb, Hct
  - Sedimentation rate
- Lytes
- BUN & Creatinine
- Cardiac markers
  - CPK-MB
  - HDL/LDL
  - Troponin
- C-reactive protein
- Homocysteine
- Lipid panel - Cholesterol
- EKG
- Chest x-ray
- Echocardiogram
- Stress test
- TEE (transesophageal echocardiogram)
- Monitoring
  - Telemetry
  - Holter monitor
- MRI
- MUGA scan (Multiple Gated Acquisition scan) heart motion isotope study

Diagnostic tests - Managing Care of a client pre, intra, post procedure

- Angiography
- Cardiac catheterization

![Angiography Image]

![Cardiac Catheterization Image]
Diagnostic tests – Invasive

- Angiography
- Cardiac catheterization
- Hemodynamic studies
- Thallium(cardiolyte) imaging – nuclear medicine-isotope study to determine myocardial perfusion

Heart Failure

- Inability of the heart to pump an adequate amount of blood to meet the metabolic demands of the body’s tissues.
- Statistics
  - 50% of deaths from heart disease
  - 5-year mortality rate – 50%
  - Most frequent cause for hospitalization for people > 65.
  - MI Complication
Etiology of HF

- Interference with
  - Preload
  - Afterload
  - Contractility
  - Heart rate
  - Metabolic state

- Pathology
  - Impaired ventricular emptying
  - Impaired ventricular filling

Left Heart Failure
Systolic & diastolic failure

**Adults**
- Cough (blood-tinged, frothy sputum)
- ↓ urinary output
- Orthopnea
- Tachycardia
- Palpitations
- Paroxysmal nocturnal dyspnea
- Weight gain

**Children**
- Poor feeding
- Weight loss
- Failure to thrive
Right Heart Failure

- Dependent edema/ascites
- Jugular vein distention
- Hepatosplenomegaly
- Fatigue

HF in Children

- Congenital heart defects most common cause
- Early S&S
  - Fatigue, irritability, restlessness
  - Toddler assumes squat position
  - venous return = preload
  - SVR = afterload
- Sinus Bradycardia may be sign of Digoxin toxicity sign (< 100 in infant, < 80 older children)

Abnormal heart sounds auscultated in Heart Failure

**S3**
- vibration of the ventricular walls, resulting from the first rapid filling heard after S2
- commonly heard in children and young adults, older adults elderly with heart disease

**S4**
- fourth heart sound when the atriums contract before S1
- vibration of valves, supporting structures, and the ventricular walls
- auscultated in patient with increase resistance to ventricular filling, such as in heart failure
Nursing Management for a Client with Heart failure

- The home health nurse makes a visit to Renee, a client with stage II heart failure, receiving digoxin 0.25 mg daily, lasix 40 mg PO BID, KCL 40 mg Po daily, colace 250 mg PO daily, NTG gr 1/150 PRN chest pain. What should the nurse include in the assessment to measure that the heart failure is maintained for this client?

When does ventricular filling occur?
- When does ventricular emptying occur?
- What role does ejection fraction play in heart failure?
- What significance does a Brain Natriuretic Peptide (BNP) and heart failure?
- Identify the core indicators for a patient with heart failure

Managing the client with Coronary Artery Disease

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<tr>
<th>P</th>
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<td>Q</td>
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Interview questions regarding pain
Interview Questions

- Health management
- Pain History
- Family History
- Activity tolerance
- Shortness of breath

Managing patients with Coronary Artery Disease
CAD Interventions

- PTCA
- Balloon angioplasty
- Artherectomy
- Stents
  - anticoagulation therapy
- CABG
- Medication
- Diet

Angina - Ischemia

- Chest discomfort or pain occurs when myocardial oxygen demands exceed supply
- Types
  - Stable – fixed lesion – pain occurs with exertion
  - Unstable - can occur at rest
  - Variant – due to vasospasm
Pharmacologic Management of Angina

- Vasodilators (NTG)
- Antiplatelet aggregates (ASA, Plavix)
- Beta-blockers
- Calcium Channel Blockers

Myocardial Infarction

- Necrosis

Myocardial infarction

- Necrosis
- Pain characteristics
  - Myocardial Infarction
  - Duration – hours to days
  - Severity 0 – 10
    - 0 = silent M. I.
- Diagnostic
  - Serial CK-MB rises in 3-6 hours, returns to normal in 3-4 days
  - Troponin – remains elevated for 6-7 days (abnormal if > 0.4ng/ml)
  - Serial 12-lead EKG STEMI
Characteristics

Angina          Myocardial infarction

- Squeezing, pressing aching pain radiating to left shoulder, arm, jaw, right shoulder
- Transient, gradual or sudden onset, short duration
- Apprehension
- Relieved with rest/NTG

- Sudden, unbearable heavy, vise-like
- Shoulder & arm radiation
- Not relieved with rest/NTG
- Pain last hours/days
- Diabetics may not have pain- silent MI

Goals of Treatment for M.I.

- Myocardial Salvage
- Prevention of reinfarction
- Prevention of recurrent ischemia

- Coronary Reperfusion Therapy (CRT)
  - Thrombolytic therapy (clot lysis and reperfusion)
  - Plasminogen activator (TPA)
  - Tenecteplase
  - Alteplase
  - Urokinase
  - Reteplase
  - Streptokinase

- Contraindication
  - Bleeding, PUD, pregnancy

What do our names have in common?

Cardiac Cripple

- Denial
- Understanding
- Adjustments
- Living again
Compensatory Mechanisms

- Stress release the fight-or-flight hormones, epinephrine & norepinephrine
- HR, force → CO↑
- MI → Decompensate
- HF → Inability to pump adequately

Positive Outcomes
- Improved comfort
- Absence of complications
- Improved cardiac output
- Improved gas exchange
- Decrease in fear/anxiety
- Increase in activity tolerance
- Adaptation to changes in lifestyle

Nursing interventions
- Decrease workload of the heart
  - Bedrest
  - Pace activities
  - Oxygen administration
- Promote comfort
  - Pain relief
- Relieve anxiety
  - Explain
  - Monitor
Pharmacology

- **Digoxin**
  - HF
  - Improves LV Ejection fraction/contractility
  - IV push, PO
  - Administered with diuretics, ACEI
  - Serum 0.8-2.0 ng/mL
  - Side effect – bradycardia
    - digoxin toxicity (hypokalemia potentiates)
      - anorexia & nausea, visual changes, arrhythmias
    - Digibind – potent antidote binds with digoxin

- Antiarhythmics
- Analgesics
- Anti-anxiety
- Sedatives
- Hypnotics

Managing Care of the Client with Structural Disorders

- **Valvular disorders**
  - Aortic stenosis/insufficiency
  - Mitral stenosis/insufficiency
  - Check for murmurs & opening snaps (A sharp, high-pitched click in early diastole, associated with the opening of the abnormal valve in cases of mitral stenosis.)
  - Replacement – requires anticoagulant therapy

Structural Disorders/ Infections

- **Infectious disorders**
  - Bacterial endocarditis
  - Rheumatic fever Assessments

- Prevention
- Treatment – antibiotics
- Complications
  - Bacterial Endocarditis – emboli
  - Rheumatic Fever – valvular disorders
Alterations in the Hematologic System

Hematological Alterations

- How would you know that a patient has an alteration in the hematological system?
- What puts a patient at risk for a hematological alteration?
- What orders would you anticipate the physician to write?
- What nursing interventions would the nurse include on the nursing care plan?

Anemia

Assessment Findings

- Weakness
- Pale skin
- Tachycardia or irregular heartbeat
- Shortness of breath
- Chest pain
- Dizziness
- Cognitive problems
- Cold or numb extremities
- Headache
Classification of Anemias

- Due to deficiency of factors required for RBC production or RBC destruction
  - **Hemolytic**
    - Trauma/burns
    - Chemical agents
    - Transfusion reaction
    - Systemic diseases
  - **Secondary**
    - Chronic conditions
    - Cancer

Classification of Anemia's

- **Hemorrhagic**
  - Acute
  - Chronic
- **Congenital**
  - Sickle cell
  - Thalassemia

Pathophysiology of anemia

- Blood loss – acute/chronic
- Impaired production
  - Decreased hemoglobin synthesis
  - Defective DNA synthesis
  - Decreased amount of RBC precursors
- Increased destruction/Hemolysis
- Nutritional Deficiencies
- Erythrocytosis
Hematopoiesis - Nutritional Factors

- Vitamin B₁₂ (extrinsic factor)
  - formation of red blood cells and the maintenance of a healthy nervous system.
  - The protein in food binds with Vitamin B₁₂. During digestion hydrochloric acid releases vitamin B₁₂ from proteins in foods which combines with a substance called intrinsic factor (IF), a complex which is absorbed by the gastrointestinal tract.
  - fish, meat, poultry, eggs, milk, and milk products, fortified breakfast cereals

Folic Acid: RBC formation

- leafy green vegetables, fruits, dried beans, peas and nuts. Enriched breads, cereals and other grain products
- Pregnancy-prevent major brain or spine birth defects

Iron: Hemoglobin production

- Heme: red meats, fish, and poultry
- Nonheme: lentils and beans, iron-enriched and iron-fortified foods.
- Fish (cod, sardines, tuna, clams, oysters, shrimp)
- Poultry: Chicken, egg, yolk
- Lean Red Meats: Beef, lamb, veal, pork, liver
- Nuts and Beans Soybeans: dried beans, hazelnuts, almonds, lentils, peanuts
- Vegetables: Broccoli, chard, spinach, greens, asparagus, turnips, parsley, kail, watercress, brussel sprouts
- Beans: Green, lima, peas, chick peas, garbanzo
- Fruits/Sweets: Dates, prunes, figs, apricots, apples, raisins, chocolate, coconut
- Fruits/Vegetables: Citrus fruits, tomatoes, oranges, cabbages, lemons, green peppers, limes, grapefruit, tangerines, cantaloupes, tangelos
- Bread and Cereals: Enriched, fortified and whole grain breads and cereals are often high in iron (check label)
- Grains: Wild rice, corn meal, oats, soybean, wheat, bran, rye, buckwheat, popcorn, barley, wheat germ, millet
- Cereals: Farina, cream of wheat, shredded wheat
### Iron Deficiency

<table>
<thead>
<tr>
<th>Nutritional</th>
<th>Vitamin B&lt;sub&gt;12&lt;/sub&gt;</th>
<th>Folic Acid</th>
<th>Pernicious Anemia</th>
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</thead>
<tbody>
<tr>
<td>Blood loss</td>
<td>Nutritional</td>
<td>Intestinal malabsorption</td>
<td>Failure of absorption of Vit B&lt;sub&gt;12&lt;/sub&gt; due to lack of intrinsic factor* (parietal gastric cell secretion)</td>
</tr>
<tr>
<td>Diet</td>
<td>Diet</td>
<td>Supplements</td>
<td>Treat Cause</td>
</tr>
<tr>
<td>Supplemental iron</td>
<td>Diet</td>
<td>Treat Cause</td>
<td></td>
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B<sub>12</sub> = extrinsic factor  
B<sub>12</sub> (cobalamin) I.M. inj.

### Aplastic Anemia

- Bone marrow failure
  - Etiology
    - Autoimmune (hereditary/congenital)
    - Myelotoxins
    - Pancytopenia
    - RBC’s (anemia)
    - Platelets (Thrombocytopenia)
    - Leukocytes (Neutropenia)
  - Medical management
    - Bone marrow transplant
  - Focus of nursing care plan
    - Infection & bleeding complications

### Sickle Cell Anemia

- Etiology
  - Genetic
  - Ethnicity
- Pathophysiology
  - Normal Hb A replaced with Hb S molecules release O<sub>2</sub> & tend to cluster to form long rod-like structures - stiff & sickle shape
  - Occlusion of microcirculation
  - Hb S lifespan – 10-20 days
Sickle Cell Anemia

- Signs & symptoms
  - Occur at about 6 months of age (Hb F replaced with Hb S)
  - S & S of anemia
  - Crisis related to occlusion of small arteries/tissue necrosis
    - Pain in chest, back, abdomen, bones
    - Renal damage, blindness, strokes
    - Acute chest syndrome – hypoxia respiratory failure
  - Prone to infections, pneumonia

Sickle Cell Anemia

- Diagnostic studies
  - Sickledex - sickle-turbidity test
  - Screening for children > 6 mo.
  - Hemoglobin electrophoresis (measures different types of hemoglobin)

- Continuous treatment
  - Transfusions (strokes → ↑viscosity
  - Aggressive treatment of infections

- Crisis treatment
  - Hydration
  - Oxygen
  - Pain control
  - Bedrest

Sickle Cell Anemia

- Nursing Diagnosis
  - Altered family processes
  - Risk for altered parenting
  - Altered growth and development
  - Impaired physical mobility
  - Alteration in comfort: Pain

- Goals
  - Increase tissue perfusion
  - Promote hydration
  - Control pain
  - Prevent infection
  - Ensure adequate nutrition
  - Prevent complications
  - Provide emotional support
β-Thalassemia

- Inherited disorder of hemoglobin synthesis
- Ethnicity – Mediterranean descent
- Major/minor
  - S&S of infant
    - Failure to thrive
    - Pallor
    - Severe anemia
    - Hepatosplenomegaly
  - Goal supportive – blood transfusions

Polycythemia

- RBC’s & hemoglobin
- Pathophysiology
  - hyperviscosity
  - Hypervolumemia
  - Tissue & organ congestion
- Treatment
  - Phlebotomy
  - Myelosuppressive agents
  - Bone marrow radiation

Immune Thrombocytopenic Purpura

- < 40, women; Children 2-5 years-old
- Platelet deficiency < 100,000/mm³
- Major problem
- Signs
- Treatment
  - Immunosuppressant therapy
  - Platelet transfusions
  - Splenectomy
### Hemophilia - hereditary deficiency in clotting factors

**Males** – affected  
**Females** – carriers

#### Symptoms
- Spontaneous bleeding
- **Knees**, elbows, ankles, wrists, shoulders
- **Arthropathy** - Hemarthrosis - progressive joint damage
- Deep tissue bleeding
- Chronic synovitis, hypertrophy
- Acute joint pain/swelling
- Osteoarthritis/hematoid arthritis

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Details</th>
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<tbody>
<tr>
<td>Pain, swelling</td>
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<tr>
<td>Warmth &amp; tingling</td>
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<tr>
<td>ROM</td>
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<tr>
<td>Acute pain - interferes with normal activities</td>
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<tr>
<td>Limb dysfunction</td>
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<td>Compartment syndrome</td>
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#### Hemophilia

- **Treatment**
  - Clotting factor replacement
    - Hemophilia A VIII
    - Hemophilia B Christmas IX
- **Nursing interventions**
  - Teach
    - Safe environment
  - Close supervision
  - Dental care precautions
  - Referrals
    - Financial assistance
  - Support groups

#### Nursing Diagnosis - Hematological Alterations

- **Activity intolerance**
- **Altered nutrition**
- **Altered tissue perfusion**
- **Risk for injury**
- **Fatigue**
- **Alteration in comfort: Pain**
Bibliography

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- Diet and lifestyle recommendations for hypertension
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- The Role of Prophylaxis in Managing Hemophilia in Adult and Pediatric Populations