

Module 19

BASIC RESPIRATORY CARE

INTRODUCTION

Major advances in management of the patient with respiratory problems have occurred within the last twenty years. Respiratory care has developed with these advances as a foundation, resulting in improved patient care and reduced mortality from respiratory disease or complications. It is the responsibility of the nurse in any area to know how to protect patients from respiratory complications, to learn what factors predispose them to such problems, and to understand methods of management. The purpose of this module is to refresh the nurse on basic respiratory care.

This module is composed of three units: Oxygen Therapy, Chest Physiotherapy, and Preventing Respiratory Complications.

Unit 1

Oxygen Therapy

OBJECTIVES

Upon completion of this unit, you should be able to

- Identify clinical signs that indicate need for oxygen therapy.
- List various methods of oxygen administration.
- Outline safety precautions necessary during oxygen by mask, cannula, and croupette tent.

COMMENTS

Oxygen therapy is used to relieve hypoxemia (the deficient oxygenation of the blood) and to avoid hypoxia (the diminished availability of oxygen for the body tissues). The goal of oxygen therapy is to provide an adequate oxygen content in the arterial blood to meet the metabolic needs of all body tissue, particularly the brain and heart. The presence of any of the following signs often indicate the need for oxygen therapy:

- restlessness
- confusion
- tachycardia—a heart rate greater than 100 beats per minute
- cyanosis—bluish color of mucous membranes, nail beds, and/or skin, which indicates a lack of oxygen to tissues
- dyspnea—shortness of breath, difficulty breathing.

Tachycardia is often an early sign. Cyanosis and confusion are signs of severe oxygen deprivation.

Oxygen tanks

Oxygen tanks generally are encased in metal carriers equipped with wheels for transport and a broad flat base on which the tank stands at the bedside to prevent it from falling. A cap on the top protects the valves and outlets. Oxygen tanks should be placed near the head of the bed and away from traffic areas and heaters. A regulator and humidifier must be attached before the tank is used. The purpose of the regulator is to reduce the pressure in the oxygen cylinder to a safe level. The regulator consists of two parts: The flow meter and a cylinder contents gauge. The flow meter regulates the gas flow in liters per minute (see Figure 1).

Figure 1
The Basic Parts of an Oxygen Tank

Following is the procedure to assemble an oxygen tank for use.

1. Remove the protector cap.
2. Remove any dust in the outlets by slightly opening the hand wheel at the top of the tank. Turn the hand wheel clockwise slowly and then close it quickly. This is called cracking the tank. People can be frightened if not forewarned of the loud hissing sound that occurs when the tank is opened.
3. Connect the flow regulator gauge to the tank outlet and tighten the inlet nut with a wrench to ensure that the regulator is held firmly.
4. Stand at the side of the cylinder and open the cylinder valve very slowly until the needle on the cylinder gauge stops moving.
5. Regulate the flow meter to the desired rate of flow in liters per minute. For the Thorpe tube (see Figure 2A), this is done by turning the flow-adjusting valve. If the Bourdon tube (see Figure 2B) is used, turn the flow-adjusting handle slowly to the right.
6. Fill the humidifier bottle with distilled water to the mark indicated and attach it below the flow meter.
7. Attach the specific oxygen and equipment prescribed for the patient, e.g., nasal catheter, nasal cannula, or facemask.

Figure 2
Types of Oxygen Regulators
A: Thorpe
B: Bourdon

Oxygen tanks have a few disadvantages, such as their cumbersome size and shape and the fact that their oxygen supply can run out often unnoticed by hospital personnel.

Oxygen wall outlets. Oxygen is now supplied in most facilities from a central source and is piped to wall outlets at the patient's bedside. Only a flow meter and a humidifier are needed when using piped-in oxygen. To use an oxygen wall outlet:

1. Attach the flow meter to the wall outlet, exerting firm pressure. The flow meter should be in the off position (see Figure 3).
2. Fill the humidifier bottle with sterile distilled water (this can be done before coming to the bedside).
3. Attach the humidifier bottle to the base of the flow meter.
4. Attach oxygen tubing to the oxygen device prescribed by the physician to the humidifier.
5. Regulate the flow meter to the desired level.

Figure 3
Oxygen Flow Meter Attached to a Wall Outlet

Oxygen humidifying devices: Oxygen is a dry gas as it is delivered from its supply source, and moisture must be added prior to its administration to a patient. When dry gases are given to patients, the respiratory mucous membranes become dehydrated. Humidifiers work by passing the gas through water so that water vapor is picked up before the gas reaches the patient.

Numerous methods are available for administering oxygen therapy. **Masks** and **cannulas** are the two most common types of equipment. Used less frequently are **tents** and **catheters**. The method chosen should be selected with four things in mind:

1. the level of inspired oxygen achieved by the method.
2. the accuracy of control of the oxygen concentration.
3. patient comfort.
4. patient expense.

Masks: Oxygen masks may be divided into two main types: masks that deliver high concentrations of oxygen and masks that deliver low concentrations of oxygen. Though it should be reasoned that the amount of oxygen the patient is inspiring is the same as the flow setting seen on the flow meter, masks vary immensely in the actual amount of oxygen they deliver to the patient.

Simple facemask. This facemask is made of plastic so it is lightweight, fairly comfortable, and disposable. It is usually used for short-term oxygen therapy. Patients tolerate the mask well, but it is loose fitting and delivers oxygen concentrations of 35-60 percent at flow rates of 6-12 liters per minute (see Figure 4A).

Nonrebreathing mask. This mask should be used if high concentrations of oxygen are to be delivered accurately. The mask is tight fitting and has a reservoir bag and nonrebreathing valve. Oxygen flows into the bag and mask during inhalation, and a one-way valve between the bag and facemask prevents exhaled air from flowing back into the bag where it could be rebreathed. Patients find this mask uncomfortable, but it can deliver concentrations of 95 percent oxygen.

Plastic facemask with reservoir bag. With this mask, a portion of the patient's air is directed into the bag. The amount of fresh oxygen in the bag far outweighs any effect of exhaled carbon dioxide. This mask can deliver concentrations of 70 percent oxygen at flow rates of 10 liters/minute (see Figure 4B).

Venturi mask: The oxygen concentration can be more accurately controlled with this mask. Oxygen is delivered through a small jet in the center of a wide-bore cone at the base of the mask. As oxygen flows through the narrow jet, air is pulled through openings in the cone (see Figure 4).

Figure 4A
Simple Plastic Mask

Figure 4B
Mask with a Partial Rebreathing Bag

Figure 4C
Venturi Mask

Figure 4
Types of Oxygen Masks

Nasal cannula: The cannula is a comfortable, simple way to deliver oxygen. Two cannulas about ½ inch long protrude from the center of a circular tube and are inserted into the nostrils (see Figure 5). High flow rates are uncomfortable when delivered by this system, so it usually used to deliver less than 40 percent oxygen concentration.

Figure 5
Nasal Cannula

Nasal catheter: This is a rubber or plastic tube about 16 inches long with 6 or 8 holes at the end to disperse the oxygen. It delivers low to medium concentrations of oxygen. Because the cannula is now considered as effective as the catheter, this method is rarely used.

Oxygen tents: The oxygen tent is used most frequently for the therapy of children. It delivers low oxygen concentration but it is difficult to regulate the amount of oxygen received by the patient.

Assessment: Before administering oxygen the nurse should assess the patient's:

1. Breathing patterns.
 - Rate—how many completed respirations per minute?
 - Volume—are respirations deep or shallow?
 - Rhythm—are respirations spaced evenly or faster/slower at times?
 - Ease of breathing—is the patient “fighting for air” or is air flowing easily?
2. Breath sounds audible by ear and by auscultation with a stethoscope. Can you hear wheezing or crackle sounds, which indicate fluid in the lung?
3. Chest movements.
4. Presence and character of sputum and any coughing.
5. Circulatory status of the patient for anoxia. Check for abnormal pulse rate, anxiety, cyanosis, restlessness, vertigo, and syncope.

Gather preliminary information:

1. Check the method by which the agency supplies oxygen.
2. Determine from the physician's order or the responsible nurse, the method of administration, rate of oxygen flow, and times of administration, e.g., continuously, for 15 minutes every 2 hours, or when the patient is dyspneic.
3. Determine whether the patient has chronic lung disease. **Important:** Low-liter oxygen flows are essential for these individuals. A high carbon dioxide level in the blood is the normal stimulus to breathe. However, patients with chronic lung disease always have a high carbon dioxide level and their stimulus to breathe is hypoxemia. During continuous oxygen administration, arterial blood gases (oxygen and carbon dioxide) may be measured periodically to monitor the levels in the bloodstream, and the liter flow may be adjusted accordingly.
4. Determine whether setting up the oxygen is a nursing function or is done by a specialist. In some hospitals, a special respiratory service provides and sets up all breathing equipment.

Prepare the patients: Many patients are extremely anxious about receiving oxygen and need reassurance from the nurse. Explain the reason for the therapy and how it will help. Encourage the patient to breathe the oxygen in through the nose since mouth breathing dilutes the oxygen concentration. Patients often need to be reassured that oxygen is not dangerous when safety precautions are observed and that it will ease the discomfort of dyspnea. Provide information to the patient and support persons about the safety precautions connected with oxygen use.

The patient who requires oxygen is often best placed in a semi-Fowler's position to facilitate breathing.

Administering oxygen by mask: Follow these steps when administering oxygen by mask:

1. Wash your hands.
2. Assemble the equipment. You will need an oxygen supply with a flow meter; a humidifier with sterile, distilled water; and a prescribed facemask of the appropriate size for the patient.
3. Prepare the patient.
4. Guide the mask towards the patient's face and apply it from the nose downward.
5. Turn the oxygen to the prescribed liter flow.
6. Secure the elastic band around the patient's head so that the mask is comfortable but snug.

Administering oxygen by cannula: Follow these steps when administering oxygen by cannula:

- a. Wash your hands.
- b. Assemble the equipment. You will need an oxygen supply with a flow meter; a humidifier with sterile, distilled water; and a nasal cannula with tubing.
- c. Turn on the oxygen to the liter flow ordered and check that it is flowing freely. Check that there are no kinks in the tubing and that the tubing connections are straight.
- d. Put the cannula in place with the outlets in the patient's nares and secure.
- e. Assess the patient's response.

Administering oxygen by croupette: Follow these steps when administering oxygen by croupette:

1. Gather preliminary information.

- a. Determine the liter flow of oxygen ordered by the physician or recommended by agency practice.
 - b. Ascertain the agency's practice about whether the damper valve is to be kept open, partially open, or intermittently closed and opened.
 - c. Ascertain from the physician's orders whether aerosol medications are to be administered.
2. Assemble the equipment.
 - croupette tent with frame
 - ice
 - an oxygen supply
 - distilled water
 - gowns
 - bath blankets
 3. Prepare the patient. Provide an explanation that is appropriate to the age of the child and offer emotional support. Allow the child to have a suitable toy, one that will not cause static electricity. To protect the child from chilling and from the dampness and condensation in the tent, cover the child with gowns or a cotton blanket. Some agencies provide gowns with hoods, or a small towel may be wrapped around the head.
 4. Attach the metal frame that supports the canopy to the upper third of the bedsprings with gauze strips.
 5. Close the zippers on each side of the tent.
 6. Fanfold the front part of the canopy into the bedclothes or into an additional overlying draw sheet, and ensure that all sides of the canopy are tucked well under the mattress.
 7. Fill the trough with ice to a depth indicated by a line on the trough.
 8. Ensure that the drainage tube for the trough is securely in place in the elevated notch or opening provided.
 9. Unscrew the cap on the water jar and fill the jar with distilled water up to the mark indicated by a black line.
 10. Attach the tube to the oxygen or compressed air source.
 11. Flood the tent with oxygen by setting the flow meter at 15 liters/minute for about 5 minutes.

12. Open the damper valve located on the large tube between the trough and the tent for about five minutes to bring the humidity to 100%.
13. Adjust the oxygen flow meter to deliver the required amount of oxygen.
14. Place the child in the croupette tent.
15. Provide physical care of the child.

Physical care of the child in the croupette includes protection from chilling, frequent observation, maintenance of the equipment, and safety precautions in using the oxygen.

Frequently observe for signs of hypoximia to determine the child's response to the therapy. Change the bed linen and clothing as they become damp. Place a small pillow or rolled towel at the head of the croupette to prevent bruising or bumping of the child's head. This padding also helps absorb excess moisture.

When administering care, be sure to maintain the humidity of the air and oxygen therapy. You may move the canopy up around the infant's head and neck, and secure it under a pillow while providing care.

Maintenance of the equipment is essential. Drain the water from the ice trough and replenish the ice as necessary. Also replenish the distilled water in the screw-cap bottle. Monitor air and oxygen flow frequently to maintain required concentrations, and keep all connections airtight.

Maintain the temperature of the croupette at 20° to 21°C (68° to 70°F). Check the temperature by placing a bath thermometer inside the canopy.

During oxygen administration:

1. Make sure that safety precautions are carried out.
2. Assess the patient's response to therapy after 30 minutes and regularly thereafter depending on the patient's condition in terms of vital signs, color, breathing patterns, and chest movements.
3. Check the liter flow and level of water in the humidifier after 30 minutes and whenever providing care for the patient.
4. Assess regularly for clinical signs of hypoxemia, tachycardia, cyanosis, dyspnea, restlessness, and confusion.
5. Assess the patient's nares, face, and ears for areas of irritation.

6. Record on the patient's chart when therapy is started and the patient's response to it. Report to the responsible nurse any unexpected or untoward response of the patient.

Safety precautions during oxygen administration: Oxygen alone will not burn or explode, but it does facilitate combustion. For example, a bed sheet ordinarily burns slowly when ignited in the atmosphere; however, if saturated with free flowing oxygen and ignited by a spark, it will burn rapidly and explosively. The greater the concentration of oxygen, the more rapidly fires start and burn, and such fires are difficult to extinguish. Because oxygen is colorless, odorless, and tasteless, people are often unaware of its presence. Safety measures must, therefore, be taken by the staff, the patient, and visitors. These measures include the following:

1. Place cautionary "No Smoking: Oxygen in Use" signs on the patient's door, at the foot or head of the bed, and on the oxygen equipment.
2. Remove matches and cigarette lighters from the bedside.
3. Request other patients in the room and visitors to smoke in areas provided elsewhere in the hospital.
4. Remove or put aside electrical equipment (e.g., razors, hearing aids, radios, televisions, heating pads) to avoid sparks from short circuits.
5. Do not use materials that generate static electricity (e.g., wool blankets or synthetic fabrics). Instead, provide cotton blankets and wear cotton fabrics.
6. Do not use volatile flammable materials, such as oils, greases, alcohol, and ether on patients receiving oxygen. If lip ointments are required, select those with a water-soluble base, such as glycerin. Remove alcohol (for rubdowns), nail polish removers, etc. from the immediate vicinity.
7. Be sure that electrical monitoring equipment, suction machines, and portable diagnostic machines are grounded when used, or do not permit them in the area. Discontinue oxygen therapy temporarily if portable radiographic equipment is required. Place monitoring and suction equipment on the bedside opposite the oxygen source.
8. Know the location of fire extinguishers, such as a carbon dioxide extinguisher, and know how to use them.
9. When oxygen cylinders are used, they must be secured so that they will not fall over.

Unit 2

Chest Physiotherapy

OBJECTIVES

Upon completion of this unit, you should be able to:

- List indications for chest physiotherapy.
- State the purposes of postural drainage, percussion, and vibration.
- Identify the positions used for draining all lung segments.
- Describe the method of teaching a patient diaphragmatic breathing, pursed-lip breathing, and effective coughing.

COMMENTS

Physical therapy of the chest is provided by respiratory therapy personnel, nurses, and physical therapists. It is indicated in preoperative patients with excessive secretions; postoperative patients with excessive secretions due to ineffective cough, bronchial or lobar pneumonia, or lung abscess; and in patients with any disease in which abnormal sputum may be produced and the patient may be prone to recurrent infection, such as cystic fibrosis and chronic bronchitis. It is also indicated in the asthmatic patient, the patient who is not able to initiate a voluntary cough, and in a patient who is obese or inactive.

The goals of chest therapy are to assist in removing bronchial secretions from the respiratory tract, to improve the distribution of ventilation in the lung and to develop more efficient use of respiratory musculature and cardiopulmonary reserve.

Included in chest physiotherapy are **postural drainage, chest percussion and vibration, and effective breathing**. Each of these is discussed in this unit.

Postural drainage

Postural drainage is the use of varying body positions to enhance draining of secretions from the peripheral areas of the lung. See Figure 6.

Secretions that remain in the lung are respiratory airways facilitate bacterial growth and subsequent infection. They can also obstruct the smaller airways and cause atelectasis. By using gravity, secretions are moved from peripheral areas of the lung into larger bronchi and bronchioles so that they may be coughed up or aspirated. Using postural drainage requires the patient to be placed in a position so the affected lung area is elevated, allowing drainage of the secretions in that area to flow into the larger airways. The best times for postural drainage are before meals and at bedtime.

Figure 6
Lateral View of the Lungs

Prior to administering postural drainage

1. Gather preliminary information.
 - a. From the nursing care plan or the physician's order, determine the position(s) the patient is to assume.
 - b. Check whether a bronchodilator or moisturizer is ordered prior to postural drainage.
 - c. From the nursing care plan or physician's order, determine the length of time the patient is to assume each position.
 - d. Check the physician's order to see if a sputum specimen is required.
2. Prepare the patient. Explain to the patient the need for postural drainage and the reason for it. Include in your explanation the length of time he or she needs to retain the position and how you will assist with percussion and vibration. Provide auditory privacy, if possible, since coughing and expectorating secretions can embarrass the patient and disturb others. Provide the patient with adequate covering to prevent undue exposure and to protect the skin during percussion and vibration. Agency

pajamas or gowns can be left on. Minimize drafts to decrease the airborne movement of microorganisms and lung secretions.

3. Assemble the following equipment:
 - a. Pillows to support the patient comfortably in the required positions.
 - b. A sputum container for expectorated secretions.
 - c. Tissues.
 - d. Mouthwash to clean the mouth after the treatment.
 - e. A specimen label and requisition, if a specimen is required.

Positioning patient for postural drainage

Drains anterior basal segments of lower lobes. The patient is positioned supine with pillows under the head and knees. The foot of the bed is elevated to 18 inches.

Drains upper lobes
Anterior apical segments.

Drains upper lobes (posterior apical
Segments). Patient is seated in bed or
chair leaning forward at a 20-degree
angle.

Drains left upper lobe (posterior segments). The patient is positioned on the right side and turned 45 degrees toward prone position with a pillow under the head and along the spine. The head of the bed is elevated 18 inches.

Drains left lower lobe (lateral basal segments). The patient is positioned on right side with pillows placed under waist and head. The foot of the bed is elevated 18 inches.

Drains the right middle lobe (medial and lateral segments). The patient is positioned on the left side, turned 45 degrees toward the supine position with pillows placed along the spine.

Drains the left upper lobe (superior and inferior segments). The patient is positioned on the right side, turned 45 degrees toward the supine position with pillows placed along the spine and under the head. The foot of the bed is elevated 12 inches.

Drains lower lobes (posterior basal segments). Head down, hips at a 60-degree angle off of bed or lying prone in bed with pillow under hips and with thoracic cage at 45-degree angle. This can be done by elevating the foot of the bed 18 inches.

Drains anterior segments of upper lobes. The patient is positioned supine with pillows placed under the head and knees.

Drains right lower lobes (lateral basal segments). The patient is positioned on left side with pillows placed under waist and head, and foot of bed is elevated 18 inches.

Drains lower lobes (superior segments). The patient is positioned prone with pillows under the ankles and waist.

Drains right upper lobe (posterior segment). The patient is positioned on the left side turned 45 degrees toward the prone position with pillows placed under the head and along the spine.

After postural drainage

1. During and following postural drainage, have the patient do deep breathing and coughing to expel secretions.
2. Assess the patient's response to the postural drainage in terms of the amount, color, thickness, and odor of the sputum; and fatigue, vertigo, pallor, diaphoresis, and dyspnea. Report any untoward response to the responsible nurse or physician.
3. Assist the patient to a comfortable resting position.
4. Offer mouthwash to the patient.
5. Discard the sputum container and the tissues appropriately. They are usually placed in a covered container to minimize the transmission of microorganisms.
6. Wash hands.
7. Record the technique. Include the patient's tolerance of the positions, the amount and character of secretions expectorated, and the patient's response.
8. Adjust the nursing care plan as needed for further postural drainage.

9. If a sputum specimen was collected, arrange for it to be sent to the laboratory.

Percussion and vibration

To aid in dislodging secretions, the physiotherapy technique of manual percussion is employed. Terms such as “clapping” or “tapping” may be used to mean the same thing. Both hands are generally used in alternating, uniform, rhythmic percussion of the chest over the lobe where secretions have collected (see Figure 7).

The nurse’s hands should be in a cupped position, which will create an air pocket between the hand and chest wall and allow a more forceful maneuver (see Figure 8). A hollow sound not a slapping sound, should be heard. To avoid tiring the arms, the wrists must be entirely loose and the elbows slightly flexed. This technique is performed during or after postural drainage and requires only two or three minutes. The patient should not experience pain during the procedure, and the breasts, spinal column, kidneys, and sternum should be avoided. If properly performed, the patient should find this technique soothing. Muscle relaxation with sputum expectoration will follow.

Figure 7
Position of Hands and
Arms during Percussion

Figure 8
Hand Positioning for Percussion

Vibration of the chest will often dislodge stubborn secretions in both large and small airways. This technique is aimed at the shaking loose secretions and is best accomplished by keeping the arms straight and placing the hands on the patient's chest at the level of secretions. Then pressure is applied by the hands and continual vibrations should be performed during a slow, forceful expiration.

Figure 9
Hand and Arm Position for Vibration

Effective Breathing: The patient with acute or chronic respiratory disorder is often predisposed to poor breathing habits. Breathing retraining involves a number of methods designed to promote improvement in a patient's breathing patterns to assure maximal use of respiratory function. Unlike the other types of therapy, breathing retraining is learned by the patient, who must use it on a constant basis.

Abdominal or diaphragmatic breathing: If a patient learns to use the diaphragm properly, maximum beneficial effect can be obtained from breathing. To teach abdominal breathing:

1. Place the patient in a comfortable semi-Fowler's position.
2. Place your thumbs in the patient's epigastric notch, just below the xiphoid process.
3. Spread your hands around the patient's lower ribs with your fingers comfortably spread.
4. Instruct the patient to inhale through the nose while relaxing the abdomen and while the patient pushes your thumbs "out" with his/her abdominal wall. By doing this, the diaphragm is used.
5. Instruct the patient to pause naturally and briefly at the end of inspiration. This effects a smooth pattern of ventilation and an even distribution of air into and out of the lungs.
6. Gently press inward and upward on the epigastric notch with your thumbs as you instruct the patient to contract the abdominal muscles during exhalation. Instruct the patient to "purse" the lips during exhalation.
7. The length of exhalation should be two to three times longer than the time to inhale, as most patients with chronic lung disease have difficulty breathing out effectively.
8. Avoid making the patient anxious about the amount of exhalation time since this leads to dyspnea.
9. Once a patient has mastered abdominal breathing in a semi-Fowler's position, it must be learned lying, sitting, and standing.

If performed correctly, the abdomen visibly rises during deep inhalation and contracts during exhalation. This procedure will ventilate the lungs more evenly and squeeze trapped air out of the lung.

Pursed-lip breathing: The purpose of this breathing technique is to prevent airway collapse and the trapping of air during exhalation. Pursed-lip breathing is used most often with patients who have chronic obstructive lung disease. In these patients, the diseased airways tend to collapse frequently during exhalation and trap air in the alveoli. By creating a resistance with the pursing of the lips, air is allowed to be exhaled more slowly.

1. Place the patient in a semi-Fowler's position with the abdominal muscles relaxed.
2. Instruct the patient to inhale through the nose.
3. Instruct the patient to exhale through the mouth while the lips are in a position similar to that of whistling or kissing. By shaping the lips into a whistling position, the patient can exhale through the mouth with the lips pursed, creating a blowing effect.

This will increase the length of exhalation so that exhalation is about twice as long as inhalation. Like abdominal breathing, pursed-lip breathing must be performed at all times.

Effective coughing: Coughing is the natural way to remove foreign substances from the lower respiratory tract. Development of a chronic respiratory disease may inhibit the patient's ability to cough. Respiratory infection can produce an excessive amount of mucous, and this irritates the bronchial tree causing frequent involuntary coughing. This type of cough is normally ineffective. For the most effective and efficient removal of secretions by coughing, it may be necessary to instruct the patient in proper coughing techniques. The cough maneuver is a modification of the Valsalva maneuver in which the diaphragm moves upward, compressing the inhaled air against a closed glottis.

1. Place the patient in a position so that the arms and knees are slightly flexed and the abdominal muscles are relaxed. The most effective position is semi-Fowler's or sitting since this facilitates maximum chest wall expansion.
2. Instruct the patient to take a slow, deep breath, but not breathe in as deeply as possible. Instruct the patient to inhale until the lungs feel as if they are half full.
3. Then instruct the patient to hold his/her breath and compress the abdominal muscles. As pressure in the lungs increases, the vocal cords separate, and as the trapped air is expelled, secretions are dislodged.
4. Instruct the patient to cough only two or three short coughs, using a short, concise effort, and not to cough out as hard as possible.

Unit 3

Respiratory Complication Prevention

OBJECTIVES

Upon completion of this unit, you should be able to

- Discuss methods used for lung hyperinflation therapy.
- Outline a plan of patient teaching for patients with respiratory disorders.

COMMENTS

Hyperinflation therapy: Hyperinflation therapy includes any form of treatment that encourages or assists a patient to take a larger than usual inspiration. The patient is expanding the lung by taking an unusually deep breath. Hyperinflation therapy has immediate effects, including

- prevention of atelectasis (collapse of a lung or a portion of lung)
- increased arterial oxygenation
- increased secretion removal

Types of hyperinflation therapy include **voluntary deep breathing, incentive spirometry, and intermittent positive pressure.**

Voluntary deep breathing: The easiest, least expensive method to hyperinflate the lungs is voluntarily take a deep breath. Deep breathing is most effective when the breaths are taken slowly, deliberately, and to full chest expansion. Ten deep breaths should be taken every hour for maximum effect.

Incentive spirometry: Incentive spirometry is a method of encouraging voluntarily deep breathing by providing visual feedback (see Figure 10). There are basically two types of incentive spirometry: flow-oriented and volume-oriented.

Flow-oriented incentive spirometry uses a type of plastic chamber (s) that contains colored balls. The patient is instructed to inhale through a connecting tubing and elevate the balls in the chamber. The goal is to keep the balls elevated for as long as possible (3-5 seconds) to sustain the inspiration.

Volume-oriented incentive spirometry works on the same principle as flow-oriented except that there is a bellows to raise. As the patient inspires deeply, the bellows are raised and volume inhaled is measured by markings on the container.

Figure 10
Incentive Spirometry
A. Flow-Oriented Spirometers
B. Volume-Oriented Spirometers

Intermittent positive pressure: Intermittent positive pressure breathing (IPPB) uses a pressured cycled ventilation to deliver breaths during a treatment session. IPPB treatments usually last 10-15 minutes. They assist lung hyperinflation by applying positive pressure to the airways.

Other ways of hyperinflating lungs: It was once thought that blowing up balloons or surgical gloves and using blow bottles was an effective means to hyperinflate the lungs. However, all these methods are achieved by long exhalations. This emphasizes the wrong maneuver—exhalation. Hyperinflation of the lung is achieved only by deep inhalation, which is held for a period of time.

Patients with respiratory disorders: To prevent complications in patients with respiratory disorders, the most effective intervention is a good plan of patient teaching. These patients must learn discipline and control in several areas of their lives.

	ACTION	RATIONALE
1. Posture, Positioning	<ul style="list-style-type: none"> a. Teach to position self with head and chest elevated while sleeping. b. Teach to stand, sit, or lie with back straight and shoulders pulled back. 	<ul style="list-style-type: none"> a. Elevation of the chest and head makes ventilation easier by permitting the lungs and respiratory muscles to function without being cramped. b. Enables unrestricted movement of the diaphragm, facilitating diaphragmatic breathing.
2. Room Environment	<ul style="list-style-type: none"> a. Encourages patient to maintain a cool environment at home or work. b. Teach to maintain adequate humidification. c. Teach to avoid air pollution, smoke, and aerosol room sprays. 	<ul style="list-style-type: none"> a. Air-conditioning or a cool, fresh environment facilitates respirations. b. Prevents drying of secretions. c. These are pulmonary irritants.
3. Activity, Rest	<ul style="list-style-type: none"> a. Encourage ambulation and other activities within the patient's abilities b. Encourage the patient to plan periods of uninterrupted rest during the day. 	<ul style="list-style-type: none"> a. Not only helps the patient's moral, but prevents the complications resulting from inactivity. b. Necessary since respiratory disorders can be fatiguing.
4. Oral Hygiene	<ul style="list-style-type: none"> a. Teach to do frequent oral hygiene. b. Encourage use of antiseptic mouthwash. 	<ul style="list-style-type: none"> a. Removes the taste of sputum, often improving appetite. b. Reduces pathogens in mouth, thus reducing the change of pulmonary infection.

	ACTION	RATIONALE
5. Nutrition, Appetite, Hydration	<ul style="list-style-type: none"> a. Teach to take smaller, more frequent servings of food. b. Teach to avoid gas-forming foods. c. Encourage to drink 3000-4000 ml of fluid daily, mostly water. 	<ul style="list-style-type: none"> a. Tolerated better and are less tiring than large meals. b. These restrict ventilation by producing abdominal distention. c. Helps to liquify bronchopulmonary secretions so they can be more easily removed.
6. Infection Prevention	<ul style="list-style-type: none"> a. Wear warm, dry protective clothing if outside in cold or damp weather. b. Avoid excessive exertion in very cold or humid environments. c. Maintain a balanced pattern of work. d. Avoid crowds during periods when respiratory infections are prevalent or where there is heavy smoke. e. Do not smoke. f. Follow the physician's advice concerning influenza shots and antibiotics. g. Observe the sputum for increased amounts of sputum or change in color, both of which indicate infection. h. Consult the physician immediately if a new infection seems to be developing. 	<ul style="list-style-type: none"> a-h. These actions are important in preventing the development of respiratory infections.

BIBLIOGRAPHY

Kozier, B., Erb, G., Berman, A., & Synder, S. (2004). Fundamentals of nursing. (7th ed.) New Jersey: Pearson.

Perry, A., & Potter, P. (2002). Clinical nursing skills & techniques. (5th ed.). St. Louis: Mosby.

Potter, P. & Perry, A. (2001). Fundamentals of nursing. (5th ed.). St. Louis: Mosby.