

Heart Failure and Pulmonary Edema

Heart failure occurs when the heart muscle is unable to pump effectively, resulting in inadequate cardiac output, myocardial hypertrophy, and pulmonary/systemic congestion. The heart is unable to maintain adequate circulation to meet tissue needs.

Heart failure is the result of an acute or chronic cardiopulmonary problem, such as systemic hypertension, myocardial infarction (MI), pulmonary hypertension, dysrhythmias, valvular heart disease, pericarditis, or cardiomyopathy. (32.1)

Pulmonary edema is a severe, life-threatening accumulation of fluid in the alveoli and interstitial spaces of the lung that can result from severe heart failure.

Heart failure

New York Heart Association's functional classification scale

The severity of heart failure is graded on the New York Heart Association's (NYHA) functional classification scale indicating the level of activity it takes to make the client symptomatic (chest pain or shortness of breath).

CLASS I: Client exhibits no symptoms with activity.

CLASS II: Client has symptoms with ordinary exertion.

CLASS III: Client displays symptoms with minimal exertion.

CLASS IV: Client has symptoms at rest.

American College of Cardiology and American Heart Association staging heart failure

American College of Cardiology and American Heart Association developed an evidence-based guidelines for staging and managing heart failure in comparison with the NYHA system.

A: High risk for developing heart failure

B: Cardiac structural abnormalities or remodeling but no heart failure symptoms

C: Current or prior symptoms of heart failure

D: Refractory end-stage heart failure

Low-output heart failure

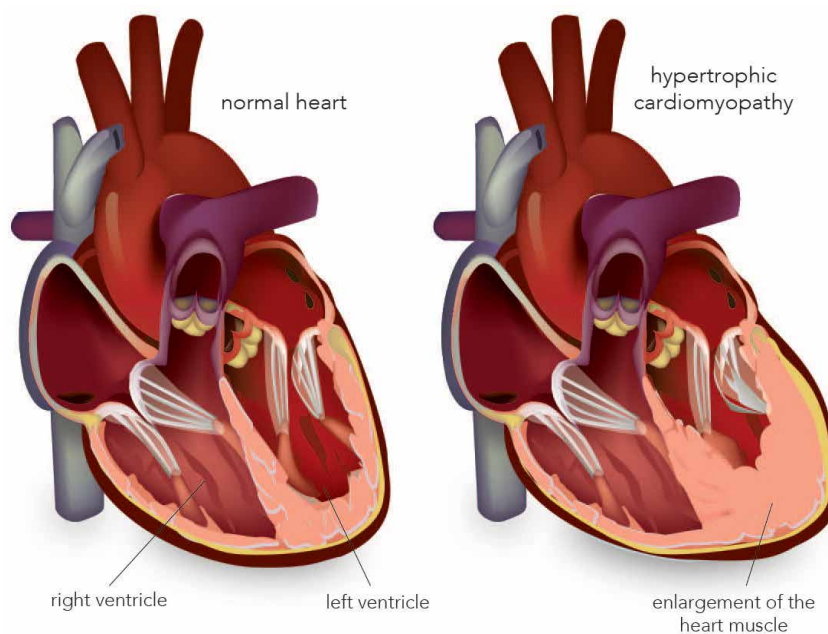
Low-output heart failure can initially occur on either the left or right side of the heart.

- Left-sided heart (ventricular) failure results in inadequate left ventricle (cardiac) output and consequently in inadequate tissue perfusion.
 - Systolic heart (ventricular) failure (ejection fraction below 40%, pulmonary and systemic congestion)
 - Diastolic heart (ventricular) failure (inadequate relaxation or “stiffening” prevents ventricular filling)
- Right-sided heart (ventricular) failure results in inadequate right ventricle output and systemic venous congestion (peripheral edema).

High-output heart failure

An uncommon form of heart failure is high-output failure, in which cardiac output is normal or above normal.

32.1 Cardiomyopathy



HEALTH PROMOTION AND DISEASE PREVENTION

- Maintain an exercise routine to remain physically active, and consult with the provider before starting any exercise regimen.
- Consume a diet low in sodium, along with fluid restrictions, and consult with the provider regarding diet specifications.
- Refrain from smoking.
- Follow medication regimen, and follow up with the provider as needed.

ASSESSMENT

RISK FACTORS

- Systolic blood pressure is elevated in older adults, putting them at risk for coronary artery disease and heart failure. ☹
- Some medications can increase the risk of heart failure or worsen manifestations in older adult clients.

Left-sided heart (ventricular) failure

- Hypertension
- Coronary artery disease, angina, MI
- Valvular disease (mitral and aortic)

Right-sided heart (ventricular) failure

- Left-sided heart (ventricular) failure
- Right ventricular MI
- Pulmonary problems (COPD, pulmonary fibrosis)

High-output heart failure

- Increased metabolic needs
- Septicemia (fever)
- Anemia
- Hyperthyroidism

Cardiomyopathy

- Coronary artery disease
- Infection or inflammation of the heart muscle
- Various cancer treatments
- Prolonged alcohol use
- Heredity

EXPECTED FINDINGS

The presence of other chronic illnesses (lung disease, kidney failure) can mask the presence of heart failure in older adult clients. ☹

Left-sided failure

- Dyspnea, orthopnea (shortness of breath while lying down), nocturnal dyspnea
- Fatigue
- Displaced apical pulse (hypertrophy)
- S₃ heart sound (gallop)
- Pulmonary congestion (dyspnea, cough, bibasilar crackles)
- Frothy sputum (can be blood-tinged)
- Altered mental status
- Manifestations of organ failure, such as oliguria (decrease in urine output)

Right-sided failure

- Jugular vein distention
- Ascending dependent edema (legs, ankles, sacrum)
- Abdominal distention, ascites
- Fatigue, weakness
- Nausea and anorexia
- Polyuria at rest (nocturnal)
- Liver enlargement (hepatomegaly) and tenderness
- Weight gain

Cardiomyopathy (leading to heart failure)

Blood circulation to the lungs is impaired when the cardiac pump is compromised. (32.1)

FOUR TYPES

- Dilated (most common)
- Hypertrophic
- Arrhythmogenic right ventricular
- Restrictive

MANIFESTATIONS

- Fatigue, weakness
- Heart failure (left with dilated type, right with restrictive type)
- Dysrhythmias (heart block)
- S₃ gallop
- Cardiomegaly (enlarged heart), more severe with dilated type
- Angina (hypertrophic type)

LABORATORY TESTS

Human B-type natriuretic peptides (hBNP)

In clients who have dyspnea, elevated hBNP confirms a diagnosis of heart failure rather than a problem originating in the respiratory system. hBNP levels direct the aggressiveness of treatment interventions.

- Less than 100 pg/mL indicates no heart failure.
- 100 to 300 pg/mL suggests heart failure is present.
- Greater than 300 pg/mL indicates mild heart failure.
- Greater than 600 pg/mL indicates moderate heart failure.
- Greater than 900 pg/mL indicates severe heart failure.

DIAGNOSTIC PROCEDURES

Hemodynamic monitoring

- Heart failure generally results in increased central venous pressure (CVP), increased pulmonary wedge pressure (PAWP), increased pulmonary artery pressure (PAP), and decreased cardiac output (CO). See **CHAPTER 30: INVASIVE CARDIOVASCULAR PROCEDURES** for detailed information related to hemodynamic monitoring.
- Mixed venous oxygen saturation (SvO₂) is directly related to cardiac output. A drop in SvO₂ indicates worsening cardiac function.

Ultrasound

Two-dimensional or three-dimensional ultrasound (also called cardiac ultrasound or echocardiogram) is used to measure the systolic and diastolic functioning of the heart.

Left ventricular ejection fraction: The volume of blood pumped from the left ventricle into the arteries upon each beat. Expected reference range is 55% to 70%.

Right ventricular ejection fraction: The volume of blood pumped from the right ventricle to the lungs upon each beat. Expected reference range is 45% to 60%.

Transesophageal echocardiography (TEE)

Uses a transducer placed in the esophagus behind the heart to obtain a detailed view of cardiac structures. The nurse prepares the client for a TEE in the same manner as for an upper endoscopy.

Chest x-ray

A chest x-ray can reveal cardiomegaly and pleural effusions.

ECG, cardiac enzymes, electrolytes, and ABGs

Electrocardiogram (ECG), cardiac enzymes, electrolytes, and ABGs are used to assess factors contributing to heart failure and/or the impact of heart failure.

PATIENT-CENTERED CARE

NURSING CARE

- Monitor daily weight and I&O.
- Assess for shortness of breath and dyspnea on exertion.
- Administer oxygen as prescribed.
- Monitor vital signs and hemodynamic pressures.
- Position the client to maximize ventilation (high-Fowler's).
- Check ABGs, electrolytes (especially potassium if on diuretics), SaO₂, and chest x-ray findings.
- Assess for signs of medication toxicity (digoxin toxicity).
- Encourage bed rest until the client is stable.
- Encourage energy conservation by assisting with care and ADLs.
- Maintain dietary restrictions as prescribed (restricted fluid intake, restricted sodium intake).
- Provide emotional support to the client and family.

MEDICATIONS

Herbal medications can stimulate the cardiovascular system. Obtain a list of herbal supplements the client takes, and advise the client of potential contraindications. **QEBP**

Diuretics

Diuretics are used to decrease preload.

Loop diuretics, such as furosemide and bumetanide

Thiazide diuretics, such as hydrochlorothiazide

Potassium-sparing diuretics, such as spironolactone

NURSING CONSIDERATIONS

- Administer furosemide IV no faster than 20 mg/min.
- Loop and thiazide diuretics can cause hypokalemia, and potassium supplementation can be required.

CLIENT EDUCATION: Teach clients taking loop or thiazide diuretics to ingest foods and drinks that are high in potassium to counter the effects of hypokalemia. **Qs**

Afterload-reducing agents

Afterload-reducing agents help the heart pump more easily by altering the resistance to contraction. These are contraindicated for clients who have renal deficiency.

Angiotensin-converting enzyme (ACE) inhibitors, such as enalapril and captopril

Angiotensin receptor II blockers, such as losartan

Calcium channel blockers, such as diltiazem and nifedipine

Phosphodiesterase-3 inhibitors, such as milrinone

NURSING CONSIDERATIONS

- Monitor clients taking ACE inhibitors for hypotension following the initial dose.
- ACE inhibitors can cause angioedema (swelling of the tongue and throat), decreased sense of taste, or skin rash.
- Monitor for increased levels of potassium.

CLIENT EDUCATION: ACE INHIBITORS

- Inform the client that this medication can cause a dry cough.
- Notify the provider if the client observes a rash or has a decreased sense of taste.
- Notify the provider if swelling of the face or extremities occurs.
- Remind the client that blood pressure needs to be monitored for 2 hr after the initial dose to detect hypotension.

Inotropic agents

Inotropic agents, such as digoxin, dopamine, dobutamine, and milrinone, are used to increase contractility and thereby improve cardiac output.

NURSING CONSIDERATIONS

- For a client taking digoxin, take the apical heart rate for 1 min. Hold the medication if apical pulse is less than 60/min, and notify the provider.
- Observe the client for nausea and vomiting.
- Dopamine, dobutamine, and milrinone are administered via IV. The ECG, blood pressure, and urine output must be closely monitored.

CLIENT EDUCATION

Teach clients who are self-administering digoxin to:

- Count pulse for 1 min before taking the medication. If the pulse rate is irregular or the pulse rate is outside of the limitations set by the provider (usually less than 60/min or greater than 100/min), instruct the client to hold the dose and contact the provider. **Qs**
- Take the digoxin dose at the same time each day.
- Do not take digoxin at the same time as antacids. Separate the two medications by at least 2 hr.
- Report signs of toxicity, including fatigue, muscle weakness, confusion, and loss of appetite.
- Regularly have digoxin and potassium levels checked.

Beta-adrenergic blockers (beta-blockers)

Medications such as carvedilol and metoprolol can be used to improve the condition of the client who has sustained increased levels of sympathetic stimulation and catecholamines. This includes clients who have chronic heart failure.

NURSING CONSIDERATIONS

- Monitor blood pressure, pulse, activity tolerance, and orthopnea.
- Check orthostatic blood pressure readings.

CLIENT EDUCATION

- Instruct the client to weigh daily.
- Advise the client to regularly check blood pressure.
- Tell the client to follow the provider's instructions for increasing medication dosage.

Vasodilators

Nitroglycerin and isosorbide mononitrate prevent coronary artery vasospasm and reduce preload and afterload, decreasing myocardial oxygen demand.

NURSING CONSIDERATIONS

- Vasodilators are given to treat angina and help control blood pressure.
- Use cautiously with other antihypertensive medications.
- Vasodilators can cause orthostatic hypotension.

CLIENT EDUCATION

- Remind the client that a headache is a common side effect of this medication.
- Encourage the client to sit and lie down slowly.

Human B-type natriuretic peptides

hBNPs, such as nesiritide, are used to treat acute heart failure by causing natriuresis (loss of sodium and vasodilation). They are administered IV.

NURSING CONSIDERATIONS

- hBNPs can cause hypotension, as well as a number of cardiac effects, including ventricular tachycardia and bradycardia.
- BNP levels will increase while on this medication.
- Monitor ECG, blood pressure, and other parameters.

CLIENT EDUCATION

- The client can be asymptomatic with a low blood pressure.
- Remind the client to sit and lie down slowly.

Anticoagulants

Anticoagulants, such as warfarin, can be prescribed if the client has a history of thrombus formation.

NURSING CONSIDERATIONS

- Assess for contraindications: active bleeding, peptic ulcer disease, history of cerebrovascular accident, and recent trauma.
- Monitor bleeding times: PT, aPTT, INR, and CBC.

CLIENT EDUCATION

- Remind the client of the risk for bruising and bleeding while on this medication.
- Instruct the client to have blood monitored routinely to check bleeding times.

INTERPROFESSIONAL CARE

Cardiology and pulmonary services should be consulted to manage heart failure.

Respiratory services should be consulted for inhalers, breathing treatments, and suctioning for airway management.

Cardiac rehabilitation services can be consulted if the client has prolonged weakness and needs assistance with increasing level of activity.

Nutritional services can be consulted for diet modification to promote low-sodium, and low-saturated fat food choices.

THERAPEUTIC PROCEDURES

Ventricular assist device (VAD)

A VAD is a mechanical pump that assists a heart that is too weak to pump blood through the body. It is used in clients who are eligible for heart transplants or who have severe end-stage heart failure and are not candidates for heart transplants. Heart transplantation is the treatment of choice for clients who have severe dilated cardiomyopathy.

NURSING ACTIONS

- Prepare the client for the procedure (NPO status and informed consent).
- Monitor postoperatively: vital signs, SaO₂, incision drainage, and pain management.

Heart transplantation

- Heart transplantation is a possible option for clients who have end-stage heart failure. Immunosuppressant therapy is required post-transplantation to prevent rejection.
- Eligibility for transplantation depends on several factors, including life expectancy, age, psychosocial status, and absence of drug and alcohol use disorders.

NURSING ACTIONS

- Prepare the client for the procedure (NPO status and informed consent). Laboratory reports and results of diagnostic testing should be available as prescribed.
- Monitor postoperatively: vital signs, SaO₂, incision drainage, and pain management.
- Monitor for complications. Organ transplant recipients are at risk for infection, thrombosis, and rejection. See **CHAPTER 58: KIDNEY TRANSPLANT** for details related to these complications.

CLIENT EDUCATION: Instruct the client to:

- Take medications as prescribed.
- Take diuretics in the early morning and early afternoon.
- Maintain fluid and sodium restriction: a dietary consult can be useful.
- Increase dietary intake of potassium (cantaloupe or bananas) if the client is taking potassium-losing diuretics, such as loop and thiazide diuretics.
- Check weight daily at the same time, and notify the provider for a weight gain of 2 lb in 24 hr or 5 lb in 1 week.
- Schedule regular follow-up visits with the provider.
- Get vaccinations (pneumococcal and yearly influenza vaccines).

COMPLICATIONS

Acute pulmonary edema

Acute pulmonary edema is a life-threatening medical emergency.

EXPECTED FINDINGS: anxiety, tachycardia, acute respiratory distress, dyspnea at rest, change in level of consciousness, and an ascending fluid level within the lungs (crackles, cough productive of frothy, blood-tinged sputum).

NURSING ACTIONS

- Administer prescribed medications to improve cardiac output.
- Teach the client about measures to improve tolerance to activity, such as alternating periods of activity with periods of rest.
- Prompt response to this emergency includes the following.
 - Positioning the client in high-Fowler's position.
 - Administration of oxygen, positive airway pressure, and/or intubation and mechanical ventilation.
 - IV morphine (to decrease anxiety, respiratory distress, and decrease venous return).
 - IV administration of rapid-acting loop diuretics, such as furosemide.
 - Effective intervention should result in diuresis (carefully monitor output), reduction in respiratory distress, improved lung sounds, and adequate oxygenation.

Cardiogenic shock

This is a serious complication of pump failure that occurs commonly following an MI and injury to greater than 40% of the left ventricle.

EXPECTED FINDINGS: include tachycardia, hypotension, inadequate urinary output, altered level of consciousness, respiratory distress (crackles, tachypnea), cool, clammy skin, decreased peripheral pulses, and chest pain.

NURSING ACTIONS

- Monitor breath sounds. Assess for crackles or wheezing.
- Monitor heart sounds.
- Administration of oxygen, intubation, and ventilation can be required.
- Administer IV morphine, diuretics, and/or nitroglycerin to decrease preload. Administer IV vasopressors and/or positive inotropes to increase cardiac output and maintain organ perfusion.
- Provide continuous hemodynamic monitoring.

Pericardial tamponade

Cardiac tamponade can result from fluid accumulation in the pericardial sac.

EXPECTED FINDINGS: include hypotension, jugular venous distention, muffled heart sounds, and paradoxical pulse (variance of 10 mm Hg or more in systolic blood pressure between expiration and inspiration).

DIAGNOSTIC PROCEDURES: Hemodynamic monitoring will reveal intracardiac and pulmonary artery pressures similar and elevated (plateau pressures).

NURSING ACTIONS

- Notify the provider immediately.
- Administer IV fluids to combat hypotension as prescribed while monitoring for fluid overload.
- Obtain a chest x-ray or echocardiogram to confirm diagnosis.
- Prepare the client for pericardiocentesis (informed consent, gather materials, administer medications as appropriate).
- Monitor hemodynamic pressures as they normalize.
- Monitor heart rhythm; changes indicate improper positioning of the needle.
- Monitor for reoccurrence of findings after the procedure.

Pulmonary edema

Cardiogenic factors are the most common cause of pulmonary edema. It is a complication of various heart and lung diseases and usually occurs from increased pulmonary vascular pressure secondary to severe cardiac dysfunction.

Noncardiac pulmonary edema can occur due to barbiturate or opiate overdose, inhalation of irritating gases, rapid administration of IV fluids, and after a pneumonectomy evacuation of pleural effusion.

Neurogenic pulmonary edema develops following a head injury.

OLDER ADULTS: Increased risk for pulmonary edema occurs related to decreased cardiac output and heart failure. ☹

- Increased risk for fluid and electrolyte imbalances occurs when the older adult client receives treatment with diuretics.
- For older adults, IV infusions must be administered at a slower rate to prevent circulatory overload.

HEALTH PROMOTION AND DISEASE PREVENTION

- Maintain an exercise routine to remain physically active, and consult with the provider before starting any exercise regimen.
- Consume a diet low in sodium along with fluid restrictions, and consult with the provider regarding diet specifications.
- Refrain from smoking.
- Follow medication regimen, and follow up with the provider as needed.

ASSESSMENT

RISK FACTORS

- Acute MI 
- Fluid volume overload
- Hypertension
- Valvular heart disease
- Postpneumonectomy
- Postevacuation of pleural effusion
- Acute respiratory failure
- Left-sided heart failure
- High altitude exposure or deep-sea diving
- Trauma
- Sepsis
- Drug overdose

EXPECTED FINDINGS

- Anxiety
- Inability to sleep
- Persistent cough with pink, frothy sputum (cardinal sign)
- Tachypnea, dyspnea, and orthopnea
- Hypoxemia (SaO₂ expected reference range greater than 95%)

- Cyanosis (later stage)
- Crackles
- Tachycardia
- Reduced urine output
- Confusion, stupor
- S₃ heart sound (gallop)
- Increased pulmonary artery occlusion pressure

PATIENT-CENTERED CARE

NURSING CARE

- Monitor vital signs every 15 min until stable.
- Monitor intake and output.
- Monitor hemodynamic status (pulmonary wedge pressures, cardiac output).
- Check ABGs, electrolytes (especially potassium if on diuretics), SaO₂, and chest x-ray findings.
- Maintain a patent airway. Suction as needed.
- Position the client in high-Fowler's position with feet and legs dependent or sitting on the side of the bed to decrease preload.
- Administer oxygen using a high-flow rebreather mask. Bilevel positive airway pressure or intubation/ventilation can become necessary. Be prepared to intervene quickly.
- Restrict fluid intake (slow or discontinue infusing IV fluids).
- Monitor hourly urine output. Watch for intake greater than output or hourly urine less than 30 mL/hr.

MEDICATIONS

Rapid-acting diuretics, such as furosemide and bumetanide, promote fluid excretion.

Morphine decreases sympathetic nervous system response and anxiety and promotes mild vasodilation.

Vasodilators (nitroglycerin, sodium nitroprusside) decrease preload and afterload.

Inotropic agents, such as digoxin and dobutamine, improve cardiac output.

Antihypertensives, such as ACE inhibitors and beta-blockers, decrease afterload

CLIENT EDUCATION

- Provide emotional support for the client and family.
- Instruct the client on effective breathing techniques.
- Instruct the client on medications.
- Stress the importance of continuing to take medications even if the client is feeling better.
- Teach common adverse effects of medications, and reasons to contact the provider.
- Instruct the client on a low-sodium diet and fluid restriction.
- The client should measure weight daily at the same time. Notify the provider of a gain of more than 2 lb in 1 day or 5 lb in 1 week.
- Instruct the client to report swelling of feet or ankles or any shortness of breath or angina.

Application Exercises

1. A nurse is caring for a client who has heart failure and reports increased shortness of breath. The nurse increases the client's oxygen per protocol. Which of the following actions should the nurse take first?
 - A. Obtain the client's weight.
 - B. Assist the client into high-Fowler's position.
 - C. Auscultate lungs sounds.
 - D. Check oxygen saturation with pulse oximeter.
2. A nurse is teaching a client who has heart failure about the need to limit sodium in the diet to 2,000 mg daily. Which of the following foods should the nurse recommend for the client? (Select all that apply.)
 - A. 1 slice cheddar cheese
 - B. 1 medium beef hot dog
 - C. 3 oz Atlantic salmon
 - D. 3 oz roasted chicken breast
 - E. 2 oz lean baked ham
3. A nurse is completing the admission assessment of a client who has suspected pulmonary edema. Which of the following manifestation are expected findings? (Select all that apply.)
 - A. Tachypnea
 - B. Persistent cough
 - C. Increased urinary output
 - D. Thick, yellow sputum
 - E. Orthopnea
4. A nurse is completing discharge teaching with a client who has heart failure and is encouraged to increase potassium in his diet. Which of the following food selections should the nurse include as having the highest source of potassium?
 - A. 1 medium apple
 - B. 1 medium baked potato
 - C. 1 slice toast with 1 tbsp peanut butter
 - D. 1 large scrambled egg
5. A nurse is providing discharge teaching for a client who has heart failure and is on a fluid restriction of 2,000 mL/day. The client asks the nurse how to determine the appropriate amount of fluids he is allowed. Which of the following statements is an appropriate response by the nurse?
 - A. "Pour the amount of fluid you drink into an empty 2-liter bottle to keep track of how much you drink."
 - B. "Each glass contains 8 ounces. There are 30 milliliters per ounce, so you can have a total of 8 glasses or cups of fluid each day."
 - C. "This is the same as 2 quarts, or about the same as two pots of coffee."
 - D. "Take sips of water or ice chips so you will not take in too much fluid."

PRACTICE Active Learning Scenario

A nurse in a cardiac rehabilitation program is teaching a class on heart failure to a group of clients. What should the nurse include in this presentation? Use the ATI Active Learning Template: System Disorder to complete this item.

ALTERATION IN HEALTH (DIAGNOSIS): Describe the difference between left- and right-sided heart failure.

LABORATORY TESTS: Describe one and its importance.

DIAGNOSTIC PROCEDURES: Describe two.

MEDICATIONS: Describe two groups of medications and an example of one medication for each group.

Application Exercises Key

1. A. Obtaining the client's weight is an appropriate action. However, another action is the priority.
B. **CORRECT:** Using the airway, breathing, and circulation (ABC) priority approach to client care, the first action the nurse should take is to assist the client into high-Fowler's position. This will decrease venous return to the heart (preload) and help relieve lung congestion.
C. Auscultating lung sounds is an appropriate action. However, another action is the priority.
D. Checking oxygen saturation is an appropriate action. However, another action is the priority.
N NCLEX® Connection: Physiological Adaptation, Medical Emergencies
2. A. **CORRECT:** One slice cheddar cheese contains 180 mg sodium.
B. A medium beef hot dog contains 557 mg sodium. Foods should be less than 300 mg per serving for a 2,000 mg sodium-restricted diet.
C. **CORRECT:** Three ounces Atlantic salmon contains 37 mg sodium.
D. **CORRECT:** Three ounces roasted chicken breast contains 62 mg sodium.
E. Two ounces lean baked ham contains 782 mg sodium. Foods should be less than 300 mg per serving for a 2,000 mg sodium-restricted diet.
N NCLEX® Connection: Basic Care and Comfort, Nutrition and Oral Hydration
3. A. **CORRECT:** Tachypnea is an expected finding in a client who has pulmonary edema.
B. **CORRECT:** A persistent cough with pink, frothy sputum is an expected finding in a client who has pulmonary edema.
C. Decreased urinary output is an expected finding in a client who has pulmonary edema.
D. Pink, frothy sputum is an expected finding in a client who has pulmonary edema.
E. **CORRECT:** Orthopnea is an expected finding in a client who has pulmonary edema.
N NCLEX® Connection: Physiological Adaptation, Pathophysiology
4. A. One medium apple contains 195 mg potassium. The nurse should recommend a different food because another choice contains more potassium.
B. **CORRECT:** A medium baked potato is the best food source of potassium because it contains 926 mg potassium per serving.
C. One slice toast with 1 tbsp peanut butter contains 148 mg potassium per serving. Another choice contains more potassium.
D. One large egg scrambled contains 81 mg potassium per serving. Another choice that contains more potassium.
N NCLEX® Connection: Basic Care and Comfort, Nutrition and Oral Hydration
5. A. **CORRECT:** Pouring the amount of fluid consumed into an empty 2 L bottle provides a visual guide for the client as to the amount consumed and how to plan daily intake.
B. Glasses and cups vary in size and can contain more than 8 oz.
C. Offering a vague frame of reference does not assist with accurate fluid measurement.
D. Suggesting that the client take sips of water or ice chips does not assist with accurate fluid measurement.
N NCLEX® Connection: Basic Care and Comfort, Nutrition and Oral Hydration

PRACTICE Answer

Using the ATI Active Learning Template: System Disorder

ALTERATION IN HEALTH (DIAGNOSIS): Left-sided heart failure results in inadequate output from the left ventricle, leading to poor tissue perfusion. Systolic failure includes an ejection fraction below 40% with pulmonary and systemic congestion. Diastolic failure includes stiffening or inadequate relaxation of the ventricle. Right-sided heart failure results in inadequate output from the right ventricle, leading to systemic venous congestion and peripheral edema.

LABORATORY TESTS: Human B-type natriuretic peptides (hBNP) confirms a diagnosis of heart failure, and findings direct the aggressiveness of the treatment.

DIAGNOSTIC PROCEDURES

- Hemodynamic monitoring
- Ultrasound
- Chest x-ray
- Electrocardiogram

MEDICATIONS

- Diuretics: furosemide, bumetanide, hydrochlorothiazide, spironolactone
- Afterload-reducing agents: enalapril, captopril, losartan, diltiazem, nifedipine, milrinone

N NCLEX® Connection: Physiological Adaptation, Alterations in Body Systems