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When you have to be right

Introduction to Clinical Pharmacology

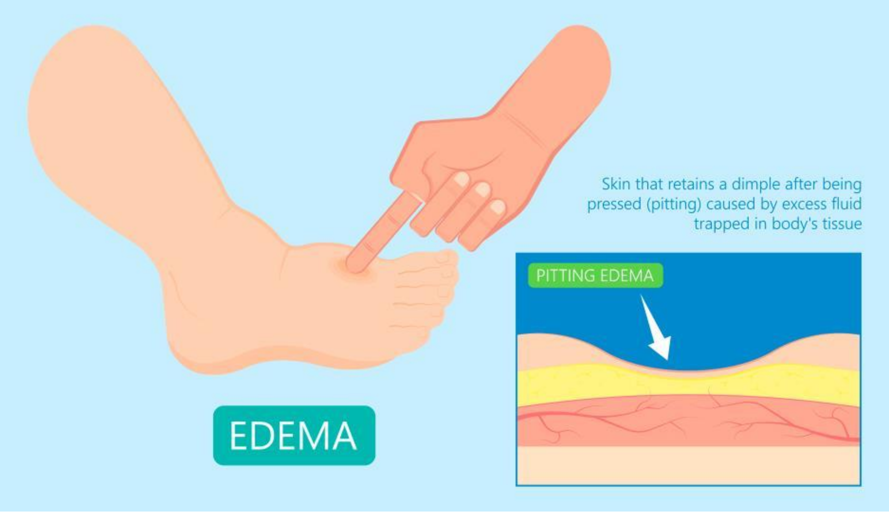
Chapter 32
Diuretics

Learning Objectives

1. List the five general types of diuretics.
2. Explain the uses, general drug actions, adverse reactions, contraindications, precautions, and interactions of the diuretics.
3. Distinguish important preadministration and ongoing assessment activities that the nurse should perform on the client taking a diuretic.
4. List nursing diagnoses particular to a client taking a diuretic.
5. 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 diuretics.

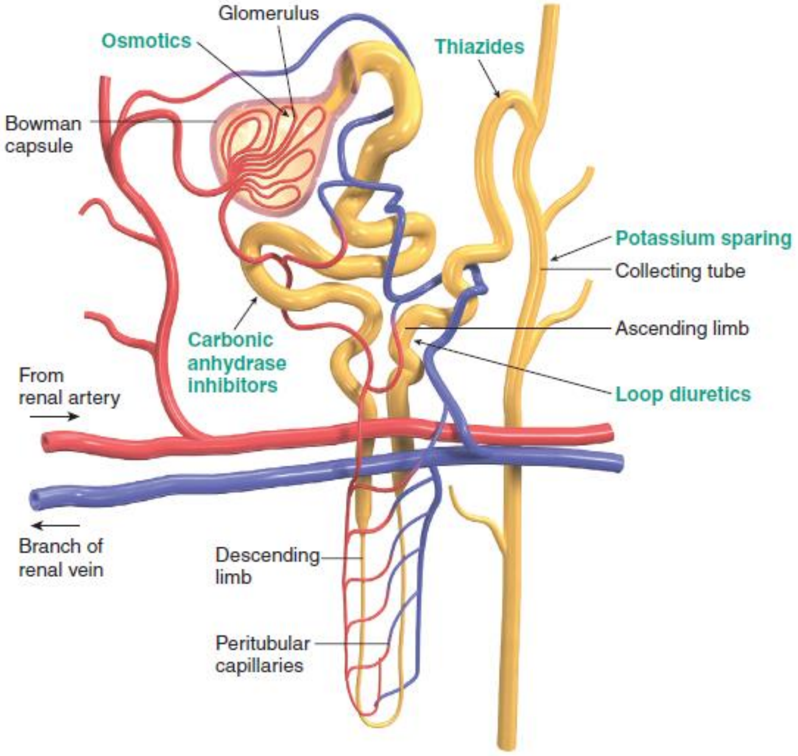
Common Conditions That Cause Edema

- Heart failure
- Endocrine disturbances
- Kidney and liver diseases
- Fluid overload from other causes



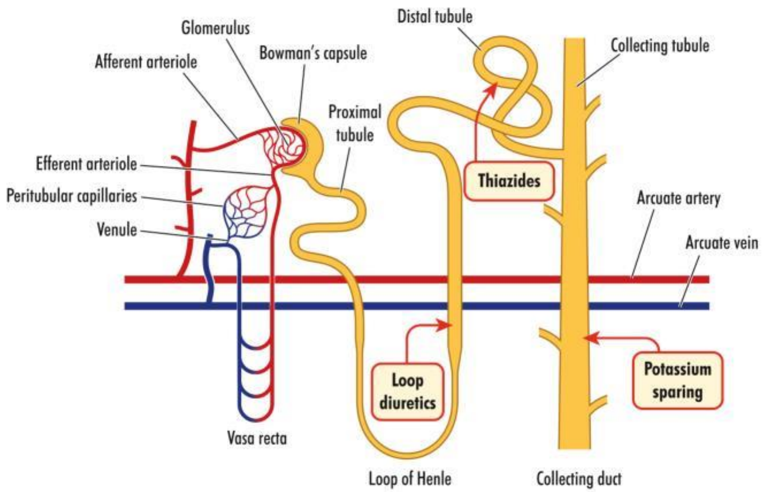
Five Types of Diuretics

- Loop diuretics
- Thiazides and related diuretics
- Potassium-sparing diuretics
- Osmotic diuretics
- Carbonic anhydrase inhibitors



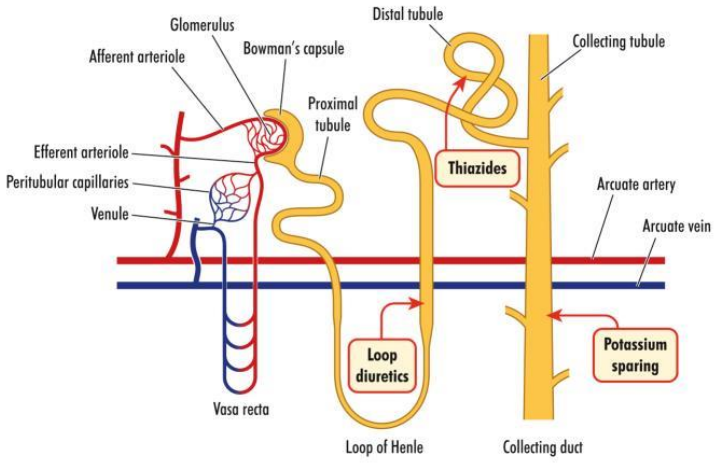
Diuretics—Actions #1

- Loop diuretics:
  - Increase the reabsorption of sodium and chloride in the ascending portion of the loop of Henle
  - Blocking the action of reabsorption in the portion of the nephron where a high percentage of sodium and fluid are usually reabsorbed is very effective



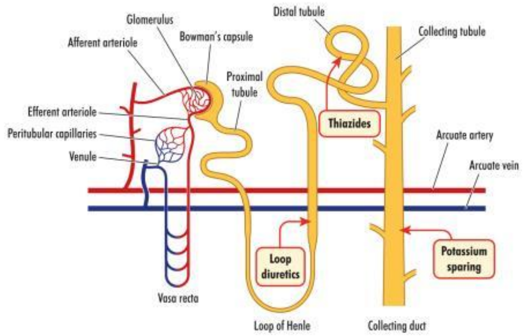
Diuretics—Actions #2

- Thiazide and related diuretics:
  - Inhibit reabsorption of sodium and chloride ions in the early distal tubule of nephron
  - Results in excretion of sodium, chloride, and water
  - Often the first drug used in the treatment of hypertension



Diuretics—Actions #3

- Potassium-sparing diuretics:
  - Works by blocking the reabsorption of sodium in the collecting tubules; increases sodium and water in the urine; reduces the excretion of potassium
  - Spironolactone: antagonizes the action of aldosterone
  - Aldosterone: enhances the reabsorption of sodium in the distal convoluted tubules of the kidney
  - When aldosterone is inhibited, sodium (but not potassium) and water are ewxcreted



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Diuretics—Actions #4

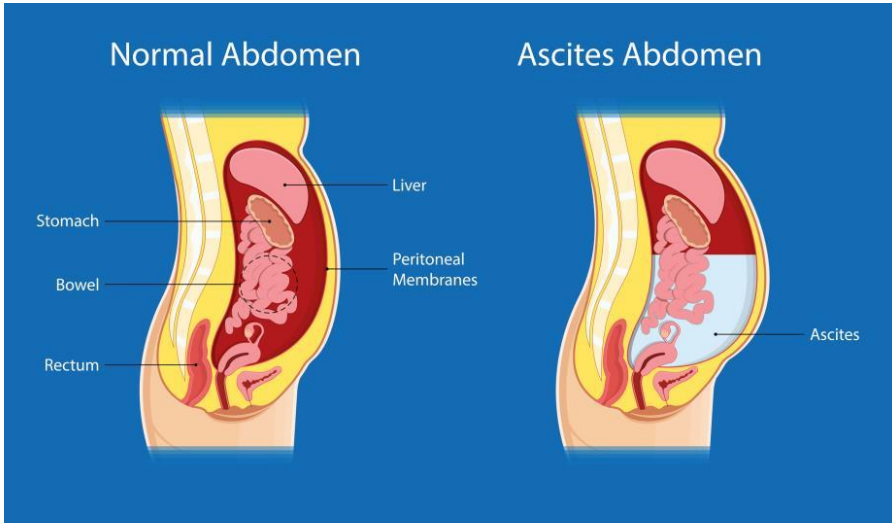
- Osmotic diuretics:
  - Increase the density of the filtrate in the glomerulus
  - Prevents the selective reabsorption of water
  - Sodium and chloride excretion is also increased
- Carbonic anhydrase inhibitors:
  - Sulfonamides without bacteriostatic action that inhibit the enzyme carbonic anhydrase
  - Results in the excretion of sodium, potassium, bicarbonate, and water

Diuretics—Uses #1

- **Used in the treatment of:**
  - edema
  - hypertension
  - renal disease
  - cerebral edema
  - seizures and altitude sickness
  - acute glaucoma (infrequently and given topically) for increased intraocular pressure

Diuretics—Uses #2

- **Used in the treatment of:**
  - male-to-female hormonal therapy for gender dysphoria (spironolactone)
  - short term management of ascites (ethacrynic acid)
  - premenstrual bloating or weight loss (nonprescription)

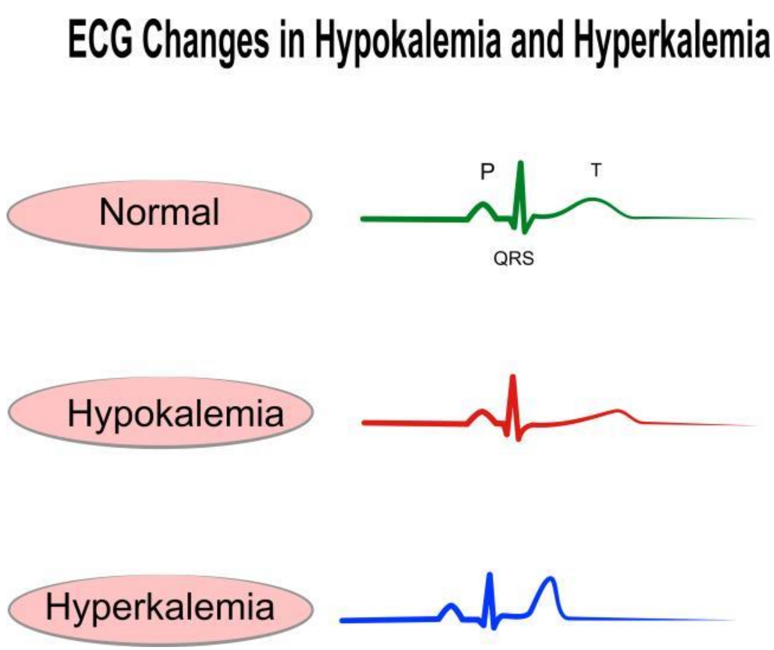


Diuretics—Adverse Reactions #1

- Neuromuscular System Reactions:
  - Dizziness
  - Lightheadedness
  - Headache
  - Weakness
  - Fatigue

Diuretics—Adverse Reactions #2

- Cardiovascular System Reactions:
  - Orthostatic hypotension
  - Electrolyte imbalances
  - Glycosuria



Diuretics—Adverse Reactions #3

- Gastrointestinal System Reactions:
  - Anorexia
  - Nausea
  - Vomiting

Diuretics—Adverse Reactions #4

- Other Reactions:
  - Photosensitivity
  - Extremity paresthesias
  - Flaccid muscles from hypokalemia
  - Hyperkalemia (potassium sparing)
  - Gynecomastia (spironolactone)

Pharmacology in Practice Exercise #1

- A nurse is caring for a client with edema due to heart failure. The primary health care provider has prescribed spironolactone for the client. Which of the following adverse reactions to the drug should the nurse monitor for in the client?

a) Vertigo

b) Paresthesias

c) Hyperkalemia

d) Anorexia

Diuretics—Contraindications

- Contraindicated in clients with:
  - known hypersensitivity to the drug
  - electrolyte imbalances
  - severe kidney or liver dysfunction
  - anuria
  - active intracranial bleeding (mannitol)
  - hyperkalemia (potassium-sparing)
  - pediatrics (potassium sparing)

Diuretics—Precautions

- Use cautiously in clients with:
  - renal dysfunction; during pregnancy (pregnancy category C), lactation
- Thiazide and loop diuretics:
  - Used cautiously in clients with gout, liver disease, diabetes, systemic lupus erythematosus, or diarrhea; pregnancy category B and C
- Potassium-sparing diuretics:
  - Used cautiously in clients with liver disease or diabetes

Diuretics—Interactions #1

Interacting Drug	Common Use	Effect of Interaction
Carbonic Anhydrase Inhibitors		
Primidone	Treatment of seizure activity	Decreased effectiveness
Potassium-sparing Diuretics		
Ace inhibitors or potassium supplements	Cardiovascular problems	Increased risk of hyperkalemia
NSAIDs and salicylates; anticoagulants	Pain relief and prevention of blood clots respectively	Decreased diuretic effectiveness

Diuretics—Interactions #2

Interacting Drug	Common Use	Effect of Interaction
Loop Diuretics		
Cisplatin, aminoglycosides	Cancer treatment, anti-infective, respectively	Increased risk of ototoxicity
Anticoagulants or thrombolytics	Blood thinner, prevention of blood clots	Increased risk of bleeding
Digitalis	Cardiac problems	Increased risk of arrhythmias
Lithium	Psychotic symptoms, treatment of mania	Increased risk of lithium toxicity

Diuretics—Interactions #3

Interacting Drug	Common Use	Effect of Interaction
Loop Diuretics (continued)		
Hydantoins	Treatment of seizure activity	Decreased diuretic effectiveness
NSAIDs and salicylates	Pain relief	Decreased diuretic effectiveness

Diuretics—Interactions #4

Interacting Drug	Common Use	Effect of Interaction
Thiazides and Related Diuretics		
Allopurinol	Treatment of gout	Increased risk of sensitivity to allopurinol
Anesthetics	Surgical anesthesia	Increased anesthetic effectiveness
Antineoplastic drugs	Cancer treatment	Extended leukopenia
Antidiabetic drugs	Control of diabetes	Hyperglycemia

Pharmacology in Practice Exercise #2

- A primary health care provider has prescribed treatment with an antihypertensive drug along with a diuretic to a client as a treatment for hypertension. The client informs the nurse about his preference for herbal extracts over medical drugs. What information regarding herbal extracts should the nurse provide to the client? Select all that apply

a) No herbal diuretic should be taken unless approved by the PHCP

b) Some herbal extracts have been associated with renal damage

c) Herbal Extracts are more effective than caffeine

d) Most plant and herbal extracts available as diuretics are nontoxic

e) Consume diuretic teas like juniper berries

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Nursing Process—Client Receiving a Diuretic #1

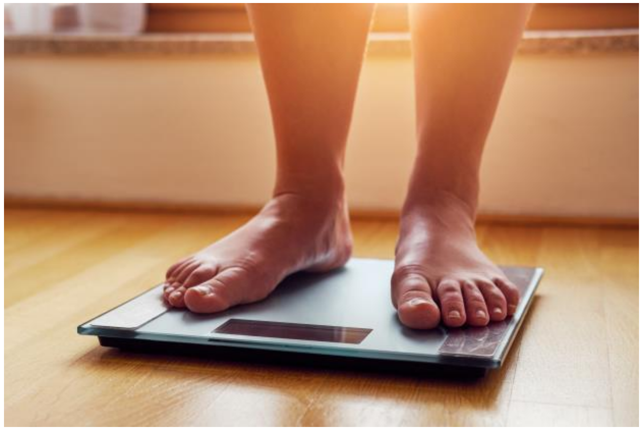
- **Preadministration Assessment**
- **Objective** Data
  - Vital signs
  - Weight
  - Description of edema and skin turgor
  - Description of lung sounds and effort of breathing
  - Body circumference measurements for peripheral edema on extremities
  - Input and output
  - Laboratory tests: Electrolytes
    - Hepatic and renal function tests

Nursing Process—Client Receiving a Diuretic #2

- **Preadministration Assessment (continued)**
- **Subjective** Data
  - Ability to engage in toilet activities with increased urination; ambulation difficulty
  - Medical history of fluid status conditions
  - Family history of diseases effecting fluid
  - Current list of all drugs; diuretics taken in the past

Nursing Process—Client Receiving a Diuretic #3

- **Ongoing Assessment**
  - Measure and record fluid intake and output
  - Report to the primary health care provider any marked decrease in the fluid output
  - Weigh the client daily
  - With an outpatient client, ensure client understands to monitor weight daily, and contact provider based on established parameters



Nursing Process—Client Receiving a Diuretic #4

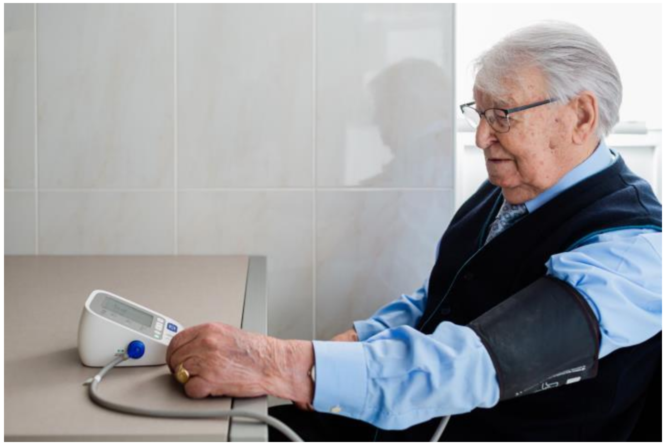
- **Nursing Diagnosis**
  - Increased Urinary Frequency related to action of the diuretics causing increased bladder filling
  - Hypovolemia/Dehydration related to excessive diuresis secondary to the administration of a diuretic
  - Injury Risk related to lightheadedness, dizziness, or cardiac arrhythmias

Nursing Process—Client Receiving a Diuretic #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 a Diuretic #6

- **Implementation**
  - Promoting Optimal Response to Therapy
  - **Client with Hypertension**
    - On and outpatient basis, client should be instructed to monitor their blood pressure and pulse
    - On an inpatient basis, vital signs are monitored frequently



Nursing Process—Client Receiving a Diuretic #7

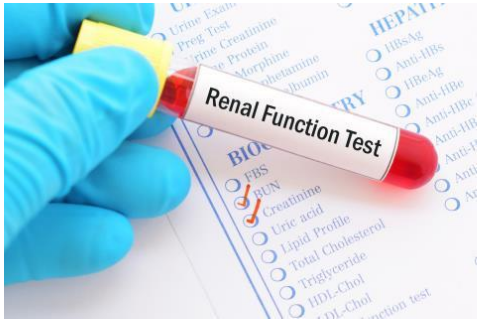
- **Implementation**
  - Promoting Optimal Response to Therapy
  - **Client with Edema**
    - Weigh the client daily
    - Assess the blood pressure, pulse, respiratory rate every 4 hours or more frequently
    - Assess fluid intake and output every 8 hours or more frequently if needed
    - Examine areas of edema daily and record findings in the client's chart
    - Monitor general appearance of area with edema

Nursing Process—Client Receiving a Diuretic #8

- **Implementation**
  - Promoting Optimal Response to Therapy
  - **Client with Increased Intracranial Pressure (Mannitol)**
    - Mannitol is given via IV; inspect solution prior to administration; give at rate to maintain urinary output of 30 to 50 mL/hr
    - Monitor the urine output, blood pressure, pulse, and respiratory rate
    - Perform neurologic assessments at specific time intervals
    - Monitor for signs and symptoms indicating decrease in intracranial pressure

Nursing Process—Client Receiving a Diuretic #9

- **Implementation**
  - Promoting Optimal Response to Therapy
  - **Client with Renal Compromise (Thiazide Diuretics)**
    - Monitor renal function periodically
    - Monitor nonprotein nitrogen, BUN, serum uric acid concentrations and serum glucose concentration periodically
    - Monitor for any joint pain or discomfort



Pharmacology in Practice Exercise #3

- A nurse is caring for a client with renal dysfunction. The PHCP has prescribed a metolazone drug for the client. What should the nurse monitor in the client before administering the drug? Select all that apply.

a) Serum cholesterol levels

b) Levels of serum electrolytes

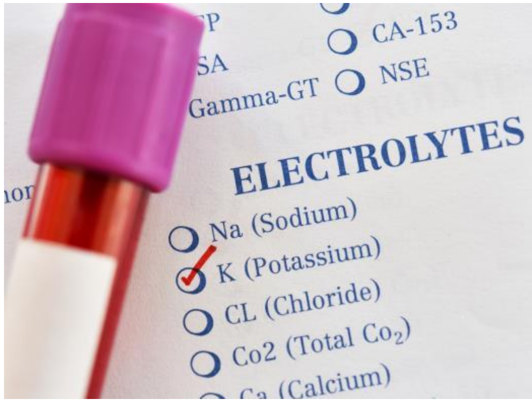
c) Fluid loss every hour

d) Creatinine clearance levels

e) Blood urea nitrogen levels

Nursing Process—Client Receiving a Diuretic #10

- **Implementation**
  - Promoting Optimal Response to Therapy
  - **Client at Risk of Electrolyte Balances**
    - Monitor for signs and symptoms of electrolyte imbalances
    - Monitor potassium level in clients taking potassium-sparing diuretics frequently; if serum potassium >5.3 mEq/mL the diuretic is stopped and contact provider



Nursing Process—Client Receiving a Diuretic #11

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Increased Urinary Frequency**
      - Explain the purpose and effects of the drug to enhance understanding, adherence to drug therapy, and reduce anxiety
      - Administer the drug early in the day
      - Make sure that client on bed rest has a call light and a bedpan or urinal within easy reach

Nursing Process—Client Receiving a Diuretic #12

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Hypovolemia/Dehydration**
      - Encourage clients to eat and drink all food and fluids served at mealtime (potassium rich foods if on a potassium if indicated)
      - Encourage fluids at frequent intervals throughout the day
      - Monitor fluid intake and output

Nursing Process—Client Receiving a Diuretic #13

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Hypovolemia/Dehydration**
      - Assess for signs and symptoms of dehydration or electrolyte imbalance
        - Dry mouth, thirst, weakness, lethargy, drowsiness, restlessness, muscle pains or cramps, confusion, GI disturbances, hypotension, oliguria, tachycardia, and seizures
      - Notify health care provider if urinary output is low, if urine is concentrated, or for signs and symptoms of electrolyte imbalance or dehydration

Nursing Process—Client Receiving a Diuretic #14

- **Implementation**
  - Monitoring and Managing Client Needs
    - **Injury Risk**
      - Frequently monitor pulse rate and rhythm
      - Report any significant changes in pulse rate or rhythm to the provider
      - Assist clients who are dizzy but allowed out of bed with ambulatory activities

Nursing Process—Client Receiving a Diuretic #15

- **Implementation—Educating the** Client and Family
  - Explain the importance of taking the drug at prescribed time intervals and as directed
  - Advise about the importance of completing the entire course of treatment
  - Emphasize the importance of taking the drug with food or milk if GI upset occurs
  - Advise the client to take the drug early in the morning unless the provider directed otherwise

Nursing Process—Client Receiving a Diuretic #16

- **Implementation—Educating the** Client and Family (continued)
  - Do not reduce fluid intake to reduce the need to urinate
  - Instruct client to avoid alcohol and nonprescription drugs
  - Emphasize observing caution while driving or performing hazardous tasks
  - Explain necessary interventions if dizziness or weakness or signs of dehydration or electrolyte imbalance occurs; notify provider

Nursing Process—Client Receiving a Diuretic #17

- **Implementation—Educating the** Client and Family (continued)
  - Instruct client to weigh themselves daily and track their weight; notify provider if weight loss or gain exceeds 3 to 5 pounds in a week.
  - If foods or fluids high in potassium are recommended by the provider, educate the client about potassium-rich food and fluid sources; caution client not to exceed daily recommended amount
  - Explain the importance of avoiding exposure to sunlight or ultraviolet light

Nursing Process—Client Receiving a Diuretic #18

- **Implementation—Educating the** Client and Family (continued)
  - Explain to clients with diabetes mellitus and who take loop or thiazide diuretics to contact health care provider if increase in blood glucose level
  - Clients on potassium-sparing diuretics: teach clients to avoid eating foods or drinking fluids high in potassium
  - Clients on thiazide diuretics: explain the necessity of contacting the primary health care provider if sudden joint pain occurs
  - Clients on carbonic anhydrase inhibitors: explain the necessity of contacting the primary health care provider immediately if eye pain is not relieved or increased; if be being used for a client with seizures, all seizures should be documented

Nursing Process—Client Receiving a Diuretic #19

- **Evaluation**
  - Was the therapeutic effect achieved and did diuresis occur?
  - Were adverse reactions: identified, reported, and managed?
    - Urinary elimination occurs without incident
    - Fluid volume problems are corrected
    - No injury is evident
  - Did client and family express confidence and demonstrate understanding of drug regimen?

Turn and Talk—Case Study

- A client is admitted to the hospital for treatment of significant edema associated with heart failure. The physician has ordered furosemide (Lasix) IV 1 mg/kg every 6 hours

1. The client weighs 150 pounds, how many milliliters should the nurse administer every 6 hours if furosemide is available in a 20-mg/mL vial?
2. During the administration of furosemide, what adverse reactions should the nurse monitor with the client?
3. The use of furosemide can result in hypokalemia. What are the signs of hypokalemia?