Introduction to Clinical Pharmacology

Chapter 33
Antihyperlipidemic Drugs

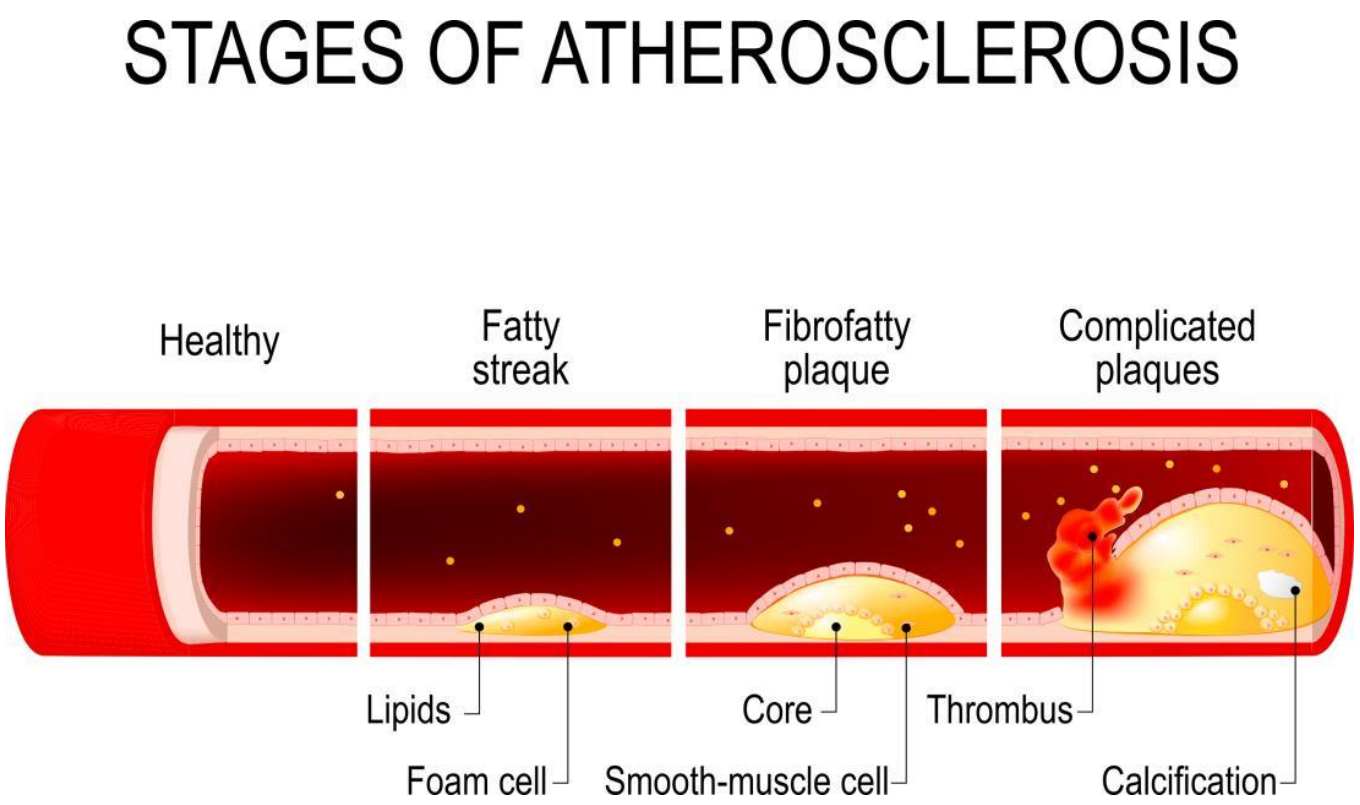
Learning Objectives #1

1. Compare and contrast cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and triglyceride levels and how they contribute to the development of heart disease.
2. Define therapeutic life changes (TLCs) and how they affect cholesterol levels.
3. Explain the uses, general drug actions, general adverse reactions, contraindications, precautions, and interactions of antihyperlipidemic drugs.
4. Distinguish important preadministration and ongoing assessment activities the nurse should perform on the client taking an antihyperlipidemic drug.

Learning Objectives #2

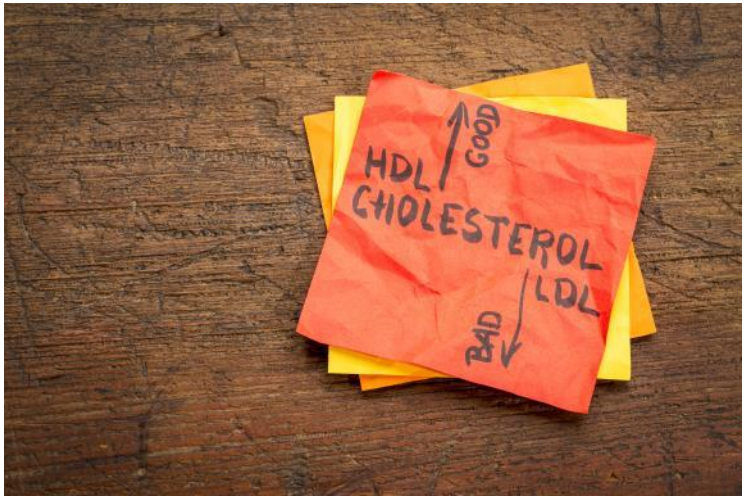
5. List nursing diagnoses particular to a client taking an antihyperlipidemic drug.
6. Examine ways to promote an optimal response to therapy, how to manage common adverse reactions, and important points to keep in mind when educating clients about the use of antihyperlipidemic drugs.

Atherosclerosis



Lipoproteins

- Low-density lipoproteins (LDLs):
  - Transport cholesterol to the peripheral cells
  - Elevation of LDLs:
  - Atherosclerotic plaque formation
  - Increases the risk for heart disease
- High-density lipoproteins (HDLs):
  - Take cholesterol from the peripheral cells and transport it to the liver



Cholesterol Levels

- HDL cholesterol: protects against heart disease
- The higher the LDL level, the greater the risk for heart disease
- Drugs used to treat hyperlipidemia:
  - HMG-CoA reductase inhibitors
  - Bile acid resins
  - Fibric acid derivatives
  - Niacin

Therapeutic Life Changes

- The primary health care provider prescribes life changes as a first line of defense in preventing and treating hyperlipidemia
  - Cholesterol-lowering diet
  - Physical activity
  - Smoking cessation
  - Weight management
  - TLC diet is low saturated-fat, low cholesterol, includes 200 mg if dietary cholesterol per day

Pharmacology in Practice Exercise #1

- Which of the following are examples of modifiable risk factors for hyperlipidemia? Select all that apply

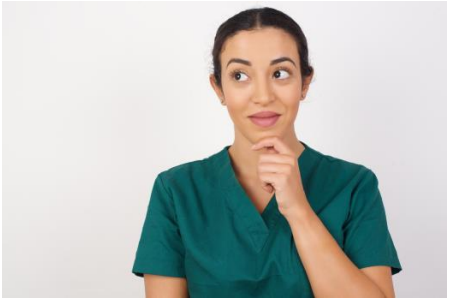
a) Weight

b) Diet

c) Postmenopausal

d) Age older than 55 years (women)

e) Age older than 45 years (men)



HMG-CoA Reductase Inhibitors—Actions

- Also known as “statins”
- HMG-CoA reductase:
  - An enzyme that is a catalyst during the manufacture of cholesterol
- Inhibits the manufacture of cholesterol or promotes the breakdown of cholesterol
- Lowers the blood levels of cholesterol and serum triglycerides

HMG-CoA Reductase Inhibitors—Uses

- **Used in the treatment of:**
  - hyperlipidemia
  - primary prevention of coronary events
  - secondary prevention of cardiovascular events

HMG-CoA Reductase Inhibitors—Adverse Reactions #1

- Neuromuscular System Reactions:
  - Headache
  - Dizziness
  - Insomnia
  - Memory or cognitive impairment

HMG-CoA Reductase Inhibitors—Adverse Reactions #2

- Gastrointestinal System Reactions:
  - Flatulence
  - Abdominal pain
  - Cramping
  - Constipation
  - Nausea
  - Hyperglycemia in nondiabetic

HMG-CoA Reductase Inhibitors—Adverse Reactions #3

- Serious Reactions:
  - Leg pain or cramping
  - Rhabdomyolysis

HMG-CoA Reductase Inhibitors—Contraindications

- Contraindicated in clients with:
  - known hypersensitivity to the drug
  - liver disorders
  - pregnancy (pregnancy category X)
  - lactation

HMG-CoA Reductase Inhibitors—Precautions

- Use cautiously in clients with:
  - diabetes
  - a history of alcoholism
  - non-alcohol-related liver disease
  - acute infection
  - hypotension
  - trauma
  - endocrine disorders
  - visual disturbances
  - myopathy

Pharmacology in Practice Exercise #2

- A client is prescribed atorvastatin for hyperlipidemia. The nurse checks the client's medical record for which of the following contraindicated conditions?

a) Visual disturbances

b) Biliary obstruction

c) Serious liver disorders

d) Renal dysfunction

HMG-CoA Reductase Inhibitors—Interactions #1

Interacting Drug	Common Use	Effect of Interaction
Macrolides, erythromycin, clarithromycin	Treatment of infections	Increased risk of sever myopathy or rhabdomyolysis
Amiodarone	Cardiovascular problems	Increased risk of myopathy
Niacin	Used to lower elevated cholesterol	Increased risk of severe myopathy or rhabdomyolysis

HMG-CoA Reductase Inhibitors—Interactions #2

Interacting Drug	Common Use	Effect of Interaction
Protease inhibitors	Treatment of HIV infection and AIDS	Elevated plasma levels of statins
Verapamil	Treatment of cardiovascular problems and hypertension	Increased risk of myopathy
Warfarin	Prevents blood clots	Increased anticoagulant effect

PCSK9 Inhibitors—Actions, Uses, and Adverse Reactions

- Proprotein convertase subtilisin/kexin type 9 (PCSK9) is an enzyme that binds with LDL and prevents it from being removed from the blood
- **Actions**: PCSK9 inhibitors are monoclonal antibodies that block the enzyme process and lowers LDL cholesterol
- **Used** in clients with genetic familial hyperlipidemia at high risk for cardiovascular disease
- Administered subcutaneously once or twice a month
- **Adverse Reaction**: cognitive adverse reactions

Bile Acid Resins—Action

- Bile: manufactured, secreted by liver; stored in the gallbladder; emulsifies fat and lipids
- Bile acid resins bind to bile acids to form an insoluble substance that cannot be absorbed in the intestine; excreted in the feces
- Increased loss of bile acids:
  - Liver uses cholesterol to manufacture more bile
  - Decrease in cholesterol levels

Bile Acid Resins—Uses

- **Used in the treatment of:**
  - hyperlipidemia
  - gallstone dissolution in clients where surgery is not recommended
  - pruritis associated with partial biliary obstruction (cholestyramine only)

Bile Acid Resins—Adverse Reactions

- General Adverse Reactions:
  - Constipation
  - Aggravation of hemorrhoids
  - Abdominal cramps
  - Flatulence
  - Nausea
  - Increased bleeding tendencies related to vitamin K malabsorption and vitamin A and D deficiencies

Bile Acid Resins—Contraindications and Precautions

- Contraindicated in clients with:
  - known hypersensitivity to the drug
  - biliary obstruction (bile acid resins)
- Use cautiously in clients with:
  - diabetes
  - liver disease
  - peptic ulcer
  - kidney disease
  - pregnancy (pregnancy category C) (bile acid resins)
  - lactation

Bile Acid Resins—Interactions #1

Interacting Drug	Common Use	Effect of Interaction
Anticoagulants	Prevent blood clots	Decreased effect of the anticoagulant (cholestyramine)
Thyroid hormone	Treatment of hypothyroidism	Loss of efficacy of thyroid also hypothyroidism (particularly with cholestyramine)
Fat-soluble vitamins (A, D, E, K) and folic acid	Nutritional supplements	Reduced absorption of vitamins

Bile Acid Resins—Interactions #2

Interacting Drug	Common Use	Effect of Interaction
NSAID	Treats pain	Decreased serum level or decreased GI absorption of these drugs when given with bile acid resins
Penicillin G and tetracycline	Treat infection	
Niacin	Treats elevated cholesterol levels	
Digitalis	Treats heart failure	
Furosemide and thiazide diuretics	Treats edema	
Glipizide	Treats diabetes	
Hydrocortisone	Treats inflammation	
Methyldopa and propranolol	Treats hypertension and cardiovascular problems respectively	

Fibric Acid Derivatives—Action

- Work in a variety of ways
- Fenofibrate reduces very-low-density lipoproteins and stimulates the catabolism of triglyceride-rich lipoproteins; decreases plasma triglycerides and cholesterol
- Gemfibrozil increases the excretion of cholesterol in the feces and reduces the production of triglycerides by the liver; lowers serum lipid levels

Fibric Acid Derivatives—Uses

- **Used in the treatment of:**
  - Varies by the drug
  - Fenofibrate: used as adjunctive treatment for reducing LDLs, total cholesterol, and triglycerides in clients with hyperlipidemia
  - Gemfibrozil treats clients with very high serum triglyceride levels at risk for abdominal pain and pancreatitis who do not respond to dietary modifications

Fibric Acid Derivatives—Adverse Reactions

- General Adverse Reactions:
  - Nausea
  - Vomiting
  - GI upset
  - Diarrhea
  - Cholelithiasis or cholecystitis

Fibric Acid Derivatives—Contraindications and Precautions

- Contraindicated in clients with:
  - known hypersensitivity to the drug
  - hepatic or renal dysfunction
  - primary biliary cirrhosis
- Use cautiously in clients with:
  - pregnancy (pregnancy category C)
  - lactation

Fibric Acid Derivatives—Interactions

Interacting Drug	Common Use	Effect of Interaction
Anticoagulants	Prevent blood clots	Enhanced effect of the anticoagulants
Cyclosporine	Immunosuppression after organ transplantation	Increased risk of rhabdomyolysis
HMG-CoA reductase inhibitors (statins)	Treatment of elevated blood cholesterol levels	Increased risk of rhabdomyolysis
Sulfonylureas	Treatment of diabetes	Increased hypoglycemic effects (gemfibrozil)

Misc. Antihyperlipidemic Drugs—Actions

- Niacin's (nicotinic acid) mechanism of lowering blood lipid levels is not fully understood
- Bempedoic acid inhibits the synthesis of cholesterol in the liver
- Ezetimibe inhibits the absorption of cholesterol in the small intestine; decrease in cholesterol in the liver

Misc. Antihyperlipidemic Drugs—Uses

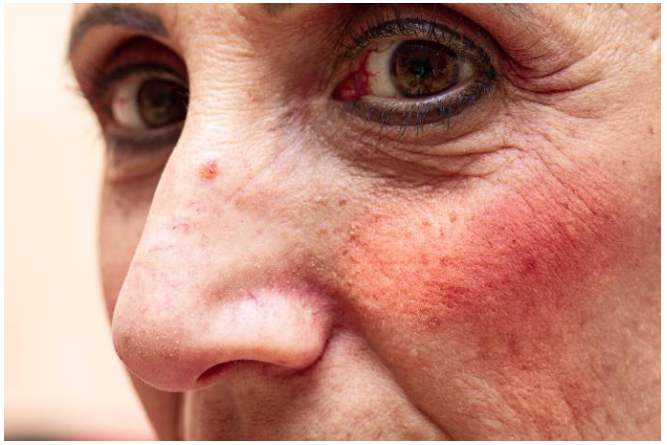
- **Used in the treatment of:**
  - Varies by the drug
  - Niacin is used as adjunctive therapy for lowering very high serum triglyceride levels in clients at risk of pancreatitis and where the response to dietary control is inadequate
  - Bempedoic acid and ezetimibe are used in combination with other antihyperlipidemics in lipid-lowering treatments

Misc. Antihyperlipidemic Drugs—Adverse Reactions #1

- Gastrointestinal System Reactions:
  - Nausea
  - Vomiting
  - Abdominal pain
  - Diarrhea

Misc. Antihyperlipidemic Drugs—Adverse Reactions #2

- Other Reactions:
  - Severe, generalized flushing of the skin
  - Sensation of warmth
  - Severe itching or tingling
  - Generalized muscle aches and flu-like symptoms



Misc. Antihyperlipidemic Drugs—Contraindications

- Niacin contraindicated in clients with:
  - known hypersensitivity
  - active peptic ulcer
  - hepatic dysfunction
  - arterial bleeding
- Bempedoic acid and ezetimibe contraindicated in clients with:
  - pregnancy
  - lactation

Misc. Antihyperlipidemic Drugs—Precautions

- Niacin is used cautiously in clients with:
  - renal dysfunction
  - high alcohol consumption
  - unstable angina
  - gout
  - pregnancy (pregnancy category C)
  - lactation

Nursing Process—Client Receiving an Antihyperlipidemic Drug #1

- **Preadministration Assessment**
- **Objective** Data
  - Vital signs
  - Weight
  - Inspect skin and eyelids for evidence of xanthomas
  - Laboratory tests: lipid profile and others specific to the client (e.g., liver function, blood glucose, HbA1c)

Nursing Process—Client Receiving an Antihyperlipidemic Drug #2

- **Preadministration Assessment (continued)**
- **Subjective** Data
  - Dietary history
  - Medical history of cholesterol/cardiac issues
  - Current list of all drugs and supplements

Nursing Process—Client Receiving an Antihyperlipidemic Drug #3

- **Ongoing Assessment**
  - Frequently monitor blood cholesterol and triglyceride levels
  - Monitor liver function tests, such as serum transaminase levels or fractionated (indirect) bilirubin levels
  - Periodic lipid profiles

Nursing Process—Client Receiving an Antihyperlipidemic Drug #4

- **Nursing Diagnosis**
  - Constipation related to antihyperlipidemic drugs
  - Malabsorption Risk related to malabsorption of vitamins
  - Altered Skin Integrity Risk related to rash and flushing
  - Nausea related to antihyperlipidemic drugs
  - Injury Risk related to dizziness

Nursing Process—Client Receiving an Antihyperlipidemic Drug #5

- **Planning**
  - Expected client outcomes depend on the reason for administration of the drug but include:
    - Optimal response to therapy
    - Management of adverse drug reactions
    - Confidence in an understanding of the prescribed medication regimen

Nursing Process—Client Receiving an Antihyperlipidemic Drug #6

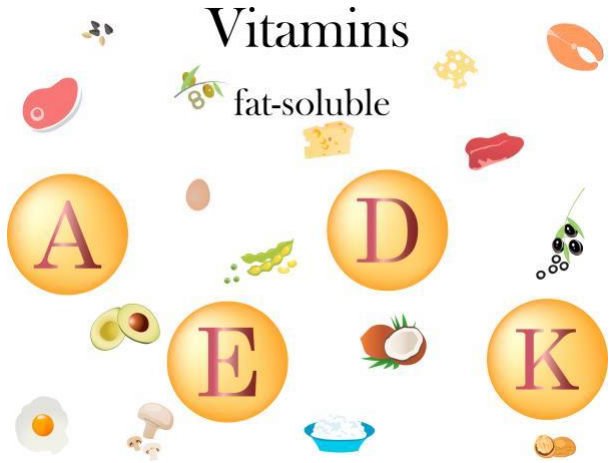
- **Implementation**
  - Promoting Optimal Response to Therapy
    - Explain drug regimen and possible adverse reactions
    - Emphasize the importance of following printed dietary guidelines
    - Discuss with the client minimizing high-fat bedtime snacks due to statins not absorbing well when administered with a high-fat meal

Nursing Process—Client Receiving an Antihyperlipidemic Drug #7

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Constipation**
      - Assess especially older adults for hard stools and difficulty passing stools
      - Instruct the client to increase fluid intake, eat foods high in dietary fiber, exercise daily
      - If a stool softener is ordered, teach client how to take the stool softener

Nursing Process—Client Receiving an Antihyperlipidemic Drug #8

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Malnutrition**
      - When bile acid resins used for long-term therapy: administer vitamins A, D in water-soluble form or parenterally



Nursing Process—Client Receiving an Antihyperlipidemic Drug #9

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Altered Skin Integrity Risk**
      - Educate the client taking niacin that they may experience moderate to severe generalized flushing of the skin, a sensation of warmth, and severe itching or tingling
      - Advise the client to contact the primary health care provider if the skin reactions are severe or cause extreme discomfort

Nursing Process—Client Receiving an Antihyperlipidemic Drug #10

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Nausea**
      - Instruct client to take drug with meal
      - Provide client with several small meals rather than three large meals
      - Notify the provider if nausea is severe or if vomiting occurs

Nursing Process—Client Receiving an Antihyperlipidemic Drug #11

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Injury Risk**
      - Monitor client closely for risk of falls/dizziness
      - Place call light within easy reach
      - Assist the client with ambulation as needed

Pharmacology in Practice

- A nurse is caring for an older client using bile acid sequestrants. What should the nurse monitor for in the client? Select all that apply.

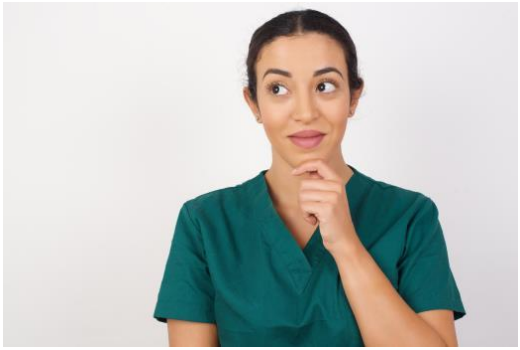
a) Difficulty in passing stools

b) Hard, dry stools

c) Constipation

d) Mouth dryness

e) Urinary hesitancy



Nursing Process—Client Receiving an Antihyperlipidemic Drug #12

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Potential complication:**
    - Vitamin K deficiency: include foods high in vitamin K in the client's diet; teach client to monitor for bruising; parenteral vitamin K may be indicated
    - Rhabdomyolysis: be alert for unexplained muscle pain, muscle tenderness, or weakness, especially if accompanied by malaise or fever; symptoms should be reported to provider

Nursing Process—Client Receiving an Antihyperlipidemic Drug #13

- **Implementation—Educating th**e Client and Family
  - Provide and review the recommended client with the client and family
  - Explain the importance of taking the drug at prescribed time intervals and as directed
  - Explain the necessity of contacting the primary health care provider immediately if symptoms occur

Nursing Process—Client Receiving an Antihyperlipidemic Drug #14

- **Implementation—Educating the** Client and Family (continued)
  - **Statins**
    - Inform client that statins should be taken in the evening or at bedtime
    - Do not take statins with grapefruit juice
    - Take antacids at least 2 hours after rosuvastatin
    - Teach the client that statins may cause photosensitivity and to wear sunscreen and protective clothing

Nursing Process—Client Receiving an Antihyperlipidemic Drug #15

- **Implementation—Educating the** Client and Family (continued)
  - **Self-Management Skills**
    - Empower clients by supporting efforts rather than telling them to participate in strategies for self-care
    - Encourage clients to reduce their cardiovascular risk by using cardiovascular risk calculator educational tools on the internet appropriate for their age, cholesterol level, and blood pressure

Nursing Process—Client Receiving an Antihyperlipidemic Drug #16

- **Implementation—Educating the** Client and Family (continued)
  - **Bile Acid Resins**
    - Take the drug before meals unless otherwise directed
    - Cholestyramine powder must be mixed with 2 to 6 ounces of water or a noncarbonated beverage and shaken
    - Colestipol granules must be mixed in liquids, soup, cereal, carbonated beverage, or pulpy fruits; use about 90 mL of liquid

Nursing Process—Client Receiving an Antihyperlipidemic Drug #17

- **Implementation—Educating the** Client and Family (continued)
  - **Bile Acid Resins (continued)**
    - Colestipol tablets should be swallowed whole, one at a time with a full glass of water
    - Do not sip or hold liquid preparations in the mouth; tooth discoloration and enamel decay
    - GI symptoms may occur but usually subside with continued therapy

Nursing Process—Client Receiving an Antihyperlipidemic Drug #18

- **Implementation—Educating th**e Client and Family (continued)
  - Gemfibrozil: teach client to observe caution while driving or performing hazardous tasks; notify provider if nausea, vomiting, or diarrhea occurs
  - Niacin: take with meals; can cause flushing, warmth, itching, and headache; provider may prescribe aspirin to take 30 minutes before niacin
  - Ezetimibe: teach client to take at least 2 hours before or 4 hours after a bile acid sequestrant; report adverse effects to provider

Nursing Process—Client Receiving an Antihyperlipidemic Drug #19

- **Evaluation**
  - Was the therapeutic effect achieved and did serum lipid levels decrease?
  - Were adverse reactions: identified, reported, and managed?
    - Client reports adequate bowel movements
    - Client maintains an adequate nutritional status
    - Nausea is controlled
    - No injury is evident
  - Did client and family express confidence and demonstrate understanding of drug regimen?

Turn and Talk—Case Study #1

- Susan Smith is a 40-year-old African American woman. She client is being discharged from the hospital today after having a myocardial infarction. This client has a history significant for diabetes, hypertension, and smoking (1 pack/day). The only new prescription added to the current medications, is pravastatin (Pravachol) 40 mg with directions to take one tablet daily at bedtime. The physician has asked the nurse to go over discharge instructions with the client. What should be the nursing priorities during the discharge counseling?

Turn and Talk—Case Study #2

1. What class of antihyperlipidemic medication is pravastatin and what should the client be told about the medication?
2. What lifestyle modifications should the client be encouraged to follow?
3. What are the client's goals with regard to cholesterol blood levels and when should follow-up laboratory work be done to measure the blood levels?