Chapter 25 Clients with Cardiovascular Disorders

Structure and Function of the Cardiovascular System
° Two basic functions
  o Oxygenated blood to tissues
  o Waste substances from tissues
° Term: cardiac cycle
° Heart structure
  o Layers: pericardium, myocardium, endocardium [corresponds to Figure 25-1]
  o Fist-sized heart, left of sternum and against diaphragm
  o Pericardial sac surrounds and protects heart
  o Four chambers: upper (atria) and lower (ventricles)
  o Septum (wall) divides left and right sides of heart.
  o Valves are between atria and ventricles prevent backflow
    ① Tricuspid valve on the right
    ② Bicuspid valve on the left
  o Ventricles connect to major blood vessels, valves separating vessel and ventricle called semilunar valves.

Movement of blood through heart and lungs:
° Deoxygenated blood from body through heart (vena cava to right atrium, tricuspid valve, right ventricle)
  o Right ventricle contracts, blood through pulmonary valve, pulmonary artery, which divides taking blood to both lungs for oxygenation
  o Oxygenated blood from lungs through left and right pulmonary veins to heart (left atrium, bicuspid or mitral valve to left ventricle)
  o Left ventricle contracts, blood through aortic valve, aorta, to systemic circulation.
  o Left and right coronary arteries originating from aorta bring oxygen to the heart muscle

Conduction System of Heart
° Cardiac cycle (contract, relax, rest)
  β Initial electrical stimulation in sinoatrial (SA) node (pacemaker of heart) in right atrium
  β Electrical impulse (action potential) causes heart to contract
  β Repolarizes -- goes back to resting state
° Heart has "all or nothing" response, i.e. always contracts as much as it can.
° Terms: pacemaker, bundle of His, refractory, tetany, diastole, ventricular systole, stroke volume, cardiac output, ejection fraction
° Factors determining cardiac output:
  o Heart rate
  o Preload (blood in ventricles before contraction)
  o Afterload (force needed to eject blood)
  o Contractility (ability of heart muscle fibers to shorten)
  o ECG or EKG shows the movement of electricity through heart as waveforms. [corresponds to Box 25-1]
Peripheral Vascular System [corresponds to Figure 25-7]
° Blood vessels (aorta, arteries, arterioles, capillaries, and veins)
° Capillaries exchange oxygen and nutrients for metabolic waste.
° Larger vessels have 3 layers
° Waste and deoxygenated blood from capillary through venules to veins to inferior and superior vena cavae to right atrium of heart.
° Expanding (dilation) and contracting (constriction) of the arterioles maintains blood flow to the capillaries, major factor in blood pressure control.
° Veins have lower pressure than arteries and valves that help move blood back to the heart against gravity.

Factors reducing amount of oxygen entering the blood stream
° Anemia, medications, stress, anger, gender
° Terms: tachycardia, bradycardia

Factors associated with heart attacks and strokes (many preventable)
° Smoking, physical inactivity, hyperlipidemia, hypertension, diabetes mellitus, stress, oral contraceptive use, heredity, obesity, family history, age, gender, race

Most Common Cardiovascular Diseases:
° Angina pectoris
° Myocardial infarction
° CHF
° Cardiac arrest
° Hypertension
° Peripheral vascular disease

Manifestations of MI [corresponds to Box 25-2]
Tests: cardiac catheterization, angiography, electrocardiogram, Holter monitor, treadmill or stress test, lab tests [corresponds to Table 25-1]

Heart Disorders
Coronary Heart Disease (coronary artery disease, CAD)
° Terms: plaque, atherosclerosis
  ° Plaque narrows artery opening, reduces blood flow, less oxygen to the heart muscle.
  ° CAD can lead to thrombus (blood clot) angina pectoris, or myocardial infarction.

Coronary Artery Disease (CAD): Treatments and techniques for treatment of obstructed arteries:
° Percutaneous transluminal coronary angioplasty (PCTA
° Stent placement
° Intracoronary streptokinase therapy (thrombolytic therapy)

Angina Pectoris – results directly from inadequate oxygen to myocardium
° Manifestations: pain squeezing, burning, crushing [corresponds to Box 25-3]
  ° Radiating to left arm, neck, jaw, or shoulder blades or
  ° Starting in the epigastric area and radiating to back between the shoulder blades.
Precursors physical exertion, emotional excitement, cold exposure, heavy meal.

- Stable, pain predictable, relieved by nitrates and rest
- Unstable, pain increasing in duration and frequency, easily induced, occurs at rest, episodes worsen
- Prolonged angina suggests MI, potential for fatal dysrhythmias and mechanical failure

Treatment for angina pectoris or MI:
- Nitrates, beta-adrenergic blockers or calcium channel blockers
- Coronary artery bypass graft (CABG), angioplasty
  - Angina pain: can quickly lead to an MI; NEVER disregard complaint of chest pain
  - Chest pain not relieved by nitroglycerin given three times at 5-minute intervals is considered impending MI. Notify physician immediately.

Nursing care:
- Assess and record location, duration, intensity, frequency and characteristics of pain, factors that initiate or relieve pain.
- Primary focus is client education regarding causes of angina, options for management, pain control.
- During attack, monitor blood pressure and heart rate, record duration of pain and amount of medication to relieve it.
  - Keep nitroglycerin at bedside.
  - Instruct client to report pain.
  - Position client in semi or high Fowler's.
  - Make sure client gets answers about procedures to reduce anxiety.
  - Provide written instructions.
  - Teach client to reduce activities that initiate angina attack and to have regular exercise program.

Myocardial Infarction (Heart Attack)
- Blood flow through coronary artery completely blocked, causes ischemia, necrosis
- Term: collateral circulation
- Classified by area of damage
- Risk factors [corresponds to Box 25-4]
- Most deaths within first hour after onset of symptoms.
- Manifestations: persistent chest pain, crushing, severe, may radiate to arm, neck, jaw, teeth; weakness, nausea, vomiting, SOB, anxiety, pallor, hypotension, signs of shock, irregular heart rate, fever diaphoresis, erratic behavior
- Treatment:
  - Relieve chest pain, relieve hypoxia with oxygen.
  - Stabilize heart rhythm with antiarhythmics, pacemaker.
  - Reduce cardiac workload.
  - Open up (revascularize) blocked artery in order to:
    - Reduce loss of functional muscle
• Increase ability of heart to maintain effective cardiac output
• Decrease threat of cardiogenic shock and death.
  o Terms: thrombolytics, percutaneous transluminal coronary angioplasty (PCTA).
  o Complications of MI [corresponds to Box 25-5]

Nursing care for clients with angina or MI
  o Take vital signs often. [corresponds to Table 25-2]
  o Administer analgesics, vasodilators, antianxiety agents, sedatives.
  o Provide calm, quiet environment.
  o Position for comfort (like semi-Fowler's).
  o Provide discharge teaching.
    • Importance of maintaining and complying with the medication regimen
    • Side effects or signs of toxicity
    • Dietary restrictions if any
    • Importance of smoking cessation
    • Sexual activity restrictions and suggestions for compliance
    • Need to respond immediately to symptoms of angina
    • Reporting new or recurrent symptoms.

Nursing Process Care Plan: Caring for a Client with Angina

Disorders Affecting the Heart and Lungs

Congestive heart failure (CHF)
  o Left-sided heart failure: heart cannot pump enough blood; blood back up into lungs, fluid leaks into air spaces of lungs, hallmark symptom SOB, dyspnea; also pulmonary crackles, orthopnea, hemoptyis, cough
  o Right-sided heart failure: right ventricle can’t pump effectively to lungs because of backup from left-sided failure or lung disease
  o Hallmark symptom peripheral edema; also jugular vein distention, abdominal distention, liver enlargement, ascites
  o CHF may be:
    • Acute, direct result of MI
    • Chronic, related to salt and water retention by kidneys.
    • Reduced cardiac output triggers ventricular dilatation, hypertrophy, increased sympathetic activity that may restrict blood to kidneys
    • Manifestations [corresponds to Box 25-6]
  o Treatment for CHF – reduce workload & increase efficiency
    • Digitalis, beta blockers, ACE inhibitors, vasodilators, diuretics (e.g. Lasix), medication to strengthen heart
    • Bed rest, antiembolism stockings
  o Pulmonary edema life-threatening complication of CHF – fluid & blood in lungs, alveoli fill
    • Hallmark sign pink, frothy sputum; crackles, wheezes, cyanosis
    • High Fowler’s, diuretics, vasodilators, ionotropics, nitroglycerin, morphine sulfate or other analgesics
    • Risk factors [corresponds to Box 25-7]
  o Cor pulmonale or pulmonary hypertension
Usual causes right-sided congestive heart failure and COPD.

Nursing care:
- Place client in high Fowler's or orthopneic position.
- Keep oxygen at ordered rate and mask on client.
- Elevate client's feet when sitting.
- Follow ordered amount of fluid for shift, provide frequent oral care.
- Use calm reassuring approach.

Valvular Disease
- Insufficiency- valves don’t close completely
  - Manifestations: dyspnea, fatigue, murmur
  - Treatment: bed rest, oxygen, antibiotics if infection, fluid restrictions, diuretics
- Stenosis – hardening of cusps of valves (usually mitral valve)
  - Manifestations: dyspnea on exertion, fatigue, cough, palpitations, cyanosis
  - Treatment: limit salt, give diuretics, anticoagulants, possible surgery

Rheumatic fever
- Follows untreated strep throat and URIs
- Aschoff’s nodules – rheumatic heart disease
  - Manifestations: fatigue or weakness, chest pain with exertion, dizziness, fainting; heart murmur and wheezes or crackles, edema
  - Treatment: antibiotics to eliminate streptococcal infection; prophylactic antibiotic therapy for 5–10 years to prevent recurrences; aspirin or NSAIDs for joint pain and fever; possible corticosteroids

Inflammatory Heart Disorders:
- Pericarditis
  - Risk for cardiac tamponade (fluid accumulation in paracardial sac) can be fatal
  - Manifestations: neck vein distention, reduced arterial blood pressure, muffled heart sounds, abnormal drop in systemic blood pressure > 15 mm Hg
  - Fever, chest pain, “pounding” heart, dyspnea, chills, malaise, tachycardia, friction rub
  - Treatment: antibiotics, pericardiocentesis (to drain fluid from pericardial sac), bed rest, analgesics, antipyretics, NSAIDs
- Myocarditis – walls of heart inflamed
  - Treatment: rest, quinidine, procainamide, analgesics, oxygen, anti-inflammatories
- Endocarditis – inflamed valves and lining
- Term: cardiomyopathy
- Nursing care for clients with inflammatory heart disorders
  - Manage discomfort and help to increase heart & lung function.
  - Encourage compliance with rest and medications.
  - Be vigilant for signs of emboli.

Conduction Disorders
- Terms: dysrhythmias, telemetry, sinus rhythm
Selected cardiac rhythms [corresponds to Table 25-3]

Major dysrhythmias
  o Sinus rhythm - sinus tachycardia = regular heartbeat > 100 bpm
    • Atrial fibrillation
    • Ventricular fibrillation
    • Ventricular tachycardia
    • Atrioventricular block.

Treatment:
  o Artificial pacemakers – invasive; temporary or permanent
    • Candidates for permanent pacemakers include: some heart attack victims, clients with complete heart block, or with slow ventricular rates from congenital or degenerative heart disease.
  o Cardioversion: noninvasive; anterior/posterior paddle electrodes; announcement of "ready stand back"

Nursing care for clients with cardiac dysrhythmias:
  o Maintain telemetry unit and client's response to exertion or potential for seizures.

Congenital Heart Defects
  o Associated with prenatal exposure to rubella, alcohol, or drugs; also other congenital or genetic defects, advanced maternal age, maternal lupus or diabetes, and familial congenital defects
  o Most require surgical correction, some may resolve
  o (See discussion in Chapter 43 Care of Neonate)

Central Circulatory Disorders
  o Hypertension
    • Primary (essential hypertension) > 140/90
      • Manifestations: few signs or symptoms following insidious onset until damage has occurred
      • Race as factor in cardiovascular disorders [corresponds to Box 25-8]
      • Risk factors [corresponds to Box 25-9]
    • Secondary hypertension – elevated BP due to other medical diagnosis (atherosclerosis, arteriosclerosis, pregnancy, and renal disease)
    • Malignant hypertension – medical emergency - rapid increase in BP; diastolic pressure > 120 mm Hg, can cause irreversible damage to arterioles of organs (heart, kidney); "silent killer"
      • Possible manifestations: headaches, blurred vision, epistaxis, lightheadedness or fainting; may not have noticeable symptoms
      • Treatment: diuretics, vasodilators, beta-adrenergic blockers, ACE inhibitors of hypertension; limit sodium intake; lose weight if overweight; stop smoking, exercise regularly, and manage stress.

Nursing care:
  o Know client's antihypertensive medication.
  o Take BP in both arms in lying, sitting, and standing to establish baseline.
  o Auscultate heart sounds for murmurs or extra sounds.
  o Check vital signs.
Check peripheral pulses carefully.
Assess for complaints of headache, blurred vision, dizziness, and fatigue, and knowledge of disease.

Aneurysms
- Weakening and dilation in the wall of a blood vessel
- Most in aorta and arteries, caused by atherosclerosis, arteriosclerosis, trauma, or congenital weakness.
- Classified by location (thoracic or abdominal) and shape:
  - Fusiform: walls of artery dilate equally causing tubular pouching
  - Saccular: one side pouches out
  - Dissecting: lining of artery pulls away from pouch allowing blood to flow between the artery layers.
    - If not treated immediately, tearing continues until client goes into shock from blood loss, often results in death
- Manifestations of aneurysms:
  - Fusiform or saccular aneurysms - often asymptomatic, found on CAT scan, x-ray, ultrasound or MRI.
  - Abdominal aneurysms - may have pulsing that matches heart rate, causes abdominal or lower back pain and coolness or cyanosis or pale extremities
  - Thoracic aneurysms may cause chest, back, or neck pain, edema of face and neck, distended neck veins, dyspnea, cough and hoarseness.
  - Dissecting aneurysm may cause sudden chest, back or abdominal pain, BP in upper extremities will fall, and radial pulses may be absent
- Treatment:
  - Prompt surgical intervention to prevent death in advanced aneurysms; early stage aneurysms may be monitored for change
- Nursing interventions for clients with aneurysms:
  - Manage anxiety.
  - Teach client medications can control though not cure hypertension.

Emboli
- Clots (blood, fat globules, bacterial clumps, or tissue that travels through vessel, lodges in blood vessel, and blocks blood flow)
- Most commonly venous thrombosis in leg, often lodges in lung
- Clots from heart can travel to the carotid and cerebral arteries resulting in CVA.
- Manifestations:
  - Sudden or insidious pain in an affected area
  - Numbness or tingling of an extremity
  - Affected area cold to the touch
  - Pulses distal to the arterial blockage being absent
  - Possible nausea and vomiting, fainting, shock.
- Diagnosed by Doppler ultrasound, venogram
- Treatment depends on area of involvement
  - Pulmonary embolism and arterial embolism require immediate treatment.
• Heparin or enoxaparin (lovenox) and Urokinase, a thrombolytic
  • Embolectomy.
  • In extremity, restore blood flow by lowering limb, maintaining warmth, treating constriction.
  o Nursing care: maintain effective circulation, prevent complications, be alert for signs of embolus, watch for changes in mental alertness, chest pain.
  o Teach clients about controlling BP. [corresponds to Box 25-10]

Peripheral Vascular Disorders
Disorders of the Arteries
  ° Term: intermittent claudication
  ° Arteriosclerosis obliterans - atherosclerosis of peripheral arteries
    o Manifestations: five Ps: pain, pallor, pulselessness, paresthesia, paralysis
    o Treatment:
      • Fibrolytics
      • Surgical intervention such as embolectomy
      • Endarterectomy (removal of the lining of the artery)
      • Angioplasty and bypass of occluded artery
      • Amputation of the extremity.
  ° Buerger's disease - inflamed peripheral arteries and veins with clot formation, caused by long-term tobacco smoking
    o Manifestations: intense pain in the affected area relieved by rest.
    o Treatment: complete cessation of smoking and exercises to improve circulation rest, surgical intervention, or amputation if limb is gangrenous.
    o Raynaud's disease, arterial spasm of the fingers, hands or feet
    o Manifestations: pain, numbness, and discoloration precipitated by cold; whiteness or blanching followed by blue due to venous flow remaining, then red/purple when circulation is restored.
    o Treatment: slowly warming area, avoidance of cold, cessation of smoking, reduction of stress.

Disorders of veins
  ° Thrombophlebitis – inflamed vein with thrombus on vessel wall
    o Terms: coagulability, stasis
    o Manifestations: pain, swelling, heaviness, and warmth in area
    o Treatment: treat superficial clots with rest, leg elevation, moist heat, NSAIDs
    o Deep vein clot requires hospitalization, immobilization, anticoagulants, warm, moist compresses
    o Prevention:
      • Avoid crossing the legs, prolonged sitting, tight stockings, or massaging clot; teach client to elevate feet
      • Teach clients to report any symptoms of thrombus or embolus.
  ° Varicose veins
    o Term: incompetence
- Manifestations: twisted, swollen, knotted veins, fatigue in legs, aching, leg cramps; veins hard when palpated
- Treatment: antiembolism stockings, walking, elevating legs, avoiding prolonged standing or sitting; surgeries: compression sclerotherapy, vein stripping
- Apply sequential compression device [corresponds to Procedure 25-1]

° Venous stasis ulcers –open sores on lower legs from poor circulation
- Assessment of peripheral vascular function – abnormal findings [corresponds to Box 25-12]
- Pain and burning in area
- Diet (vitamins A and C and zinc help healing; need protein to replace tissue replacement)
- Debride tissue
- Nursing care: maintain circulation, assess pedal pulses each shift (mark assessment spot with X for continuity), manage pain, elevate legs change client position frequently, to decrease edema, frequent wet to dry dressing changes, capillary refill in toes, watch for: infection, cyanosis, paleness, coolness,
- Teach about foot and ankle care [corresponds to Box 25-11]

° Nursing care of all clients with peripheral vascular disorders:
  - Maintain circulation to area, decrease edema, and manage pain.
  - Use over-bed cradles to keep sheets off tender extremities.
  - Assess pedal pulses and post tibial pulses every shift.
  - Compare left and right pulses for strength.
  - Check lower extremities for evidence of impaired circulation (paleness, cyanosis).
  - Compare capillary refill in toes right and left feet.
  - Elevate client's legs when sitting.

Critical Thinking Care Map: Caring for a Client After a Heart Attack