

Lincoln Memorial University
Caylor School of Nursing
NURS 241
Spring 2010

TITLE: Nursing Strategies: Alterations in Cardiac Function

DATES: See syllabus

TIMES: See syllabus

OBJECTIVES: Upon completion of this unit the student will be able to demonstrate in the clinical/campus laboratory setting, in individual and group conferences, and on written material, the ability to:

1. Define and use the glossary terms as listed in the assigned readings.
2. Using the four adaptive modes of Roy's Adaptation Model (RAM), recognize human adaptive responses to behavior or stimuli that affect cardiovascular function.
3. Describe the patho, clinical manifestations, management and associated use of the RAM nursing process to provide care for adults with alterations of the cardiovascular and peripheral vascular system.
4. Describe cardiac anatomy and physiology of the circulatory system and conduction system of the heart in relationship to cardiovascular disorders.
5. Incorporate assessment of cardiac risk factors into the nursing history and physical assessment of the cardiac patients.
6. Identify the clinical significance and related nursing implications of laboratory and diagnostic tests and procedures used for assessment and evaluation of cardiovascular function.
7. Describe nursing measures associated with hemodynamic monitoring and state clinical significance and nursing responsibilities.
8. Incorporate assessment of cardiac and peripheral vascular risk factors into the nursing history and physical assessment of the cardiac patients.
9. Describe the different treatments, non-surgical and surgical, procedures commonly use for treatment of cardiac problems.
10. Discuss the preoperative and postoperative goals and nursing care for adults undergoing surgery for related peripheral vascular disorders.
11. Identify possible complications following vascular surgery, measures to prevent these complications and assessment parameters appropriate for their identification.
12. Utilize the RAM nursing process to provide care for the adult who is experiencing any of the following common disorders of the cardiovascular system:
 - a. Hypertension
 - b. Heart Failure
 - c. Pulmonary Edema
 - d. Pericarditis
 - e. Rheumatic Endocarditis
 - f. Myocarditis
 - g. Infective Endocarditis
 - h. Mitral Valve Prolapase
 - i. Mitral Stenosis
 - j. Mitral Insufficiency
 - k. Aortic Valve Stenosis
 - l. Aortic Insufficiency
 - m. Atherosclerosis

- n. Burger's Disease
 - o. Raynaud's Disease
 - p. Aneurysm
 - q. Thrombophlebitis
 - r. Varicose Veins
 - s. Coronary artery disease
 - t. Angina pectoris
 - u. Myocardial infarction
 - v. Arrhythmia
 - w. Cardiogenic Shock
13. Specify anatomic and physiologic factors that affect peripheral blood flow and tissue oxygenation such as positioning and stress.
 14. Define appropriate parameters for assessment of peripheral circulation including skin temperature, turgor, and capillary refill.
 15. Describe appropriate nursing measures in evaluation of laboratory and diagnostic tests associated with peripheral vascular disorders.
 16. Describe the "stepped care approach" to drug therapy for hypertension and the goals of health teaching for patients of all ages with hypertension.
 17. Compare and contrast nursing assessment, care and evaluation of patients with coronary atherosclerosis, angina pectoris and myocardial infarction.
 18. Differentiate adult symptoms of angina pectoris and myocardial infarction from those symptoms experienced by geriatric clients.
 19. Identify the important steps of patient teaching and cardiac rehabilitation associated with cardiovascular disorders.
 20. Discuss the preoperative and postoperative goals and nursing care for adults undergoing cardiac surgery.
 21. Identify possible complications following cardiovascular surgery, measures to prevent these complications and assessment parameters appropriate for their identification.
 22. Correlate the components of the ECG with physiologic events of the heart such as depolarization and repolarization.
 23. Specify the clinical usefulness of ECG for patients with cardiovascular disorders, electrolyte imbalance and drug toxicity.
 24. Identify important factors associated with identification, management and evaluation of commonly occurring cardiac dysrhythmias.
 25. State the use of pacemakers, nursing implications and possible complications.
 26. Discuss the appropriate techniques and pharmacologic management of cardiac arrest.
 27. Identify the psychological problems characteristic of patients admitted or transferred to an intensive care setting.
 28. Identify the medications on the drug list by generic name, classification, mechanism of action, clinically significant side effects, normal dosage and nursing implications and be able to correctly calculate IV, IM, and po dosages.
 29. Correctly calculate and regulate IV flow rate for critical care medications such as dopamine, dobutamine or nitroglycerine.

TOPICAL OUTLINE:

- I. Assessment of the Cardiovascular System Function
 - A. Overview of Cardiac Structure and Function
 - 1. Cardiac Anatomy and Physiology
 - 2. Conduction System of Heart
 - B. Health History
 - C. Physical Assessment
 - D. Diagnostic Tests and Procedures
 - 1. Laboratory Tests
 - a. CK, CK-MB, Troponin T or I, & Myoglobin
 - b. Lipid Profile
 - c. B-Type Natriuretic Peptide (BNP)
 - d. C-Reactive Protein
 - e. Homocysteine
 - 2. ECG
 - 3. Echocardiogram
 - 4. Exercise Stress Test
 - 5. Pharmacologic Stress Test
 - 6. Cardiac Catheterization
 - 7. Radionuclide Imaging
 - 8. Hemodynamic Monitoring
- II. Assessment and Management of Patients with Cardiac Disorders
 - A. Hypertension
 - 1. Primary
 - 2. Secondary
 - B. Hypertensive Crisis
- III. Assessment and Management of Patients with Heart Failure
 - A. Heart Failure
 - 1. Left-sided failure
 - 2. Right-sided failure
 - B. Acute Pulmonary Edema
 - C. Cardiomyopathy
- IV. Assessment and Management of Patients with Structural Infectious and Inflammatory cardiac disease.
 - A. Acquired Valvular Diseases of the Heart
 - 1. Mitral Valve Prolapse
 - 2. Mitral Stenosis
 - 3. Mitral Regurgitation
 - 4. Aortic Stenosis
 - 5. Aortic Regurgitation
 - B. Infectious Diseases of the Heart
 - 1. Rheumatic Endocarditis
 - 2. Infective Endocarditis
 - 3. Myocarditis
 - 4. Pericarditis

- V. Assessment and Management of Patients with Cardiac Disease
 - A. Coronary Artery Disease
 - 1. Coronary Atherosclerosis
 - 2. Angina Pectoris
 - 3. Myocardial Infarction
 - B. Management of cardiac surgery
 - 1. PTCA
 - 2. Stent
 - 3. Laser
 - 4. CABG

- VI. Assessment and Management of Patients with Complications of Cardiac Disease
 - A. Cardiogenic Shock
 - B. Cardiac Arrest
 - C. Dysrhythmias
 - 1. Sinus Bradycardia
 - 2. Sinus Tachycardia
 - 3. Premature Atrial Contraction
 - 4. Atrial Flutter
 - 5. Atrial Fibrillation
 - 6. Premature Ventricular Contraction
 - 7. Ventricular Tachycardia
 - 8. Ventricular Fibrillation
 - 9. Asystole
 - 10. First, Second, Third Degree Heart Block
 - a. Pacemaker Therapy
 - b. Nursing care r/t pacemakers

- VII. Assessment and Management of Patients with Vascular Disorders and Problems with Peripheral Circulation.
 - A. Review of Circulatory Physiology
 - B. Assessment of Circulatory Insufficiency of the Extremities
 - C. Diagnostic Tests and Procedures
 - 1. Laboratory Tests
 - 2. Diagnostic Tests
 - a. Arteriogram
 - b. Venogram
 - c. Doppler Ultrasound Flow Studies
 - D. Diseases of Arteries
 - 1. Atherosclerosis
 - 2. Arterial Insufficiency
 - 3. Buerger's Disease
 - 4. Raynaud's Disease
 - 5. Aneurysm
 - a. Thoracic
 - b. Abdominal Aortic
 - c. Dissecting

- E. Diseases of Veins
 - 1. Thrombophlebitis
 - 2. Varicose Veins
 - 4. Chronic Venous Insufficiency
 - 5. Leg Ulcers
 - 6. Varicose Veins

REQUIRED READINGS:

Kee, J. L., Hayes, E.R., & McCuiston, L.E. (2009). *Pharmacology: A nursing process approach (Ed 6)*. St. Louis: Mosby. Ch 41-45; 58.

Smeltzer, S. G., & Bare, B. G. (2008). *Brunner and Suddarth's textbook of medical – surgical nursing. (Ed 11)*. Philadelphia: Lippincott, Williams & Wilkins. Ch 26-32.

Smeltzer, S. G. & Bare, B. G. (2008). *Handbook for Brunner & Suddarth's textbook of medical-surgical nursing. (Ed 11)*. Philadelphia: Lippincott, Williams & Wilkins.

Wissmann, J. (Ed.). *Adult Medical –Surgical Nursing: Content mastery series review module (Ed 7.1)*. Kansas City, MO: Assessment Technologies Institute, LLC. Ch 20-24; 28-39.

CLINICAL SKILLS:

- 1. Monitor central venous and Swan Ganz lines.
- 2. Perform CPR.
- 3. Administer medications.
- 4. Read and interpret EKG.
- 5. Administer Blood products.
- 6. Application of telemetry monitoring.

CLINICAL OBJECTIVES:

- 1. Assess cardiovascular status of selected clients of all ages.
- 2. Provide teaching in the area of prevention of CV disease.
- 3. Assess for risk factors associated with cardiovascular disease.
- 4. Utilize the nursing process to provide care for the patient of all age groups undergoing medical treatment for cardiovascular and peripheral vascular disorders.
- 5. Conduct discharge planning and teaching for patients undergoing medical treatment for cardiovascular and peripheral vascular disorders.

CARDIAC STUDY GUIDE

Drug Classification with examples		
Cardiac Glycoside	Indications	Herbral Alert
Digoxin (Lanoxin)		Ginseng may falsely elevate digoxin levels
Digitoxin (Crystodigin)		St. John's wort decreases absorption of dig.
Amrinone (Inocor)		Metamucil may decrease absorption of dig.
Milrinone lactate (Primacor)		Hawthorn may increase the effects of dig.
		Goldenseal may decrease the effects of dig.
Antianginals Nitrates	Indications	Nursing Precautions
Nitrates		
Nitroglycerin (Nitrostat, Nitro-bid)		
Isosorbide dinitrate (Isordil Sorbitrate)		
Beta Blockers		
Calcium Channel Blockers		
Antidysrhythmic Drugs	Indications	Nursing Precautions or Interventions
Disopyramide phosphate (Norpace)	PVC's & Vent.	
Procainamide HCl (Pronestyl)	PVC's & Vent	
Quinidine sulfate (Quinidex)	Atrial	
Lidocaine (Xylocaine)	Acute Ventricular.	
Mexiletine HCl (Mexitil)	Ventricular	
Tocainide HCl (Tonocard)	Ventricular	
Flecainide (Tambocor)	Vent. PSVT, PAF	
Propafenone HCl (Rythmol)	Ventricular	
Adenosine (Adenocard)	PSVT	
Amiodarone HCl (Cordarone)	Atrial & Vent.	
Beta Blockers		
Calcium Channel Blockers		
Digoxin (Lanoxin)	A-fib and flutter	
Phenytoin (Dilantin)	Dig. Induced dysrhythmias	
Emergency Drugs	Indications	Nursing Precautions or Interventions
Dopamine		
Dobutamine		
Norepinephrine		
Amiodorone		
Atropine		
Bretyllium		
Calcium Chloride		
Isuprel		
Lidocaine		
Sodium Bicarbonate		

Emergency Drugs for HTN Crises and Acute Pulmonary Edema	Indications	Nursing Precautions or Interventions
Nitroprusside sodium (Nipride)		
Labetalol hydrochloride		
Morphine		
Labetalol hydrochloride		
Diazoxide (Hyperstat)		
Diuretics	Indications	Nursing Precautions or Interventions
Loop Diuretics		
Bumetanide (Bumex)		
Ethacrynic acid (Edecrin)		
Furosemide (Lasix)		
Potassium-Sparing		
Amiloride HCl (Midamor)		
Spironolactone (Aldactone)		
Spironolactone and hydrochlorothiazide (Dyazide, Maxzide)		
Thiazide Diuretics		
Chlorothiazide (Diuril)		
Hydrochlorothiazide (Hydro Diuril)		
Herbal Alert		
Aloe can decrease the serum K		
Uva ursi may increase the effects		
Ginkgo may increase B/P when taken with thiazide diuretics		
Licorice can decrease serum K		
Antihypertensives	Indications	Nursing Precautions or Interventions
Beta-adrenergic Blockers		
Atenolol (Tenormin)		
Bisoprolol Fumarate (Zebeta)		
Carteolol HCl (Cartrol)		
Carvedilol (Coreg)		
Esmolol (Brevibloc)		
Pindolol (Visken)		
Propranolol (Inderal)		
Central Alpha Agonists		
Clonidine HCl (Catapres)		
Methyldopa (Aldomet)		
Selective Alpha-Adrenergic Blockers		
Doxazosin mesylate (Cardura)		

Prazosin HCl (Minipress)		
Terazosin HCl (Hytrin)		
Antihypertensives	Indications	Nursing Precautions or Interventions
Direct- Acting Vasodilators		
Diazoxide (Hyperstat)		
Hydralazine HCl (Apresoline)		
Sodium Nitroprusside (Nipride)		
ACE Inhibitors		
Benazepril (Lotension)		
Captopril (Capoten)		
Enalapril maleate (Vasotec)		
Fosinopril (Monopril)		
Lisinopril (Prinivil, Zestril)		
Quinapril (Accupril)		
Ramipril (Altace)		
Angiotension II Receptor Blockers (ARB's)		
Eprosartan (Teveten)		
Losartan Potassium (Cazaar)		
Olmesartan medoxomil (Benicar)		
Calcium Channel Blockers		
Verapamil (Calan)		
Diltiazem HCl (Cardizem)		
Amlodipine (Norvasc)		
Felodipine (Plendil)		
Nifedipine (Procardia)		
Antilipemic Drugs	Indications	Nursing Precautions or Interventions
Cholestyramine resin (Questran)		
Fenofibrate (Tricor)		
Gemfibrozil (Lopid)		
Nicotinic acid (Niacin)		
Ezetimibe (Zetia)		
Atorvastatin calcium (Lipitor)		
Lovastatin (Mevacor)		
Simvastatin (Zocor)		
Peripheral Vasodilators	Indications	Nursing Precautions or Interventions
Cilostazol (Pletal)		
Pentoxifylline (Trental)		
Anticoagulants	Indications	Nursing Precautions or Interventions
Heparin sodium IV, SQ		
Dalteparin sodium (Fragmin) SQ		

Enoxaparin sodium (Lovenox) SQ		
Warfarin (Coumadin) PO		
Anticoagulant Antagonists		
Protamine sulfate (antidote for heparin)		
Vitamin K (AquaMephyton) (antidote for warfarin)		
Herbal Alert		
Garlic, ginger, ginkgo may increase bleeding when taken with warfarin		
Ginseng may decrease the effects of warfarin		
Alfalfa may decrease activity of warfarin		
Goldenseal may decrease the effect of heparin and warfarin		
Chamomile may interfere with actions of anticoagulatants		
Antiplatelets	Indications	Nursing Precautions or Interventions
Aspirin		
Cilostazol (Pletal)		
Dipyridamole (Persantine)		
Ticlopidine (Ticlid)		
Antiplatelets: Glycoprotein IIb/IIIa Receptor Antagonists		
Abciximab (ReoPro)		
Eptifbatide (Integrilin)		
Tirofiban (Aggrastat)		
Thrombolytics	Indications	Nursing Precautions or Interventions
Streptokinase (Streptase)		
Alteplase (tissue-type plasminogen activator (tPA))		
Human B-type Natriuretic Peptide	Indications	Nursing Precautions or Interventions
Nesititide (Natrecor)		

Kee, J. L., Hayes, E.R., & McCuiston, L.E. (2009). *Pharmacology: A nursing process approach* (6th ed.). St. Louis: Mosby.

CARDIOVASCULAR DRUG STUDY GUIDE
NURS 241

I. Cardiac Glycosides
digoxin (Lanoxin)

1. Explain why digoxin is the major therapeutic treatment of CHF.
2. What is the loading or digitalizing dose of digoxin? Include the range.
3. What factors predispose a patient to digoxin toxicity?
4. List signs and symptoms of digoxin toxicity:

 Cardiovascular –

 GI -

 CNS –

 Visual –
5. What nursing precautions should be used when administering digoxin?
6. Your patient has a heart rate of 58 and it is time to administer the 2:00 pm dose of Lanoxin. What intervention should the nurse take?
7. Atrial fibrillation develops in your patient. The patient is not on any agent to treat this and is becoming symptomatic. The physician orders digoxin 0.5 mg IV stat, followed by 0.25 mg q 6 hrs for two doses. The vial on hand is labeled 0.5 mg/2cc. How many mL will you administer for the above doses?
8. Your pt, a 78-year-old man, has a K level of 3.0 mEq/L. He states that he has been nauseous and without an appetite and has experienced some diarrhea. He has been taking digoxin for the past few weeks for the treatment of heart failure. Discuss the implication of hypokalemia in a patient who is on digoxin.
9. The lab called with a digoxin level of 3Ng/ml. It is 10:00 am and time for the daily dose of digoxin. What should the nurse do? Explain your answer.
10. Compile a list of discharge instructions adults who are taking digoxin.

II. Nitrates

**nitroglycerin (Nitrostat), (Nitrobid IV), (Nitrol), (Nitro-Dur), (Nitrolingual)
isosorbide (Sorbitrate), (Isordil)**

1. Explain the mechanism of action of nitrates.
2. How do nitrates help in the treatment of chest pain?
3. List side effects of nitrates.
4. List the various routes of administration for nitrates and state nursing actions specific to each route.
5. List common agents that interact with nitroglycerin.
6. What discharge instructions should the nurse include for the patient who is discharged home on NTG, SL, prn chest pain.
7. A patient complains of feeling dizzy when getting OOB. What instructions should the nurse give the patient?

III. Beta Blockers

**atenolol (Tenormin)
metoprolol (Lopressor)
nadolol (Corgard)
propranolol (Inderal)**

1. What is the mechanism of action of beta blockers?
2. How do beta blockers help to relieve angina?
3. What therapeutic effects are produced by beta blockers for the patient who has had a MI?
4. Why are beta blockers contraindicated in patients with a history of asthma?
5. What are the major physical contraindications for the use of Inderal?
6. Beta blockers have shown drug interactions with which other medications?

IV. Calcium Channel Blockers

verapamil (Calan), (Isoptin)

diltiazem (Cardizem), (Tiazac), (Dilacor XR)

amlodipine (Norvasc)

nifedipine (Procardia)

nicardipine(Cardene)

1. What is the mechanism of action of calcium channel blockers?
2. What are two cardiovascular disorders that are often treated with calcium channel blockers?
3. Do calcium channel blockers increase or decrease afterload? Explain your answer.
4. Explain the action of calcium channel blockers in the treatment of angina.
5. Name the 2 calcium channel blockers most often prescribed to treat arrhythmias.

V. Diuretics

Thiazide Diuretics: chlorthalidone (Hygroton)

chlorothiazide (Diuril)

hydrochlorothiazide (Esidrix), (Hydo-DIURUL)

Loop Diuretics: furosemide (Lasix)

bumetamide (Bumex)

Potassium Sparing Diuretics: sprionolactone (Aldactone)

triamterene & hydrochlorothizide (Dyazide), (Maxzide)

1. What cardiovascular conditions are diuretics prescribed for?
2. What side effects must the nurse assess for if the patient is on diuretics?
3. Develop a teaching plan for the patient who is discharged on Lasix.

VI. ACE (Angiotensin-Converting Enzyme) Inhibitors

captopril (Capoten)
enelepril (Vasotec)
lisinopril (Prinivil), (Zestril)
remipril (Altace)
benazepril (Lotensin)
quinapril (Accupril)
fosinopril (Monopril)

1. What is the mechanism of action of ACE inhibitors?
2. What cardiovascular conditions are ACE inhibitors used to treat?
3. What is the most common side effect of ACE inhibitors?

VII. Angiotensin II Receptor Antagonist

losartan (Cozzar)
valsartan (Diovan)
irbesartan (Avapro)

1. What is the mechanism of action of angiotensin II receptor antagonists?
2. What cardiovascular condition do angiotensin II receptor antagonists treat?
3. Should patients with CHF use angiotensin II receptor antagonists? Why or why not?

VIII. Alpha-Blockers

A. Centrally Acting Alpha-Blockers

clonidine (Catapres)
guanabenz (Wytensin)

1. What is the mechanism of action of centrally acting alpha-blockers?
2. What are the common side effects of this classification of drugs?
3. Why would these drugs not be prescribed for a patient who has a history of substance abuse?

B. Peripherally Acting Alpha-Blockers

prazosin (Minipress)

terazosin (Hytrin)

doxazosin (Cardura)

1. What is the mechanism of action of peripherally acting alpha-blockers?
2. What are the most common side effects of this classification of medications?

IX. Medications used to treat Hypertensive Emergencies

nitroprusside (Nitropress), (Nipride)

diazoxide (Hyperstat)

hydralazine (Apresoline)

nitroglycerine

1. What is the mechanism of actions of these medications?
2. At what diastolic reading would these medications be ordered?
3. What is the major adverse side effect of these medications?
4. List several nursing assessments that would monitor the patient for this side effect?

X. Medications used to treat Severe Hypotension (Shock) – Vasopressors

dopamine (Intropin)

dobutamine (Dobutrex)

epinephrine (Adrenaline)

isoproterenol (Isuprel)

norepinephrine (Levephed)

phenylephrine (Neo-Synephrine)

1. What is the mechanism of action of vasopressors?
2. Name the various types of shock.
3. Discuss nursing actions associated with administering vasopressors.
4. Assure that you can calculate the correct flow rate for this classification of medications. Refer to the Advanced Dosage Calculations Study Guide for practice questions.

XI. Coagulation Modifier Agents

A. Anticoagulants

heparin (Liquaemin Sodium), (Calciparine)

enoxaparin (Lovenox)

dalteparin (Fragmin)

warfarin (Coumadin)

1. What is the mechanism of action of heparin?
2. What lab is ordered to monitor levels of heparin? Include the therapeutic range.
3. How can heparin be administered?
4. Discuss nursing actions pertinent to the administration of heparin.
5. What is the antidote for heparin?
6. Which of the above medications are low-molecular-weight heparin?
7. What are the advantages of low-molecular-weight heparin?
8. What is the mechanism of action of Coumadin?
9. What lab is ordered to monitor levels of Coumadin? Include the therapeutic range.
10. What is the antidote for Coumadin?
11. List discharge instructions for the patient going home on Coumadin. Include substances to be avoided.

B. Antiplatelet Agents

ASA, aspirin (Acetylsalicylic acid)

dipyridamole (Persantine)

ticlopidine (Ticlid)

clopidogrel (Plavix)

1. What is the mechanism of action of the above medications?
2. What patient condition would these medications be prescribed for?
3. What are the most common side effects of these medications?
4. What instructions should be given to the patient who is discharged on ASA?

XII. Thrombolytics
streptokinase (Streptase)
urokinase (Abbokinase)
alteplase, tPA (Activase)
reteplase (Retavase)

1. What is the mechanism of actions of the above medications?
2. How do these medications differ from anticoagulants?
3. All of the above medications are considered thrombolytics but they are used for specific conditions. List the use for each medication.
4. What are the contraindications for using these medications?
5. What nursing interventions need to be done after administering these medications?

XIII. Antilipemic Agents

Statins: lovastatin (Mevacor)
simvastatin (Zocor)
pravastatin (Pravachol)
fluvastatin (Lescol)
atorvastatin (Lipitor)

Fibrates: gemfibrozil (Lopid)
fenofibrate (Tricor)

Niacin

Bile Acid Resins: cholestamine
(Questran)

1. What specific lowering effect do the above medications have on LDL, HDL, triglycerides and cholesterol levels? (Not all of the above medications lower all of the listed lipid levels).
2. What are the common side effects of the above medications?
3. Discuss patient teaching for the above medications.

**Lincoln Memorial University
Caylor School of Nursing**

Laboratory Value:

Normal Range:

Complete Blood Count (CBC)

Red Blood Count (RBC)	Male: 4.7- 6.1	Female: 4.2- 5.4
Hemoglobin (Hgb)	13.5-17.5	11.5-15.5
Hematocrit (Hct)	40 - 52 %	36 - 48 %
Mean Corpuscular Volume (MCV)	Both: 81 - 96	
Mean Corpuscular Hgb Concentration (MCHC)	33 – 36	
Platelets	150,000 – 400,000	
White Blood Count (WBC)	5,000-10,000	
Differential:		
Neutrophils	40 – 75 %	
Lymphocytes	20 – 50 %	
Monocytes	1 – 10 %	
Eosinophils	0 - 6 %	
Basophils	0 - 2 %	

Coagulation Studies

Prothrombin Time (PT)	11 – 12.5 seconds
Partial Prothrombin Time (PTT)	25 – 35 seconds
International Normalized Ratio (INR)	2.0 – 3.0

Blood Chemistry

Serum Electrolyte Levels:

Sodium (Na)	135 - 145
Potassium (K)	3.5 – 5.5
Calcium (Ca)	8.5 – 10.5
Magnesium (Mg)	1.5 – 2.5

Blood Urea Nitrogen Level (BUN) 10 - 20

Serum Glucose Level 70 - 110

Lipid Profile:

Cholesterol	< 200
Triglycerides	40 -150

Lipoproteins:

Low-density Lipoproteins (LDL)	< 130	
High-density Lipoproteins (HDL)	Male: 35 –65	Female: 35 – 85

Lincoln Memorial University
Department of Nursing
Cardiovascular Diagnostic Evaluation Tools

1. Laboratory Tests

Purpose: Blood test to determine if cellular contents are present that would indicate myocardial damage. Useful in determining if patient has experienced an MI.

Procedure: Blood specimens drawn at specified times:

- **Total CK (Creatine Kinase) or CPK (Creatine Phosphkinase)**
Normal = male-12 – 70 U/ml, female-10 – 55 U/ml
1st increase = 3-6 hrs, peak = 24-36 hrs, return to normal 3 days
- **CK-MB:** 1st increase = 1 hr, peak = 24 hrs, return to normal 3-4 days
Normal = 0%
- **LDH:** Elevation useful in diagnosing MI patient who delays seeking treatment. 1st increase = 8-12 hrs, peak 2 –3 days post MI
- **Troponin T or I:** 1st increase = 3-4 hrs, peak = 4-24 hrs, return to normal 1- 3 weeks
- **Myoglobin:** 1st increase = 1-3 hrs, peak = 4–12 hrs, return to normal 12 hrs
Normal = 0 – 85 ng/ml
- **Brain type natriuretic peptide (BNP) –**

- **C-reactive protein (CRP) –**

- **Homocysteine –**

- **D-dimer -**

2. Chest X-Ray

Purpose: To determine the size, contour and position of the heart. Useful to diagnose CHF, correct placement of pacemakers, pulmonary artery and central venous catheters. Does not diagnose an MI, but can diagnose complications of an MI such as CHF.

3. Electrocardiography (ECG or EKG)

Purpose: To provide a graphic recording of the electrical activity of the heart. To detect and assist in the treatment of dysrhythmias, to identify conduction abnormalities, hypo or hypercalcemia, hypo or hyperkalemia and to determine certain medication effects.

Procedure: 4 types

1. Hardwire Cardiac Monitoring – ECG monitoring used in critical care units to provide bedside monitoring.
2. Telemetry – ECG monitoring that is transmitted to a centrally located station in the hospital where a technician monitors several patients ECG's.
3. Holter Monitor – Usually used in outpatient setting to monitor a patients ECG for a continuous 24 – 48 hour period that stores the ECG until it is played back for printing and evaluation by the cardiologist. Pt keeps a diary of activity, noting time of any symptoms, experiences or unusual activities performed. This is used to diagnose dysrhythmias and ischemia as well as

evaluate medication and pacemaker function on an outpatient basis.

4. Transtelephonic Monitoring – Patient attaches a special type of lead to self and places the telephone mouthpiece over the transmitter box and a monitor tech at a distant location records and evaluates the ECG.

Nursing Care for all types: Swab area with alcohol for better adherence of the electrodes.

4. Cardiac Stress Testing

Purpose: To evaluate the response of the cardiovascular system to stress ie, exercise. (Normally, the cardiac arteries dilate 4 times their usual diameter in response to an increased metabolic demand for oxygen and nutrients.) Assists in diagnosing CAD, the cause of chest pain, functional capacity of the heart after an MI or cardiac surgery and the effectiveness of antianginal or antiarrhythmic medications.

Procedure: 2 types

1. Exercise Stress Test – The patient walks on a treadmill or rides a stationary bicycle until a “target heart rate” is achieved or the patient experiences chest pain, extreme fatigue, a drop in BP or pulse rate, serious dysrhythmias or other complications. The patient’s ECG is monitored and assessed for abnormalities.

Contraindications: aortic stenosis, acute myocarditis or pericarditis, extremely elevated blood pressure, left main CAD, CHF,

Nursing Pre-care: Explain test, NPO at least 4 hrs prior, no stimulants (caffeine or tobacco), check on which medications to hold, (usually hold beta-blockers), advise comfortable clothing and shoes.

Nursing Post-care: Monitor patient for 10 – 15 minutes.

2. Pharmacologic (Non-Stress)Stress Test – Used when patient is physically handicapped or in poor physical condition and would not be able to achieve their target heart rate. The patient is given medication to dilate the coronary arteries just as exercise would do. The IV medications commonly used are dipyridamole (Persantin), Adenosine (Adenogard) or Dobutamine.

Nursing Pre-care: Explain test, NPO at least 4 hrs prior, no stimulant (caffeine or tobacco), withhold aminophylline or theophylline for 24 – 48 hrs before test, explain the sensations that are to be expected when the medications are injected ie, chest discomfort, dizziness, headache, flushing and nausea, and tell patient to inform physician and/or nurse if these sensations persist during the test.

Nursing Post-care: Monitor patient for any of the above lasting side effects from the injected medications.

5. Echocardiography

Purpose: Uses ultrasound to record the movement of the structures of the heart. Used to diagnose pericardial effusions, determine cause of heart murmurs, evaluate function of prosthetic heart valves, determine heart chamber size and evaluate ventricular wall motion which indicates if myocardial ischemia is present.

Procedure: 2 types

1. Noninvasive Ultrasound Test – A hand-held transducer is applied to the front of the chest and a two-dimensional picture is recorded. An ECG is recorded.

Nursing Pre-care: Explain test and stress it is painless. Inform patient he will have to turn onto his right side and hold his breath occasionally.

2. Transesophageal Echocardiography – A small transducer is threaded through the mouth and into the esophagus. The quality of the two-dimensional pictures produced by this method is much better.

Nursing Pre-care: Explain test, NPO 6 hrs prior to test and start an IV.

Nursing Post-care: NPO 4 hours after, assess for respiratory depression, assess for return of gag reflex, aspiration, vasovagal response and esophageal perforation.

6. Radionuclide Imaging

Purpose: To evaluate coronary artery perfusion, to detect myocardial ischemia and infarction, and to assess left ventricular function.

Procedure: 4 types

1. Thallium Scan (Cold Spot Imaging) – This radioisotope is injected IV and areas of decreased uptake are projected onto a screen. This indicates necrotic tissue. In addition, scanning during exercise may be incorporated into this test.

Nursing Pre-care: Explain test, avoid heavy meals, cigarettes, and strenuous activity before the test. If an exercise test is planned, advise patient to wear comfortable clothing and shoes. Inform patient there is no radiation danger.

2. Technetium Scan (Hot Spot Imaging) – This is also a type of radioisotope that is injected IV. Uptake of this isotope by the myocardial cells is proportional to their amount of perfusion. (No specific nursing pre-care except pt teaching)

3. Multiple Gated Acquisition (MUGA) Scan – This is a noninvasive scan that utilizes a camera equipped with a computer to record images of the heart during several hundred heart beats. It specifically measures the ejection fraction of the right and left ventricle.

Nursing Pre-care: Explain test, instruct patient they will have to remain motionless during the scan.

4. Positron Emission Tomography (PET) – A noninvasive scan that is utilized after the IV injection of a radioisotope. The scanner provides a detailed three-dimensional image of the uptake of the radioisotope which corresponds to coronary artery perfusion and myocardial perfusion. It also measures the glucose metabolism in the myocardium which corresponds to the degree of blood flow.

Nursing Pre-care: Explain test, NPO status varies greatly between institutions, no meds that affect glucose metabolism, no tobacco or caffeine 4 hrs before test, patient must remain motionless during the scan.

7. Magnetic Resonance Imaging (MRI)

Purpose: To visualize coronary artery occlusion, MI, valve leaflets and other heart structures, pericardial abnormalities and processes, ventricular hypertrophy, cardiac neoplasms and structural deformities.

Procedure: Patient is placed inside scanner and high resolution, cross-sectional images of heart structures are recorded.

Nursing Pre-care: Explain test, have patient remove all jewelry and assess for metal implants.

8. Invasive Catheterization (Combination of Cardiac Catheterization & Angiography)

Purpose: Generally these tests are used to visualize chambers and blood vessels of the heart. They also assess heart structure and function as well as measure pressures within the heart. They provide useful information re: CAD, congenital heart disease and ventricular function.

Procedure: 4 types

1. Aortography - A catheter is inserted into the brachial artery or the femoral artery and passed into the aorta. A contrast medium is injected and the aorta and the major vessels arising from it are outlined.
2. Coronary Arteriography (also called “angiography” & “heart cath”) – Usually, the catheter is inserted into the aorta as described above and then it is passed into the openings of the coronary arteries. A contrast medium is injected and the patency of the coronary arteries and collateral circulation is determined.
3. Right-Heart Catheterization – A catheter is inserted and passed into the right atrium, right ventricle, pulmonary artery and pulmonary capillary to measure pressures and oxygen saturations. This pressure measurement is called wedge pressure and is used to determine the function of the left side of the heart. Usually right-sided catheterization is performed prior to left-sided. Major complications include: dysrhythmias, venous spasm, cardiac perforation and cardiac arrest.

4. Left-Heart Catheterization – The catheter can be inserted 2 ways; as described above via the brachial or femoral artery and then into the left ventricle, or once the catheter is in the right atrium, the physician punctures through the septum separating the right and left atria and enters the left atrium and advances the catheter into the left ventricle.

Complications for all 4 catheterizations: dysrhythmias, MI, perforation of the heart or great vessels, systemic emboli, breakage of catheter, blood loss, allergic reaction to dye, infection and thrombus.

Nursing Pre-care for all 4 catheterizations:

Explain test, have consent form signed, check for allergies to iodine and shellfish, shave insertion site, assess and mark pulses, assess lab values, chart vital signs, NPO after midnight except for meds, start IV, administer sedative as prescribed, teach normal sensations when dye injected (flushed feeling, metallic taste).

Nursing Post-care for all 4 catheterizations:

Assess insertion site for bleeding or hematoma and peripheral pulses per hospital policy. Usually every 15 minutes for the first hour. Evaluate temperature, color and sensation of affected extremity. Bedrest for 6 - 8 hrs if homeostasis device (sutures ie Perclose, a collagen plug ie Vasoseal, or a combination of both ie Angio-Seal) is not used to close the insertion site. If this is the case, pt will have sandbag (5 – 10 pound) to apply pressure to insertion site. Assess for chest pain, dysrhythmias, respiratory difficulty (pulmonary emboli). Encourage fluids.

9. Electrophysiologic Study (EPS)

Purpose: To diagnose and treat serious dysrhythmias, to determine what triggers the dysrhythmias and to determine the need for other therapeutic interventions such as a pacemaker, implantable cardioverter defibrillator or radiofrequency ablation.

Procedure: Catheters (like pacemaker wires) with recording and electrical stimulating capabilities are inserted into the heart via the femoral and right subclavian veins to record electrical activity in the right and left atrium, bundle of His and right ventricle. Electrical stimuli are administered to the heart to induce dysrhythmias. Medications are administered IV and their effectiveness is evaluated. If the medication is successful in treating the dysrhythmia, the patient is started on the oral form. Results of the test may also indicate a need for further treatment such as pacemaker placement, implantable defibrillator or ablation.

Complications: bleeding, hematoma, pneumothorax, DVT, CVA, sudden death

Nursing Pre-care: Explain test, NPO 8 hrs prior, hold antiarrhythmic meds 24 hrs prior.

Nursing Post-care: Take frequent VS, assess apical pulses, auscultate for pericardial friction rub (=bleeding into pericardium), monitor continuous ECG, care for catheter insertion site as discussed with heart catheterization.

10. Hemodynamic Monitoring

Purpose: To allow for continuous assessment of a patient's cardiovascular system. (The specific purpose of each test will be included below.)

Procedure: 3 types

1. Central Venous Pressure (CVP) Monitoring – This is used to assess right ventricular function and venous blood return to the right heart. The patient must have a catheter placed into the superior vena cava. The CVP can be monitored continuously or intermittently. The normal reading is between 0-8 mm Hg. Many times used when a patient is hypovolemic which would give a low reading. This would indicate a decreased right ventricle preload. A high reading may be related to hypervolemia secondary to CHF or pulmonary edema. This would indicate an increased right ventricle preload.
2. Pulmonary Artery Pressure Monitoring – This is used to assess left ventricle function, diagnosing the cause of shock and evaluating a patient's response to fluid and medication administration. It is a measurement of left ventricle preload and it measures cardiac output. A catheter (Swan-Ganz) is inserted through the jugular or subclavian to the vena cava and floated through the chambers of the heart into the pulmonary artery. The pulmonary artery wedge pressure can be measured (normal = 25/9) as well as the pulmonary capillary wedge pressure (normal = 4.5-13 mm Hg). An increased level indicates fluid overload and a decreased level indicates fluid depletion. The pulmonary capillary wedge pressure is especially important in critically ill patients and many times has to be maintained as high as 18 mm Hg to optimize cardiac output.
3. Systemic Arterial Pressure Monitoring – This is used to obtain direct and continuous blood pressure measurements in critically ill patients with either severe hypertension or hypotension. An arterial catheter is inserted for measurement.

Nursing Pre-care: Explain use of catheter to patient if he/she is able to understand. Obtain written consent. Note electrolyte levels. Hypo levels make patient prone to dysrhythmias. Note coagulation study results. Increased bleeding time may lead to hemorrhage.

Nursing Post-care: Change central line dressing and flush ports according to hospital policy. Monitor patient for complications ie, dysrhythmias, thrombus, emboli, infection, sepsis and pulmonary rupture.

Written by: Tammy Dean, RN, MSN (Associate Professor of Nursing), Fall 01
Revised 5/03, 5/05, 5/09/JE

CARDIAC – MI CASE STUDY

Mr G., a 54 year-old machine operator of 30 years, collapsed at work and was taken to the ER. He is complaining of severe crushing pain in his chest that radiated down his left arm and up to his jaw. VS = B/p 100/58, P 54 regular, R 26. He is diaphoretic and very anxious. A stat EKG reveals an extensive MI. The following orders are written:

- O2 via nasal cannula at 2 L.min
- Nitroglycerin IV 10 to 20 mcg/min, increase by 5-10 mcg q 5-10 min to relieve chest pain
- Morphine Sulfate 2-4 mg prn pain
- Routine lab, EKG and CXR
- Heparin gtt at 1000 u/hr

Mr. G. is allowed to rest. The nurse talks with Mrs. G. to obtain information for the nursing history. Mrs. G. informs the nurse that her husband is very active. He is on the soccer team at work and plays basketball. He smokes 4-6 cigarettes daily and drinks a can of beer after dinner to help him relax. His father died at the age of 50 from a massive heart attack.

Two hours after admission, Mr. G. experiences a progressive decline in blood pressure. VS = B/P 80/46, P 110, R 28. He is diaphoretic, restless and confused. Chest auscultation reveals bilateral rales. A diagnosis of cardiogenic shock is made. The following orders are written:

- Dopamine 250 mg in 500 cc of D5W, keep systolic above 100
- Foley catheter
- Intake and output

24 Hours later Mr. G. is stable. The physician writes an order for a heart cath with a possible PTCA. The following orders are written:

- D/C Heparin gtt
- Permit signed
- Start NS at 100 cc/hr
- Routine heart cath orders

1. What routine lab would be ordered and include rationale.
2. What lab would be indicative of an MI?
3. Write 4 nursing diagnoses with interventions.
4. State the rationale for each of the treatments and medications mentioned above.
5. What is cardiogenic shock?
6. What are the clinical manifestations of cardiogenic shock? Include the nursing care.
7. State pre and post nursing care for a heart cath.
8. What patient teaching should be included for a heart cath?
9. What is PTCA?
10. Develop a comprehensive teaching plan for Mr. G's discharge home.
11. What will you teach Mr. G regarding the following home meds: NTG1", Cardizem, and ASA?

MITRAL REGURGITATION – CASE STUDY

A 50-year-old female is admitted to the hospital for evaluation of a heart murmur. She had rheumatic fever as a child. Recently she has c/o fatigue, weakness and dyspnea. She is admitted to COU. On admission she is SOB, vital signs are stable except for a HR of 125. The monitor shows A-Fib. The MD orders an echocardiography and Lanoxin 0.125 mg IV and Calan prn for continued increased HR.

1. Explain the etiology and pathophysiology of mitral regurgitation.
2. Where would you hear the murmur?
3. Describe the medical treatment.
4. Why was Lanoxin and Calan ordered for this patient?
5. Discuss any nursing precautions and side effects for the above 2 medications.
6. Discuss discharge instructions.

PERICARDITIS – CASE STUDY

A patient is admitted to CCU with a diagnosis of acute MI. He progresses normally and after 2 days he is transferred to COU. He is ready for discharge on the 8th day after admission. He starts c/o chest pain that increases with inspiration. He has a temp of 100.1. The doctor suspects pericarditis.

1. What is the etiology of the suspected pericarditis?
2. Describe the normal clinical manifestations of pericarditis.
3. What major complication may occur and what signs/symptoms would you see?
4. What nursing care will you deliver related to the pericarditis? Include discharge instructions.
5. What meds will most likely be ordered?

VALVULAR DISEASE – CASE STUDY

A 64-year-old man is admitted to CCU with a diagnosis of aortic stenosis. He has been having SOB and fatigue at home with some syncope. On admission his vital signs are: BP 120/70, HR 120, RR 32 with crackles in both bases with S3. His abdomen is flat with normal bowel sounds. He has a loud murmur and faint pedal pulses bilaterally. The MD orders Lasix 40 mg IV, Digoxin 0.25 mg IV, O2 @ 4L via NC, BMP, ABG and EKG. The monitor reads sinus tachycardia with a few PVC's.

1. Explain the etiology and pathophysiology of aortic stenosis.
2. Where would you best hear the murmur in this patient?
3. What other condition does this patient have on admission to CCU?
4. What is the purpose of Lasix and Digoxin? Include nursing precautions and common side effects of each medication.
5. What other diagnostic tool will be used?
6. Discuss treatment and management of aortic valve disease.

CARDIAC – Advanced Dosage Calculations Study Guide

1. The physician orders Dopamine to infuse at 4 mcg/kg. The client weighs 170 lbs. The standard mixture of this medication is 400 mcg in 250 cc of D5W. How many cc/hr will deliver 4 mcg/kg?
2. The physician orders a Lidocaine drip at 4mg/min. The standard mixture is 2 gms in 500 cc of D5W. How many cc/hr will deliver 4mg/min?
3. The physician orders a Heparin drip to infuse at 1200u/hr. The Heparin is mixed 25,000 units in 250 cc of D5W. How many cc/hr will deliver 1200 u/hr?
4. The physician orders Procainamide to infuse at 4 mg/min. The mixture is 500 mg in 250 cc of D5W. How many cc/hr will this infuse? How many gtts/min if there is a drip factor of 15 gtts?
5. The physician orders a Cardizem drip at 5 mg/hr. The pharmacy sends the medication mixed 125 mg in 100 cc of D5W. How many cc/hr will deliver 5 mg/hr?
6. The physician orders a Dopamine drip at 4mcg/kg/min. The patient weighs 150 lbs. The premixed Dopamine is 400 mg/250 cc of D5W. How many cc/hr will you give?

EKG HANDOUT

- EKG paper is made of small boxes; each small box = 0.04 seconds
- Atrial Depolarization = P waves
- Atrial Repolarization = hidden in the QRS complex
- Ventricular Depolarization = QRS complex
- Ventricular Repolarization = T Wave (remember R = Rest)
- Normal Intervals
 - PR = 0.12-0.20 seconds
 - QRS = less than 0.10 seconds
 - QT – less than 0.40 seconds
- Heart Rates & Rhythm (identify when analyzing EKG rhythms)
 - Atrial Rate = count P waves in 6-second strip & multiply X 10
 - Atrial Rhythm = measure P to P (irregular or regular)
 - Ventricular Rate = count QRS complexes in 6 second strip & multiply X 10
 - Ventricular Rhythm = R to R (irregular or regular)

Basic Characteristics of Different Rhythms

Nursing Care of Patients' with Arrhythmias

- 1) – **Assessment, assessment, assessment – Know your patient.**
 - a. **Vital signs**
 - b. **Physical assessment (heart sounds, BS, skin color, etc.)**
 - c. **Check all labs**
 - d. **Always be PREPARED for emergencies**
- 2) – **Be familiar with patient's medications, OTC meds, herbs, or nutritional supplements.**
- 3) – **Treat arrhythmia if patient's are symptomatic (decrease b/p, lightheadedness, dizziness, fatigue, chest pain, or palpitations.**
- 4) - **Know the correct drugs, dosages, and routine orders.**
- 5) – **Identify nursing diagnosis, set goals, implement nursing interventions, and evaluate (nursing process).**

Sinus Rhythms – initiated by the SA node: Characteristics include:

- 1) Positive, upright P waves
- 2) Smooth, rounded P waves – all P's look the same
- 3) QRS is narrow
 - Normal Sinus Rhythm (NRS)
 - Sinus Arrhythmia
 - Sinus Bradycardia
 - ❑ Atropine 0.5 mg IV for symptomatic bradycardia
 - ❑ Be prepared for transcutaneous pacing
 - Sinus Tachycardia (table 27.1)
 - ❑ Beta blockers
 - ❑ Calcium channel blockers
 - ❑ Catheter ablation

Atrial Rhythms –initiated by the an atrial cell outside the SA node

- 1) P waves look different than those generated by the SA node
- 2) QRS is narrow
 - Premature Atrial Complexes (PAC)
 - Atrial Flutter
 - ❑ Adenosine
 - ❑ Cardizem
 - ❑ Beta Blockers
 - ❑ Amiodarone, digoxin, or clonidine, or mag.
 - ❑ Possible elective cardioversion
 - Atrial Fibrillation
 - ❑ Same as above
 - ❑ Warfarin is indicated is indicated if high risk for stroke or over 48 hours or chronic a-fib.

Junctional Rhythms – initiated by a junctional cell

- 1) Inverted P waves before QRS complex
- 2) Missing P waves with narrow WRS complex
- 3) Inverted P waves after QRS complex
 - Premature Junctional Complexes (PJC)
 - Junctional Escape Rhythm
 - Accelerated Junctional Rhythm
 - Junctional Tachycardia
 - ❑ Adenosine
 - ❑ Cardizem
 - ❑ Beta Blockers

Ventricular Rhythms – initiated by ventricular cells

- 1) Wide, bizarre QRS complexes
- 2) T waves can also be bizarre
 - Premature Ventricular Complexes (PVC)
 - Ventricular Tachycardia (VT)
 - ❑ Amiodarone for stable VT
 - ❑ Procainamide
 - ❑ Lidocaine
 - ❑ Cardioversion
 - Ventricular Fibrillation (VF)
 - ❑ CPR
 - ❑ Defibrillation – Stat
 - ❑ Vasoactive meds (epinephrine, vasopressin or both)
 - ❑ Possible induction of hypothermia
 - Ventricular Asystole
 - ❑ CPR

AV Blocks – can be classified according to location of block.

Treatment will depend on the degree of block and symptoms of patient. Be prepared for insertion of pacemaker.

- 1st Degree AV Block
- 2nd Degree AV Block Type I
- 2nd Degree AV Block Type II
- 2nd Degree AV Block 2:1 Block
- 3rd Degree AV Block (Complete Heart Block)

Pacemaker Rhythms

- Pacemaker Identification Codes
 - 1st letter – identifies the chamber(s) paced. (A=Atrium, V=Ventricles, or D= both)
 - 2nd letter – identifies chamber(s) where patient-initiated is being sensed by the pacemaker.
 - 3rd letter – indicates how the pacemaker will respond when it senses. (I=Inhibited, T=Triggered, D=Both, or O=None).
- Single-Chamber Pacemakers
 - Atrial pacemaker – stimulation of the atria produces a pacemaker spike on the EKG, followed by a P wave.
 - Ventricular pacemaker – produces a pacemaker spike on the EKG followed by a wide QRS complex.
- Dual-Chamber Pacemakers
 - Both the Atria and Ventricle are paced
- TCP (Transcutaneous Pacing)
 - Type of pacing used in an emergency situation

- Pacemaker Malfunction (Also see table 27.2 , page 848 of Brunner Textbook)
 - Failure to Pace – See on the EKG by an absence of pacemaker spikes
 - Failure to Capture – Seen on the EKG by visible pacemaker spikes not followed by P waves (if atrial) or QRS (if ventricular).
 - Failure to Sense – Seen on the EKG by pacemaker spikes that follow too closely behind the QRS complexes.
 - Loss of Pacing – Total absences of pacing spikes.
 - Rhythmic diaphragmic or chest wall twitching or hiccuping
- Patient Teaching and Home care (See table 27.4, page 853)
- Review the nursing process

Smeltzer, S. G., & Bare, B. G. (2008). *Brunner and Suddarth's textbook of medical – surgical nursing*. (11th ed.). Philadelphia: Lippincott, Williams & Wilkins. Chapters: 26 - 32.