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Caring for the Client with Disorders of the Respiratory System

Terms you'll need to understand:

- ✓ Acute respiratory failure
- ✓ Apnea
- ✓ Asthma
- ✓ Atelectasis
- ✓ Bronchitis
- ✓ Continuous positive airway pressure (CPAP)
- ✓ Cor pulmonale
- ✓ Cyanosis
- ✓ Dyspnea
- ✓ Emphysema
- ✓ Empyema
- ✓ Hemoptysis
- ✓ Hypoxemia
- ✓ Hypoxia
- ✓ Pleural effusion
- ✓ Pleurisy
- ✓ Pneumonia
- ✓ Pulmonary embolus
- ✓ Tachypnea

Nursing skills you'll need to master:

- ✓ Assessing breath sounds
- ✓ Providing tracheostomy care
- ✓ Collecting sputum
- ✓ Teaching proper use of an inhaler
- ✓ Performing postural drainage
- ✓ Assisting with thoracentesis
- ✓ Obtaining a throat culture
- ✓ Performing venopuncture
- ✓ Administering medication
- ✓ Managing chest tubes
- ✓ Maintaining oxygen therapy

Acute Respiratory Failure

Acute respiratory failure can be defined as the lungs' failure to meet the body's oxygen requirements. Two acute respiratory conditions you need to be familiar with are ARDS and RDS.

Acute Respiratory Distress Syndrome

Acute respiratory distress syndrome, commonly known as *ARDS* or *non-cardiogenic pulmonary edema*, occurs mostly in otherwise healthy persons. ARDS can be the result of anaphylaxis, aspiration, pulmonary emboli, inhalation burn injury, or complications from abdominal or thoracic surgery. ARDS may be diagnosed by a chest x-ray that will reveal emphysematous changes and infiltrates that give the lungs a characteristic appearance described as ground glass. Assessment of the client with ARDS reveals

- ▶ Hypoxia
- ▶ Sternal and costal retractions
- ▶ Presence of rales or rhonchi
- ▶ Diminished breath sounds
- ▶ Refractory hypoxemia

Care of the client with ARDS involves

- ▶ Use of assisted ventilation
- ▶ Monitoring of arterial blood gases
- ▶ Attention to nutritional needs
- ▶ Frequent change in position, placement in high Fowler's position, prone positioning, or use of specialized beds to minimize consolidation of infiltrates in large airways
- ▶ Investigational therapies, include the use of vitamins C and E, aspirin, interleukin, and surfactant replacements

Respiratory Distress Syndrome

Respiratory distress syndrome (RDS), once referred to as *hyaline membrane disease*, occurs most often in preterm infants and is the result of insufficient surfactant production. Administering dexamethasone (Decadron) 24 hours prior to delivery has been shown to be effective in speeding fetal lung maturity and may be used in cases where early delivery is unavoidable. Infants with

with RDS are placed on ventilator support and treated with surfactant replacement.

Pulmonary Embolus

Pulmonary embolus refers to the obstruction of the pulmonary artery or one of its branches by a clot or some other undissolved matter, such as fat or a gaseous substance. Clots can originate anywhere in the body but are most likely to migrate from a vein deep in the legs, pelvis, kidney, or arms. *Fat emboli* are associated with fractures of the long bones, particularly the femur. *Air emboli*, which are less common, can occur during the insertion or use of central lines. Common risk factors for the development of pulmonary embolus include immobilization, fractures, trauma, and history of clot formation.



Remember the three Fs of fat emboli:

- Fat
- Femur
- Football player

Most fat emboli come from fractured femurs; most fractured femurs occur in young men 18–25, the age of most football players.

Symptoms of a pulmonary embolus depend on the size and location of the clot or undissolved matter. Symptoms include

- Chest pain
- Dyspnea
- Syncope
- Hemoptysis
- Tachycardia
- Hypotension
- Sense of apprehension
- Petechiae over the chest and axilla
- Distended neck veins

Diagnostic tests to confirm the presence of pulmonary embolus include chest x-ray, pulmonary angiography, lung scan, and ECG to rule out myocardial infarction. Management of the client with a pulmonary embolus includes

- ▶ Placing the client in high Fowler's position
- ▶ Administering oxygen via mask
- ▶ Giving medication for chest pain
- ▶ Using thrombolytics/anticoagulants

Antibiotics are indicated for those with septic emboli. Surgical management using umbrella-type filters is indicated for those who cannot take anticoagulants as well as for the client who has recurrent emboli while taking anticoagulants. Clients receiving anticoagulant therapy should be observed for signs of bleeding. PT, INR, and PTT are three tests used to track the client's clotting time. You can refer to Chapter 13, "Caring for the Client with Disorders of the Cardiovascular System," for a more complete discussion of these tests.



Streptokinase is made from beta strep; therefore, clients with a history of strep infections may respond poorly to anticoagulant therapy with streptokinase because they might have formed antibodies.



Streptokinase is not clot specific; therefore, the client may develop a tendency to bleed from incision or injection sites.

Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease (COPD) exists when prolonged disease or injury has made the lungs less capable of meeting the body's oxygen needs. Examples of COPD include chronic bronchitis, emphysema, and asthma.

Chronic Bronchitis

Chronic bronchitis, an inflammation of the bronchi, leads to chronic lung infections. These infections are characterized by productive cough and dyspnea. Both chronic bronchitis and emphysema are the result of cigarette smoking and have similar symptoms requiring similar interventions.

Emphysema

Emphysema is the irreversible overdistention of the airspaces of the lungs, which results in destruction of the alveolar walls. Clients with emphysema are classified as *pink puffers* or *blue bloaters*. Pink puffers may complain of exertional dyspnea without cyanosis. Blue bloaters develop chronic hypoxia, cyanosis, polycythemia, cor pulmonale, pulmonary edema, and eventually respiratory failure.

Physical assessment reveals the presence of a barrel chest, use of accessory muscles, coughing with the production of thick mucoid sputum, prolonged expiratory phase with grunting respirations, peripheral cyanosis, and digital clubbing.

In identifying emphysema, a chest x-ray reveals hyperinflation of the lungs with flattened diaphragm. Pulmonary studies show that the residual volume is increased while vital capacity is decreased. Arterial blood gases reveal hypoxemia.

Many symptoms of chronic bronchitis and emphysema are the same; therefore, medications for the client with chronic bronchitis and emphysema include bronchodilators, steroids, antibiotics, and expectorants. Oxygen should be administered via nasal cannula at 2–3 liters/minute. Close attention should be given to nutritional needs, avoidance of respiratory irritants, prevention of respiratory infections, providing oral hygiene, and teaching regarding medications.

Asthma

Asthma is the most common respiratory condition of childhood. *Intrinsic (nonallergenic) asthma* is precipitated by exposure to cold temperatures or infection. *Extrinsic (allergenic or atopic) asthma* is often associated with childhood eczema. Both asthma and eczema are triggered by allergies to certain foods or food additives. Introducing new foods to the infant one at a time helps decrease the development of these allergic responses. Easily digested, hypoallergenic foods and juices should be introduced first. These include rice cereal and apple juice.

Symptoms of asthma include expiratory wheeze; shortness of breath; and a dry, hacking cough, which eventually produces thick, white, tenacious sputum. In some instances an attack may progress to status asthmaticus, leading to respiratory collapse and death.

Management of the client with asthma includes the use of bronchodilators, (xanthines and adrenergics), steroids, antibiotics, and oxygen. Maintenance medications include leukotriene modifiers and mast cell stabilizers.



When administering antibiotics, a separate IV line should be established for the administration of aminophylline—a bronchodilator—because incompatibilities can exist with some antibiotics and the administration of a bronchodilator. If only one access is established, then the SAS (saline, administer drug, saline) procedure should be used.



The client receiving aminophylline should be placed on cardio-respiratory monitoring because aminophylline affects heart rate, respiratory rate, and blood pressure. In this scenario, toxicity can occur rapidly. Toxic symptoms include nausea, vomiting, tachycardia, palpitations, hypotension, shock, coma, and death.



The therapeutic range for aminophylline is as follows:
10–20 mcg/ml

Acute Respiratory Infections

Acute respiratory infections, such as pneumonia, are among the most common causes of death from infectious diseases in the United States. Pneumonia is the fifth major cause of death in persons over age 65.

Pneumonia

Pneumonia is an inflammation of the parenchyma of the lungs. Causative organisms include bacteria, viruses, and fungi. Some of these organisms are listed here:

- ▶ *Pneumococcus*
- ▶ Group a beta hemolytic streptococcus
- ▶ *Staphylococcus*
- ▶ *Pseudomonas*
- ▶ Influenza types A and B
- ▶ Cytomegalovirus
- ▶ *Aspergillus fungiat*
- ▶ *Pneumocystis carinii*

Presenting symptoms depend on the causative organism. The client with viral pneumonia tends to have milder symptoms, whereas the client with bacterial pneumonia might have chills and fever as high as 103°. Clients with

cytomegalovirus, pneumocystis carinii, or aspergillus will be acutely ill. General symptoms of pneumonia include

- Hypoxia
- Tachypnea
- Tachycardia
- Chest pain
- Malaise
- Fever
- Confusion in the elderly

Care of the client with pneumonia depends on the causative organism. The management of bacterial pneumonias includes antibiotics, antitussives, antipyretics, and oxygen. Antibiotics that may be ordered include penicillin G, tetracycline, garamycin, and erythromycin. Viral pneumonias do not respond to antimicrobial therapy but are treated with antiviral therapy. Fungal pneumonias are treated with antifungal antibiotic therapy. Additional therapies for the client with pneumonia include providing for fluid and nutritional needs, obtaining frequent vital signs, and providing oral hygiene. Supplemental oxygen and chest percussion and drainage should be performed as ordered by the physician.



Some medications used in the treatment of pneumonia require special attention:

- **Tetracycline**—Should not be given to women who are pregnant or to small children because of the damage it can cause to developing teeth and bones.
- **Garamycin**—An aminoglycoside, it is both ototoxic and nephrotoxic. It is important to monitor the client for signs of toxicity. Serum peak and trough levels are obtained according to hospital protocol.

Peak levels for garamycin are drawn 30 minutes after the third or fourth IV or IM dose. Trough levels for garamycin are drawn 30 minutes before the third or fourth IV or IM dose. The therapeutic range for garamycin is 4–10 mcg/ml.

Pleurisy

Pleurisy, an inflammation of the pleural sac, can be associated with upper respiratory infection, pulmonary embolus, thoracotomy, chest trauma, or cancer. Symptoms include

- Sharp pain on inspiration
- Chills
- Fever

- Cough
- Dyspnea

Chest x-ray reveals the presence of air or fluid in the pleural sac. Management of the client with pleurisy includes the administration of analgesics, antitussives, antibiotics, and oxygen therapy. The presence of pleural effusion can require the client to have a thoracentesis. It is the nurse's responsibility to prepare the client and monitor for signs of complications related to the procedure. The nurse should assess the client's vital signs, particularly changes in respirations and blood pressure, which can reflect impending shock from fluid loss or bleeding. The nurse should also observe the client for signs of a pneumothorax.

Tuberculosis

Tuberculosis (TB) is a highly contagious respiratory infection caused by the mycobacterium tuberculosis. It is transmitted by droplets from the respiratory tract. Airborne precautions, as outlined by the Centers for Disease Control (CDC), should be used when caring for the client with tuberculosis.

A circular icon with a scalloped border containing the word "NOTE" in a serif font.

Standard precautions and transmission-based precautions are provided in Appendix B, "Things You Forgot," which is on the CD.

Diagnosis includes the administration of the Mantoux skin test, which is read in 48–72 hours. The presence of a positive Mantoux test indicates exposure to TB but not active infection. A chest x-ray should be ordered for those with a prior positive skin test. A definite diagnosis of TB is made if the sputum specimen is positive for the tubercle bacillus.

Management of the client with TB includes the use of ultraviolet light therapy and the administration of antimycobacterial drugs. Medication regimens can consist of several drugs, and treatment can last up to 2 years. Clients should be told that they are no longer infectious after 2–4 weeks of treatment. Surgical management may include a wedge resection or lobectomy.

Emerging Infections

The CDC (1994) defines *emerging infections* as diseases of infectious origin with human incidences occurring within the past two decades. Emerging

illnesses are likely to increase in incidence in the near future. Two respiratory conditions listed as emerging infections are Severe Acute Respiratory Syndrome (SARS) and Legionnaire's Disease.

Severe Acute Respiratory Syndrome

Severe Acute Respiratory Syndrome (SARS) is caused by a coronavirus. Symptoms include

- ▶ Fever
- ▶ Dry cough
- ▶ Hypoxemia
- ▶ Pneumonia

In identifying SARS, a chest x-ray reveals ground glass infiltrates with bilateral consolidation occurring within 24–48 hours, thus suggesting the rapid development of acute respiratory failure.

SARS has occurred with greater frequency in Asia, although cases have also been confirmed in Canada, Switzerland, and Germany.

The SARS virus can be found in nasopharyngeal and oropharyngeal secretions, blood, and stool. Diagnostic tests for SARS include

- ▶ Sputum cultures for Influenza A, B, and RSV
- ▶ Serum tests to detect antibodies IgM and IgG
- ▶ Reverse transcriptase polymerase chain reaction tests performed to detect RNA of SARS CoV

Two tests on two different specimens must be positive to confirm the diagnosis. Test results are considered negative if no SARS CoV antibodies are found 28 days after the onset of symptoms.

The client suspected of having SARS should be cared for using airborne and contact precautions. Management includes the use of antibiotics to treat secondary or atypical pneumonia. Antivirals or retrovirals can be used to inhibit replication. Respiratory support, closed system for suctioning, and the use of surfactant replacement may be ordered.

Legionnaire's Disease

Legionnaire's Disease is caused by gram negative bacteria found in both natural and manmade water sources. Bacterial growth is greater in stored water maintained at temperatures ranging from 77° to 107° F. Risk factors include

- Immunosuppression
- Diabetes
- Pulmonary disease

Legionnaire's involves the lungs and other organs. The symptoms include

- Productive cough
- Dyspnea
- Chest pain
- Diarrhea
- Fever

Diagnostic tests include a urinary antigen test that remains positive after initial antibiotic therapy. Management includes the use of antibiotics, oxygen, provision of nutrition, and hydration.

Diagnostic Tests for Review

These are simply some of the tests that are useful in diagnosing pulmonary disorders. You should review the normal lab values as well as any special preparations for the client undergoing those tests. In addition, think about the care given to clients after the procedures have been completed. For instance, the client who has undergone a bronchoscopy will have a depressed gag reflex, which increases the chance of aspiration. No food or fluid should be given until the gag reflex returns. The tests for diagnosing pulmonary disorders are as follows:

- CBC
- Chest x-ray
- Pulmonary function tests
- Lung scan
- Bronchoscopy

Pharmacology Categories for Review

The client with a respiratory disorder should be managed with several categories of medications. The client with an acute respiratory condition, such as bacterial pneumonia, is given an antibiotic to fight the infection, antipyretic medication for fever and body aches, and an antitussive for relief of cough. The client with a chronic respiratory condition may receive many of the same medications, with the addition of a steroid or bronchodilator. The following list contains the most commonly prescribed categories of medications used to treat clients with respiratory conditions:

- Antibiotics
- Antivirals
- Antituberculars
- Antitussives
- Bronchodilators
- Expectorants
- Leukotrienes
- Mast-cell stabilizers
- Steroids

Exam Prep Questions

- When performing an assessment on the client with emphysema, the nurse finds that the client has a barrel chest. The alteration in the client's chest is due to:
 - A. Collapse of distal alveoli
 - B. Hyperinflation of the lungs
 - C. Long-term chronic hypoxia
 - D. Use of accessory muscles
- The nurse notes that a client with COPD's respiratory symptoms are altered by his position. Which position helps alleviate the client's dyspnea?
 - A. Lying supine with a single pillow
 - B. Standing or sitting upright
 - C. Side lying with the head elevated
 - D. Lying with head slightly lowered
- When reviewing the client's chart, the nurse should pay close attention to the results of which pulmonary function test?
 - A. Residual volume
 - B. Total lung capacity
 - C. FEV1 /FVC ratio
 - D. Functional residual capacity
- The physician has ordered O₂ at 3 liters/minute via nasal cannula. O₂ amounts greater than this are contraindicated in the client with COPD because:
 - A. Higher concentrations result in severe headache.
 - B. Hypercapnic drive is necessary for breathing.
 - C. Higher levels will be required later for pO₂.
 - D. Hypoxic drive is needed for breathing.
- The client taking aminophylline tells the nurse that he is going to begin a smoking cessation program when he is discharged. The nurse should tell the client to notify the doctor if his smoking pattern changes because he will:
 - A. Need his aminophylline dosage adjusted
 - B. Require an increase in antitussive medication
 - C. No longer need annual influenza immunization
 - D. Not derive as much benefit from inhaler use
- Lab results indicate that the client's serum aminophylline level is 17 mcg/ml. The nurse recognizes that the aminophylline level is:
 - A. Within therapeutic range
 - B. Too high and should be reported
 - C. Questionable and should be repeated
 - D. Too low to be therapeutic

7. The morning weight for a client indicates that the client has gained 5 pounds in less than a week, even though his oral intake has been modest. The client's weight gain may reflect which associated complication of COPD?
- A. Polycythemia
 - B. Cor pulmonale
 - C. Left ventricular failure
 - D. Compensated acidosis
8. The nurse is teaching the client the appropriate way to use an inhaler. Which action indicates the client needs additional teaching?
- A. The client takes a deep breath and holds it for 3 or 4 seconds.
 - B. The client places the inhaler mouthpiece beyond his lips.
 - C. The client inhales with lips tightly sealed to mouthpiece.
 - D. The client exhales slowly using purse lipped breathing.
9. The client with COPD may lose weight despite having adequate caloric intake. When counseling the client in ways to maintain an optimal weight, the nurse should tell the client to:
- A. Continue the same caloric intake and increase the amount of fat intake
 - B. Increase his activity level to stimulate his appetite
 - C. Increase the amount of complex carbohydrates and decrease the amount of fat intake
 - D. Decrease the amount of complex carbohydrates while increasing calories, protein, vitamins, and minerals
10. The client has been receiving garamycin 65mg IVPB every 8 hours for the past 6 days. Which lab result indicates an adverse reaction to the medication?
- A. WBC 7500
 - B. Serum glucose 92
 - C. Protein 3.5
 - D. Serum creatinine 1.2

Answer Rationales

1. Answer B is correct. Clients with emphysema develop a barrel chest due to the trapping of air in the lungs, causing them to hyperinflate. Answers C and D are common in those with emphysema but do not cause the chest to become barrel shaped. Answer A does not occur in emphysema.
2. Answer B is correct. The client with chronic obstructive pulmonary disease has increased difficulty breathing when lying down. His respiratory effort is improved by standing or sitting upright or by having the bed in high Fowler's position. Answers A, C, and D do not alleviate the client's dyspnea; therefore they are incorrect.

3. Answer C is correct. The FEV1 /FVC ratio indicates disease progression. As COPD worsens, the ratio of FEV1 to FVC becomes smaller. Answers A and B reflect loss of elastic recoil due to narrowing and obstruction of the airway. Answer D is increased in clients with obstructive bronchitis.
4. Answer D is correct. Respiratory effort is stimulated in clients with COPD by hypoxemia. Answers A and C are incorrect because higher levels would rob the client of the drive to breathe. Answer B is an incorrect statement.
5. Answer A is correct. Changes in smoking patterns should be discussed with the physician because they have an impact on the amount of aminophylline needed. Answer B is incorrect because clients with COPD are placed on expectorants, not antitussives. Answer C is incorrect because an annual influenza vaccine is recommended for all those with lung disease. Answer D is incorrect because benefits from inhaler use should be increased when the client stops smoking.
6. Answer A is correct. The therapeutic range for aminophylline is 10–20 mcg/ml. Answers B and D are incorrect. There are no indications that the results are questionable; therefore, repeating the test as offered by answer C is incorrect.
7. Answer B is correct. Answers A and D do not cause weight gain, so they're incorrect. And answer C would be reflected in pulmonary edema, so it's incorrect.
8. Answer C is correct. Keeping the lips tightly sealed encourages nasal breathing, which interferes with the inhaler effectiveness. Answers A, B, and D indicate correct use of the inhaler.
9. Answer D. The client with COPD needs additional calories, protein, vitamins, and minerals. Answer A is incorrect because the client needs more calories but not more fat. Answer B is not feasible, will increase the O₂ demands, and will result in further weight loss. Answer C leads to excess acid production and an increased respiratory workload.
10. Answer D is correct. Serum creatinine is elevated, indicating renal impairment. Answers A, B, and C are within normal limits.