

18

Thorax and Lungs

Structure and Function

The term **thorax** identifies the portion of the body extending from the base of the neck superiorly to the level of the diaphragm inferiorly. The lungs, distal portion of the trachea, and the bronchi, are located in the thorax and constitute the **lower respiratory system**. The outer structure of the thorax is referred to as the *thoracic cage*; the *thoracic cavity* contains the respiratory components. A thorough assessment of the lower respiratory system focuses on the external chest as well as the respiratory components in the thoracic cavity.

THORACIC CAGE

The **thoracic cage** is constructed of the sternum, 12 pairs of ribs, 12 thoracic vertebrae, muscles, and cartilage. It provides support and protection for many important organs including those of the lower respiratory system. Structures and landmarks of the anterior thoracic cage (Fig. 18-1) and the posterior thoracic cage (Fig. 18-2) are discussed below.

Sternum and Clavicles

The **sternum**, or breastbone, lies in the center of the chest anteriorly and is divided into three parts: the manubrium, the body, and the xiphoid process. The manubrium connects laterally with the clavicles (collar bones) and the first two pairs of ribs. The clavicles extend from the manubrium to the acromion of the scapula.

A U-shaped indentation located on the superior border of the manubrium is an important landmark known as the **suprasternal notch**. A few centimeters below the suprasternal notch, a bony ridge can be palpated at the point where the manubrium articulates with the body of the sternum. This landmark, often referred to as the *sternal angle* (or angle of Louis), is also the location of the second pair of ribs and becomes a reference point for counting ribs and intercostal spaces.

Ribs and Thoracic Vertebrae

The 12 pairs of ribs constitute the main structure of the thoracic cage. They are numbered superiorly to inferiorly, the uppermost pair being number one. Each pair of ribs has a corresponding pair of intercostal spaces located immediately inferior to it. Anteriorly the first seven pairs articulate with the sternum by way of costal cartilages. The first pair of ribs curves up immediately under the clavicles so only a small portion of these ribs and the first interspaces are palpable. The second ribs and intercostal spaces are easily located adjacent to the sternal angle. Ribs two through six are easy to count anteriorly because of their articulation with the sternal body.

The next four pairs of ribs (seven through ten) connect to the cartilages of the pair lying superior to them rather than to the sternum (see Fig. 18-1). This configuration forms an angle between the right and left costal margins meeting at the level of the xiphoid process. This angle, commonly referred to as the *costal angle*, is an important landmark for assessment. It is normally less than 90 degrees but may be increased in instances of long-standing hyperinflation of the lungs as in emphysema. The 11th and 12th pairs of ribs are called “**floating**” ribs because they do not connect to either the sternum or another pair of ribs anteriorly. Instead they are attached posteriorly to the vertebra and their anterior tips are free and palpable (see Fig. 18-2).

The ribs are more difficult to palpate posteriorly. Each pair of ribs articulates with its respective **thoracic vertebra**. The spinous process of the seventh cervical vertebra (C7), also called the **vertebra prominens**, can be easily felt with the client’s neck flexed. The process immediately inferior to the vertebra prominens is the first thoracic vertebra, which is adjacent to the posterior aspect of the first rib.

➤ **Clinical Tip** • *When counting the spinous processes, it is helpful to know that they align with their corresponding ribs only to the fourth thoracic vertebra (T4). After this, the spinous processes angle downward from their own vertebral body and can be palpated over the vertebral body and rib below.*

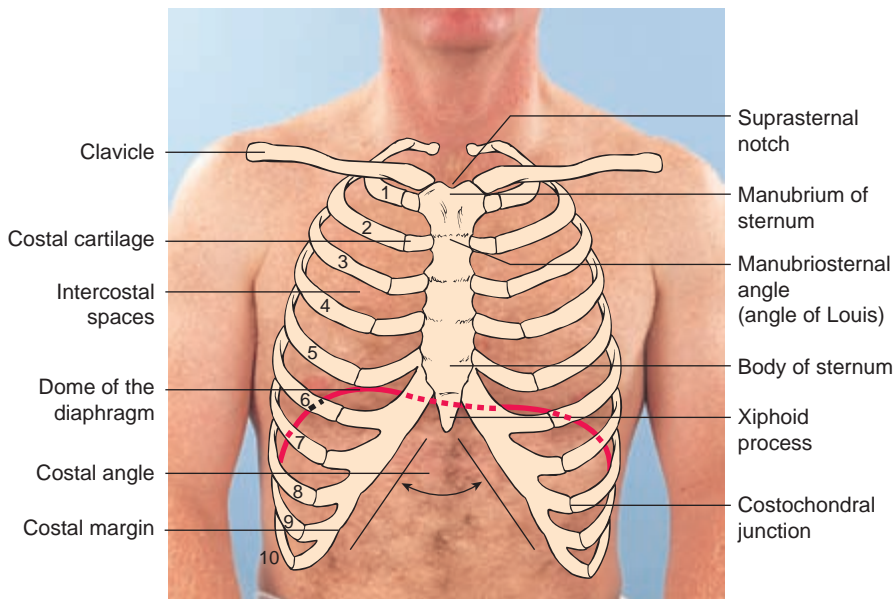


Figure 18-1 Anterior thoracic cage.

The lower tip of each scapula is at the level of the seventh or eighth rib when the client's arms are at his or her side (see Fig. 18-2).

Vertical Reference Lines

By counting the ribs, an examiner can describe the location of a finding vertically. However, to describe a location around the circumference of the chest wall, the examiner uses imaginary lines running vertically on the chest wall. On the anterior chest, these lines are known as the **midsternal line** and the **right and left midclavicular lines** (Fig. 18-3).

The posterior thorax includes the **vertebral (or spinal) line** and the **right and left scapular lines**, which extend through the inferior angle of the scapulae when the arms are at the client's side (Fig. 18-4).

The lateral aspect of the thorax is divided into three parallel lines. The **midaxillary line** runs from the apex of the axillae to the level of the 12th rib. The **anterior axillary line** extends from the anterior axillary fold along the anterolateral aspect of the thorax, whereas the **posterior axillary line** runs from the posterior axillary fold down the posterolateral aspect of the chest wall (Fig. 18-5).

THORACIC CAVITY

The thoracic cavity consists of the **mediastinum** and the lungs. The mediastinum refers to a central area in the thoracic cavity that contains the trachea, esophagus, heart, and great vessels. These structures are discussed in separate chapters (Chapters 17 and 20). The lungs lie on each side of the mediastinum.

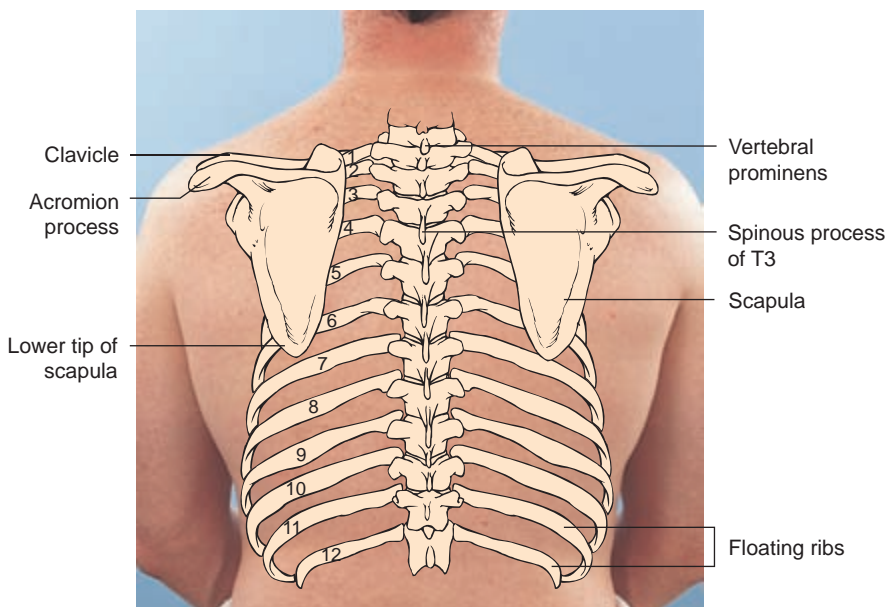


Figure 18-2 Posterior thoracic cage.

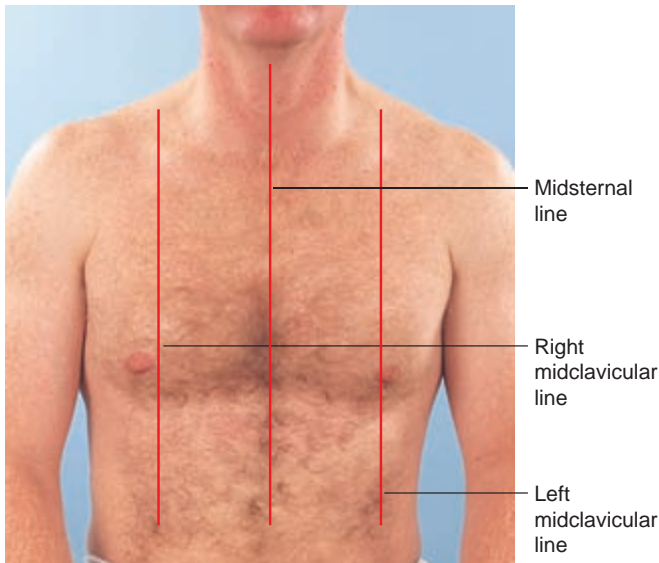


Figure 18-3 Anterior vertical lines (imaginary landmarks).

Lungs

The **lungs** are two cone-shaped, elastic structures suspended within the thoracic cavity. The **apex** of each lung extends slightly above the clavicle; the **base** is at the level of the **diaphragm**. At the point of the midclavicular line on the anterior surface of the thorax, the lung extends to approximately the sixth rib. Laterally lung tissue reaches the level of the eighth rib, and posteriorly the lung base lies at about the tenth rib (Fig. 18-6).

Although the lungs are paired, they are not completely symmetric. Both are divided into lobes by fissures. The right lung is made up of three lobes, whereas the left lung contains only two lobes. Fissures separating the lobes run obliquely through the chest, making the lobes appear as diagonal sloping segments. Anteriorly the horizontal fissure separating the right upper lobe from the middle lobe extends from the fifth rib in the right mid-axillary line to the third intercostal space or fourth rib

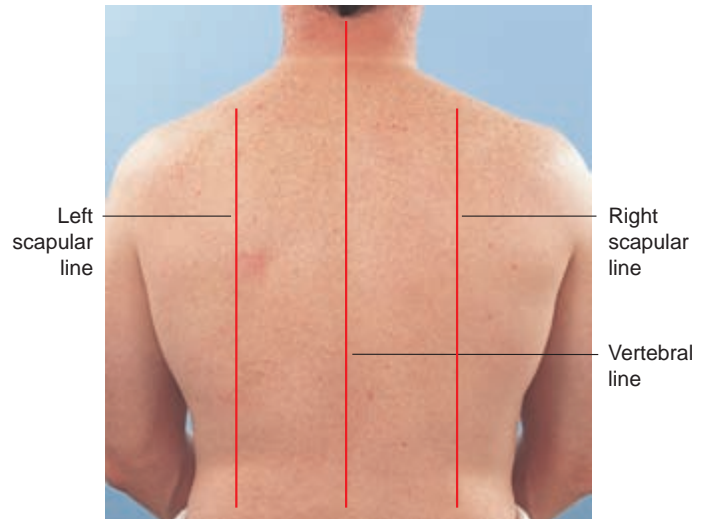


Figure 18-4 Posterior vertical lines (imaginary landmarks).

at the right sternal border. Posteriorly oblique fissures extend on both the right and left lungs from the level of T3 to the sixth rib at the midclavicular line.

In the healthy adult, during deep inspiration the lungs extend down to about the eighth intercostal space anteriorly and the twelfth intercostal space posteriorly. During expiration, the lungs rise to the fifth or sixth intercostal space anteriorly and tenth posteriorly.

➤ **Clinical Tip** • Remember that most lung tissue in the upper lobes of both lungs is located on the anterior surface of the chest. Similarly the lower lobes of both lungs are primarily located toward the posterior surface of the chest wall. In addition, the right middle lobe of the lung does not extend to the posterior side of the thoracic wall and, thus, must be assessed from the anterior surface alone.

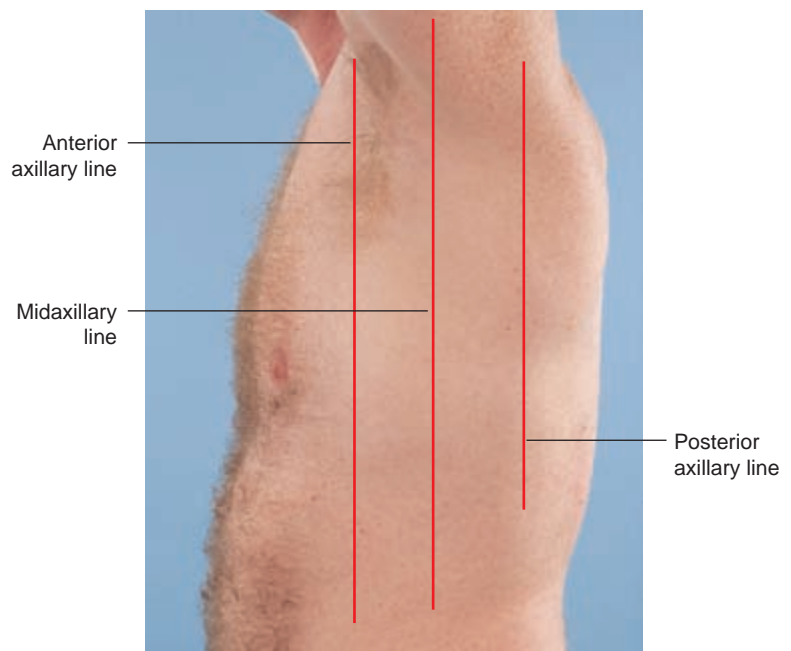


Figure 18-5 Lateral vertical lines (imaginary landmarks).

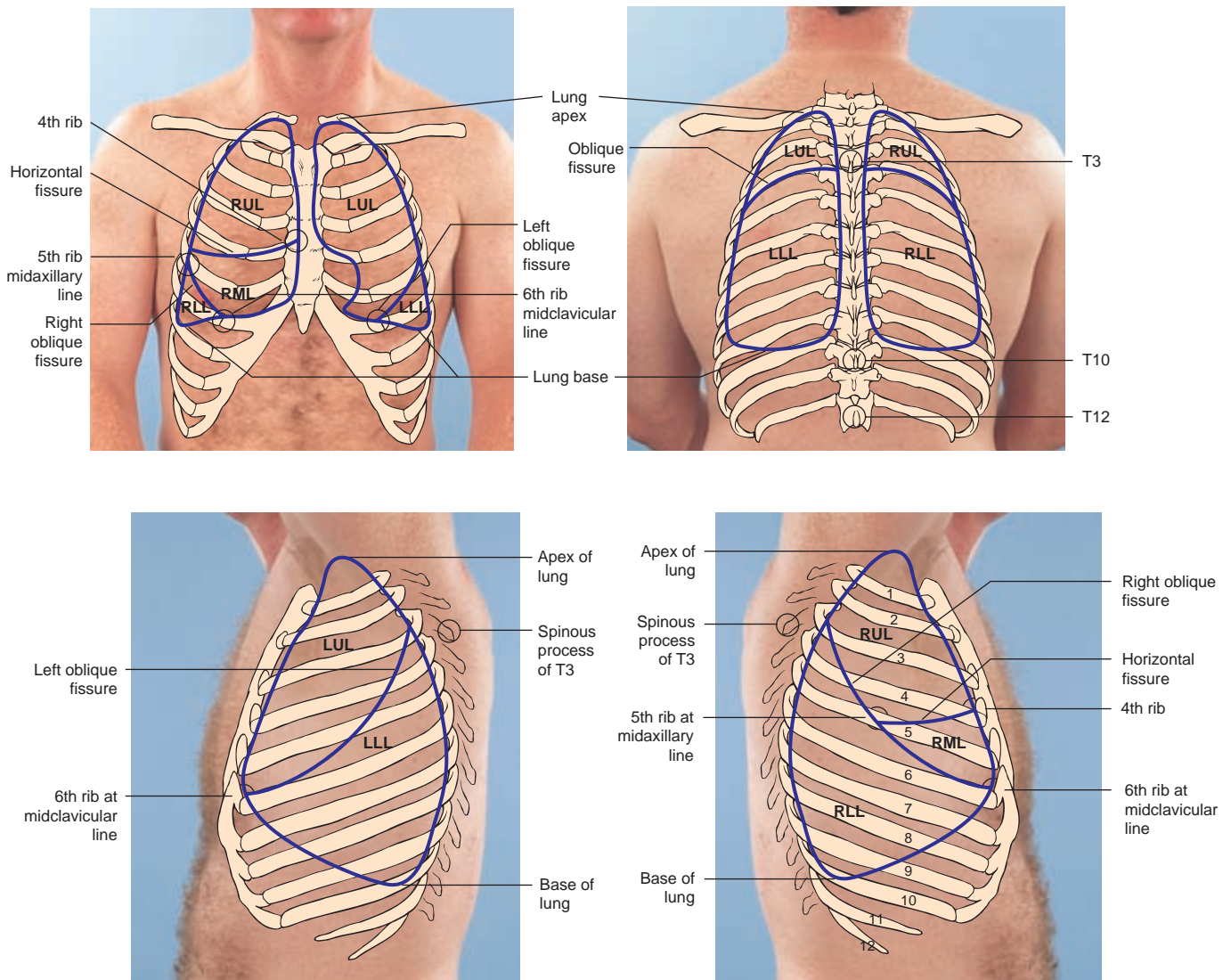


Figure 18-6 (A) Anterior view of lung position. (B) Posterior view of lung position. (C) Lateral view of left lung position. (D) Lateral view of right lung position.

Pleural Membranes

The thoracic cavity is lined by a thin, double-layered serous membrane collectively referred to as the pleura (Fig. 18-7). The **parietal pleura** line the chest cavity, and the **visceral pleura** covers the external surfaces of the lungs. The **pleural space** lies between the two pleural layers. In the healthy adult, the lubricating serous fluid between the layers allows movement of the visceral layer over the parietal layer during ventilation without friction. Because the pleural space is one of the physiologic third spaces for body fluid storage, severe dehydration will reduce the volume of pleural fluid, resulting in the increased transmission of lung sounds and a possible friction rub.

Trachea and Bronchi

The **trachea** is a flexible structure that lies anterior to the esophagus, begins at the level of the cricoid cartilage in the neck, and is approximately 10 to 12 cm long in an adult (see Fig. 18-7). C-shaped rings of **hyaline cartilage** compose the trachea; they help to maintain its shape and prevent its collapse during respiration.

At the level of the sternal angle, the trachea bifurcates into the right and left main **bronchi**. Both bronchi are at an oblique position in the mediastinum and enter the lungs at the hilum. The **right main bronchus** is shorter and more vertical than the **left main bronchus**, making aspirated objects more likely to enter the right lung than the left.

The bronchi and trachea represent “dead space” in the respiratory system, where air is transported but no gas exchange takes place. They function primarily as a passageway for both inspired and expired air. In addition, the trachea and bronchi are lined with mucous membranes containing **cilia**. These hairlike projections help sweep dust, foreign bodies, and bacteria that have been trapped by the mucus toward the mouth for removal.

Inspired air travels through the trachea into the main bronchi and continues through the system. The bronchi repeatedly bifurcate into smaller passageways known as **bronchioles**. Eventually the bronchioles terminate at the alveolar ducts, and air is channeled into the alveolar sacs, which contain the **alveoli** (see Fig. 18-7). Alveolar sacs contain a number of alveoli in a cluster formation (resembling grapes), creating millions of interalveolar walls that serve to increase the surface area available for gas exchange.

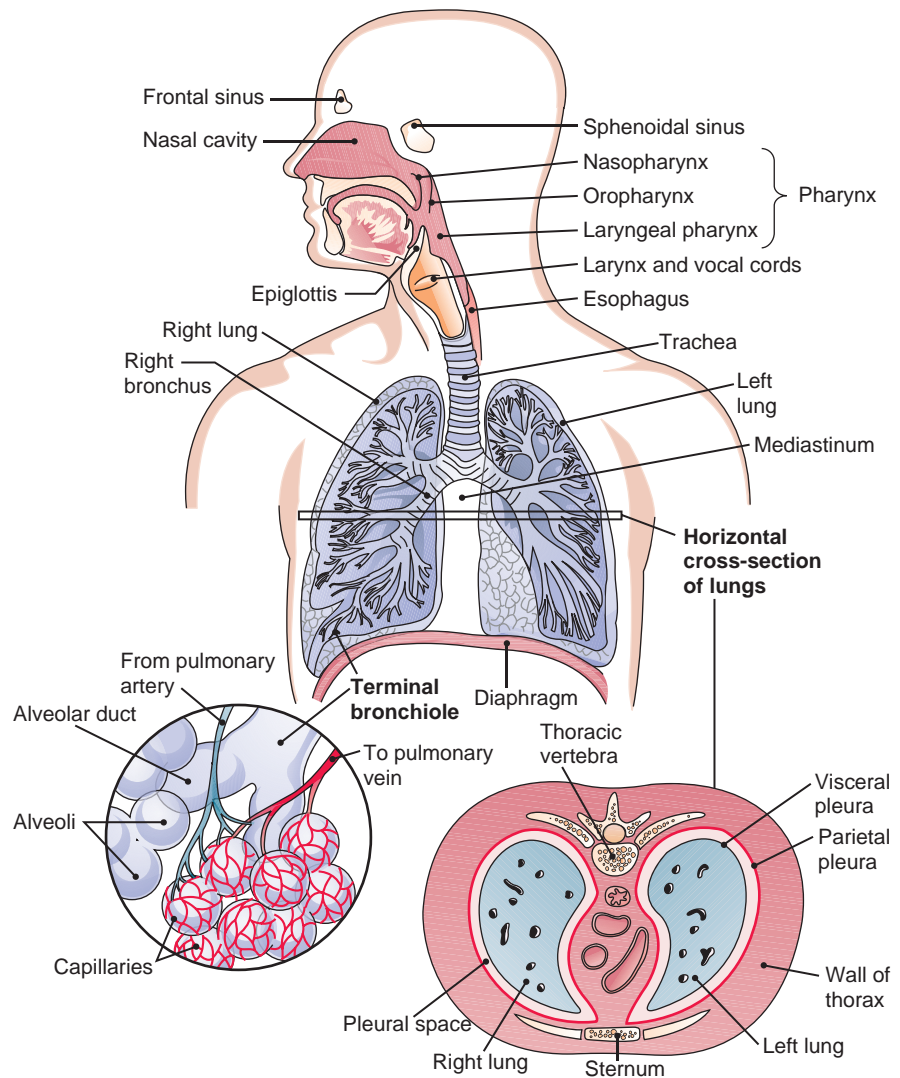


Figure 18-7 Major structures of the respiratory system.

MECHANICS OF BREATHING

The purpose of respiration is to maintain an adequate oxygen level in the blood to support cellular life. By providing oxygen and eliminating carbon dioxide, respiration assists in the rapid compensation for metabolic acid–base defects; however, changes in the respiratory pattern can cause acid–base imbalances.

External respiration, or ventilation, is the mechanical act of breathing and is accomplished by expansion of the chest, both vertically and horizontally. Vertical expansion is accomplished through contraction of the diaphragm. Horizontal expansion occurs as intercostal muscles lift the sternum and elevate the ribs, resulting in an increase in anteroposterior diameter.

As a result of this enlargement of the chest cavity, a slight negative pressure is created in the lungs in relation to the atmospheric pressure, resulting in an inflow of air into the lungs. This process, called **inspiration**, is shown in Figure 18-8. **Expiration** is mostly passive in nature and occurs with relaxation of the intercostal muscles and the diaphragm. As the diaphragm relaxes, it assumes a domed shape. The resultant decrease in the size of the chest cavity creates a positive pressure, forcing air out of the lungs.

Breathing patterns change according to cellular demands—often without awareness on the part of the individual. Such involuntary control of respiration is the work of

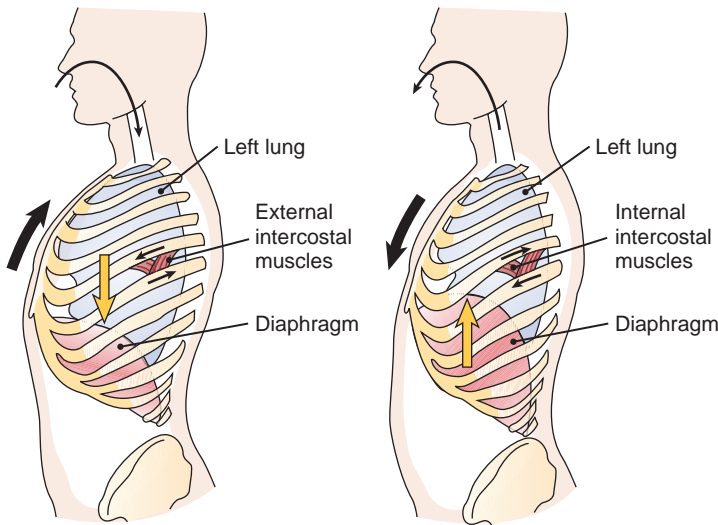
the medulla and pons located in the brain stem. The hypothalamus and the sympathetic nervous system also play a role in involuntary control of respiration in response to emotional changes such as fear or excitement.

Hormonal regulation, changes in oxygen or carbon dioxide levels in the blood, or changes in the hydrogen ion (pH) level cause changes in breathing patterns. Under normal circumstances, the strongest stimulus to breathe is an increase of carbon dioxide in the blood (hypercapnia). A decrease in oxygen (hypoxemia) also increases respiration but is less effective than a rise in carbon dioxide levels.

Health Assessment

COLLECTING SUBJECTIVE DATA: THE NURSING HEALTH HISTORY

Subjective data related to the thoracic and lung assessment provide many clues about underlying respiratory problems and associated nursing diagnoses as well as clues about risk for the development of lung disorders. Information about the client's level of functioning is also important because certain respiratory problems greatly impact a person's ability to perform activities of daily living. When collecting subjective data, remember to



During inhalation the diaphragm presses the abdominal organs downward and forward.

During exhalation the diaphragm rises and recoils to the resting position.



Action of rib cage in inhalation



Action of rib cage in exhalation

Figure 18-8 Mechanics of normal—not deep, not shallow—inspiration (*left*) and expiration (*right*).

follow up on the client’s related signs and symptoms to determine specific respiratory problems and associated nursing diagnoses.

Be careful to avoid judgmental approaches to poor health practices. Smoking, for example, has become a stigmatized addiction in our society. Avoid conveying feelings of intolerance

when caring for a smoker with respiratory complaints. Based on the client’s readiness for teaching, the nurse may offer information about smoking cessation methods.

(text continues on page 311)

HISTORY OF PRESENT HEALTH CONCERN

Question

Difficulty Breathing

Do you ever experience difficulty breathing? Describe the difficulty.

Do you experience any other symptoms when you have difficulty breathing?

Do you have difficulty breathing when you are resting or do any specific activities cause the difficulty?

Rationale

Dyspnea (difficulty breathing) can indicate a number of health problems, most of which are related to the respiratory system. Gradual onset of dyspnea is usually indicative of lung changes such as emphysema, whereas sudden onset is associated with viral or bacterial infections.

Associated symptoms provide clues to the underlying problem. Certain associated symptoms suggest problems in other body systems. For example, edema or angina that occurs with dyspnea may indicate a cardiovascular problem.



Older adults may experience dyspnea with certain activities related to aging changes of the lungs (loss of elasticity, fewer functional capillaries, and loss of lung resiliency).

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HISTORY OF PRESENT HEALTH CONCERN *Continued*

Question

Rationale

Do you have difficulty breathing when you sleep? Do you use more than one pillow or elevate the head of the bed when you sleep?

Orthopnea (difficulty breathing when lying supine) may be associated with heart failure. Paroxysmal nocturnal dyspnea (severe dyspnea that awakens the person from sleep) also may be associated with heart failure. Changes in sleep patterns may cause the client to feel fatigued during the day.

Do you snore when you sleep? Have you been told that you stop breathing at night when you snore?

Sleep apnea (periods of breathing cessation during sleep) may be the source of snoring and gasping sounds. In general, sleep apnea diminishes the quality of sleep, which may account for fatigue or excessive tiredness, depression, irritability, loss of memory, lack of energy, and a risk for auto and workplace accidents.

Chest pain

Do you have chest pain? Is the pain associated with a cold, fever, or deep breathing?

Pain-sensitive nerve endings are located in the parietal pleura, thoracic muscles, and tracheobronchial tree but not in the lungs. Thus chest pain associated with a pulmonary origin may be a late sign of pulmonary disease.



Chest pain related to pleuritis may be absent in older clients because of age-related alterations in pain perception.

Cough

Do you have a cough? When and how often does it occur?

Continuous coughs are usually associated with acute infections, whereas those occurring only early in the morning are often associated with chronic bronchial inflammation or smoking. Coughs late in the evening may be the result of exposure to irritants during the day. Coughs occurring at night are often related to postnasal drip or sinusitis.



The ability to cough effectively may be decreased in the older client because of weaker muscles and increased rigidity of the thoracic wall.

Do you produce any sputum when you cough? If so, what color is the sputum? How much sputum do you cough up? Has this amount increased or decreased recently? Does the sputum have an odor?

Nonproductive coughs are often associated with upper respiratory irritations and early congestive heart failure.

White or mucoid sputum is often seen with common colds, viral infections, or bronchitis. Yellow or green sputum is often associated with bacterial infections. Blood in the sputum (hemoptysis) is seen with more serious respiratory conditions. Rust-colored sputum is associated with tuberculosis or pneumococcal pneumonia. Pink, frothy sputum may be indicative of pulmonary edema. An increase in the amount of sputum is often seen in an increase in exposure to irritants, chronic bronchitis, and pulmonary abscess. Clients with excessive, tenacious secretions may need instruction on controlled coughing and measures to reduce viscosity of secretions.

Do you wheeze when you cough or when you are active?

Wheezing indicates narrowing of the airways due to spasm or obstruction. Wheezing is associated with congestive heart failure (CHF), asthma (reactive airway disease), or excessive secretions.

Gastrointestinal symptoms

Do you have any gastrointestinal symptoms such as heartburn, frequent hiccups, or chronic cough?

Studies have shown that patients with asthma often have GERD (gastroesophageal reflux disease) or are more susceptible to GERD.

continued

COLDSPA Example

Use the **COLDSPA** mnemonic as a guideline to collect needed information for each symptom the client shares. In addition, the following questions help elicit important information.

Mnemonic	Question	Client Response Example
C haracter	Describe the sign or symptom (feeling, appearance, sound, smell, or taste if applicable).	"I have pain in my chest when I cough or take a deep breath."
O nset	When did it begin?	"About six days ago."
L ocation	Where is it? Does it radiate? Does it occur anywhere else?	"It is on my right side." <i>Client points to right lower back side of chest.</i>
D uration	How long does it last? Does it recur?	"It hurts when I cough or take a deep breath."
S everity	How bad is it? How much does it bother you?	"I can't sleep at night and have trouble going up stairs because I am short-winded."
P attern	What makes it better or worse?	"Mucinex helps me to cough up phlegm but I still have the pain."
A ssociated factors/How it affects the client	What other symptoms occur with it? How does it affect you?	"A 102 fever for the last 2 days. I am coughing up thick tan sputum. I smoke 1 pack a day but have quit for the last 2 days."

PAST HEALTH HISTORY

Question**Rationale**

Have you had prior respiratory problems?

A history of respiratory disease increases the risk for a recurrence. In addition, some respiratory diseases may imitate other disorders. For example, asthma symptoms may mimic symptoms commonly associated with emphysema or heart failure.

Have you ever had any thoracic surgery, biopsy, or trauma?

Previous surgeries may alter the appearance of the thorax and cause changes in respiratory sounds. Trauma to the thorax can result in lung tissue changes.

Have you been tested for or diagnosed with allergies?

Many allergic responses are manifested with respiratory symptoms such as dyspnea, cough, or hoarseness. Clients may need education on controlling the amount of allergens in their environment.

Have you ever had a chest x-ray, tuberculosis (TB) skin test, or influenza immunization? Have you had any other pulmonary studies in the past?

Information on previous chest x-rays, TB skin tests, influenza immunizations, and so forth is useful for comparison with current findings and gives information on self-care practices and possible teaching needs.

Have you recently traveled outside of the United States? Have you been in close contact with anyone known or suspected to have SARS?

Travel to high-risk areas such as mainland China; Hong Kong; Hanoi, Vietnam; Singapore; or Toronto, Canada, may have exposed the client to SARS (severe acute respiratory syndrome).

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FAMILY HISTORY

Question	Rationale
Is there a history of lung disease in your family?	The development of lung cancer is thought to be partially based on genetics. A history of certain respiratory diseases (asthma, emphysema) in a family may increase the risk for development of the disease. Exposure to viral or bacterial respiratory infections in the home increases the risk for development of these conditions.
Did any family members in your home smoke when you were growing up?	Second-hand smoke puts individuals at risk for emphysema or lung cancer later in life.
Is there a history of other pulmonary illnesses/disorders in the family, e.g., asthma?	Some pulmonary disorders, such as asthma, tend to run in families.

LIFESTYLE AND HEALTH PRACTICES

Question	Rationale
Have you ever smoked cigarettes or other tobacco products? Do you currently smoke? At what age did you start? How much do you smoke and how much have you smoked in the past? What activities do you usually associate with smoking? Have you ever tried to quit?	Smoking is linked to a number of respiratory conditions, including lung cancer (see Promote Health—Lung Cancer). The number of years a person has smoked and the number of cigarettes per day influence the risk for development of smoking-related respiratory problems. Information on smoking behavior and previous efforts to quit may be helpful later in identifying measures to assist with smoking cessation.
Are you exposed to any environmental conditions that affect your breathing? Where do you work? Are you around smokers?	Exposure to certain environmental inhalants can result in an increased incidence of certain respiratory conditions. Environmental irritants commonly associated with occupations include coal dust, insecticides, paint, pollution, asbestos fibers, and the like. For example, inhaling dust contaminated with <i>Histoplasma capsulatum</i> may cause histoplasmosis, a systemic fungal disease. This disease is common in the rural midwestern United States. Second-hand smoke is another irritant that can seriously affect a person's respiratory health.
Do you have difficulty performing your usual daily activities? Describe any difficulties.	Respiratory problems can negatively affect a person's ability to perform the usual activities of daily living.
What kind of stress are you experiencing at this time? How does it affect your breathing?	Shortness of breath can be a manifestation of stress. Client may need education about relaxation techniques.
Are you currently taking medications for breathing problems or other medications (prescription or OTC) that affect your breathing? Do you use any other treatments at home for your respiratory problems?	Consider all medications when determining if respiratory problems could be attributed to adverse reactions. Certain medications, for example, beta-adrenergic antagonists (beta blockers) such as atenolol (Tenormin) or metoprolol (Lopressor) and angiotensin-converting enzyme (ACE) inhibitors such as enalapril (Vasotec) or lisinopril (Zestril), are associated with the side effect of persistent cough. These medications are contraindicated with some respiratory problems such as asthma. If the client is using oxygen or other respiratory therapy at home, it is important to evaluate knowledge of proper use and precautions as well as the client's ability to afford the therapy.
Have you used any herbal medicines or alternative therapies to manage colds or other respiratory problems?	Many people use herbal therapies, such as Echinacea, or alternative therapies, such as zinc lozenges, to decrease cold symptoms. Knowing what clients are using enables you to check for side effects or adverse interactions with prescribed medications.



PROMOTE HEALTH

Lung Cancer

Overview

Lung cancer is the leading cause of death in the United States and Europe. Both incidence and mortality rates for lung cancer continue to increase despite decreasing mortality rates for most other cancers. However, the rates for men and women have changed. The incidence of lung cancer among women in the United States and Europe is soaring to epidemic proportions (CancerConsultants.com, 1998–2004).

In 2005, there are expected to be 172,500 new lung cancer cases and 163,510 deaths in the United States with 73,020 of the deaths being women (nearly twice as many as those caused by breast cancer). The average age of diagnosis is 60; a lung cancer diagnosis is unusual under age 40. For people whose cancer is found early and treated with surgery, the 5-year survival rate is about 42% but only 15% of cases are diagnosed in the early stages.

Risk Factors

- Cigarette smoking
- Genetic predisposition possibly associated with interaction of genetics and smoking
- Beta carotene supplements esp. in presence of heavy smoking, moderate alcohol intake
- Asbestos exposure
- Radon exposure
- Exposure to workplace pollutants: radioactive ores, mining chemicals (e.g., arsenic, vinyl chloride, nickel, coal, mustard gas, chloromethyl esters, and fuels such as gasoline)
- Other environmental exposure: air pollution, passive tobacco smoke, marijuana smoking
- History of previous lung cancer, silicosis, berylliosis
- Recurring inflammation that leaves scars (e.g., tuberculosis, some types of pneumonia)
- African American heritage, especially men

- Gender; women's lung cells may have a predisposition to lung cancer when exposed to tobacco smoke
- History of Hodgkin's disease treated with chemotherapy, radiation or both
- Smokers who have been treated with chemotherapy or radiation
- Eating a poor diet with few fruits and vegetables

Teach Risk Reduction Tips

- Do not start smoking, and stop smoking if you do smoke.
- Join a smoking cessation program.
- Eat a healthy, low-cholesterol diet with adequate amounts of fruits and vegetables.
- If you smoke, avoid beta carotene supplements or diet high in beta carotene.
- Limit exposure to air pollution and harmful substances.
- Wear a mask when exposed to air pollution or dangerous airborne substances.

Collecting Objective Data: Physical Examination

Examination of the thorax and lungs begins when the nurse first meets the client and observes any obvious breathing difficulties. However, complete examination of the thorax and lungs consists of inspection, palpation, percussion, and auscultation of the posterior and anterior thorax to evaluate functioning of the lungs. Inspection and palpation are fairly simple skills to acquire; however practice and experience are the best ways to become proficient with percussion and auscultation.

Preparing the Client

Have the client remove all clothing from the waist up and put on an examination gown or drape. The gown should open down the back and is used to limit exposure. Examination of a female client's chest may create anxiety because of embarrassment related to breast exposure. Explain that exposure of the entire chest is necessary during some parts of the examination; to further ease client anxiety, explain the procedures before initiating the examination.

For the beginning of the examination, ask the client to sit in an upright position with arms relaxed at the sides. Provide explanations during the examination as you perform the various assessment techniques. The client should be encouraged to

ask questions and to inform the examiner of any discomfort or fatigue he experiences during the examination. Try to make sure that the room temperature is comfortable for the client.

Equipment

- Examination gown and drape
- Gloves
- Stethoscope
- Light source
- Mask
- Skin marker
- Metric ruler

Physical Assessment

During examination of the client, remember these key points:

- Provide privacy for the client.
- Keep your hands warm to promote the client's comfort during examination.
- Remain nonjudgmental regarding client's habits and lifestyle, particularly smoking. At the same time, educate and inform about risks, such as lung cancer and chronic obstructive pulmonary disease (COPD), related to habits.

(text continues on page 325)

PHYSICAL ASSESSMENT

Assessment Procedure

Normal Findings

Abnormal Findings

General

Inspection

Inspect for nasal flaring and pursed lip breathing.

Nasal flaring is not observed. Normally the diaphragm and the external intercostal muscles do most of the work of breathing. This is evidenced by outward expansion of the abdomen and lower ribs on inspiration and return to resting position on expiration.

Nasal flaring is seen with labored respirations (especially in small children) and is indicative of hypoxia.

Pursed lip breathing may be seen in asthma, emphysema, or CHF as a physiologic response to help slow down expiration and keep alveoli open longer.

Observe color of face, lips, and chest.

The client has evenly colored skin tone without unusual or prominent discoloration.

Ruddy to purple complexion may be seen in clients with COPD or CHF as a result of polycythemia. Cyanosis may be seen if client is cold or hypoxic.



Cyanosis makes white skin appear blue-tinged, especially in the perioral, nailbed, and conjunctival areas. Dark skin appears blue, dull, and lifeless in the same areas.

Inspect color and shape of nails.

Pink tones should be seen in the nailbeds. There is normally a 160-degree angle between the nail base and the skin.

Pale or cyanotic nails may indicate hypoxia. Early clubbing (180-degree angle) and late clubbing (greater than a 180-degree angle) can occur from hypoxia.

Posterior Thorax

Inspection

Inspect configuration. While the client sits with her arms at her sides, stand behind her and observe the position of scapulae and the shape and configuration of the chest wall (Fig. 18-9).

► **Clinical Tip** • *Some clinicians prefer to inspect the entire thorax first, followed by palpation of the anterior and posterior thorax, then percussion and auscultation of the anterior and posterior thorax.*

Scapulae are symmetric and nonprotruding. Shoulders and scapulae are at equal horizontal positions. The ratio of anteroposterior to transverse diameter is 1:2.

Spinous processes appear straight, and thorax appears symmetric with ribs sloping downward at approximately a 45-degree angle in relation to the spine.



Kyphosis (an increased curve of the thoracic spine) is common in older clients (see Abnormal Findings 18-1). It results from a loss of lung resiliency and a loss of skeletal muscle; it may be a normal finding.



The size of the thorax, which affects pulmonary function, differs by race. Compared with African Americans, Asians and Native Americans, adult Caucasians have a larger thorax and greater lung capacity (Overfield, 1995).

Spinous processes that deviate laterally in the thoracic area may indicate scoliosis.

Spinal configurations may have respiratory implications. Ribs appearing horizontal at an angle greater than 45 degrees with the spinal column are frequently the result of an increased ratio between the anteroposterior–transverse diameter (barrel chest). This condition is commonly the result of emphysema due to hyperinflation of the lungs.

Abnormal Findings 18-1 depicts various thoracic configurations.

Assessment Procedure

Observe use of accessory muscles. Watch as the client breathes and note use.

Inspect the client's positioning. Note the client's posture and his ability to support weight while breathing comfortably.

Palpation

Palpate for tenderness and sensation. Palpation may be performed with one or both hands; however, the sequence of palpation is established (Fig. 18-11). Use your fingers to palpate for tenderness, warmth, pain, or other sensations. Start toward the midline at the level of the left scapula (over the apex of the left lung) and move your hand left to right, comparing findings bilaterally. Move systematically downward and out to cover the lateral portions of the lungs at the bases.

Normal Findings

The client does not use accessory (trapezius/shoulder) muscles to assist breathing. The diaphragm is the major muscle at work. This is evidenced by expansion of the lower chest during inspiration.

Client should be sitting up and relaxed, breathing easily with arms at sides or in lap.

Client reports no tenderness, pain, or unusual sensations. Temperature should be equal bilaterally.

Abnormal Findings

Trapezius, or shoulder, muscles are used to facilitate inspiration in cases of acute and chronic airway obstruction or atelectasis.

Client leans forward and uses arms to support weight and lift chest to increase breathing capacity, referred to as the *tripod position* (Fig. 18-10). This is often seen in chronic obstructive pulmonary disease (COPD). See Promote Health—COPD.

Tender or painful areas may indicate inflamed fibrous connective tissue. Pain over the intercostal spaces may be from inflamed pleurae. Pain over the ribs, especially at the costal chondral junctions, is a symptom of fractured ribs.

Muscle soreness from exercise or the excessive work of breathing (as in COPD) may be palpated as tenderness.

Increased warmth may be related to local infection.

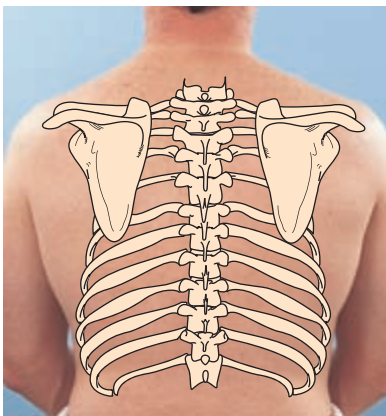


Figure 18-9 Observing the posterior thorax.

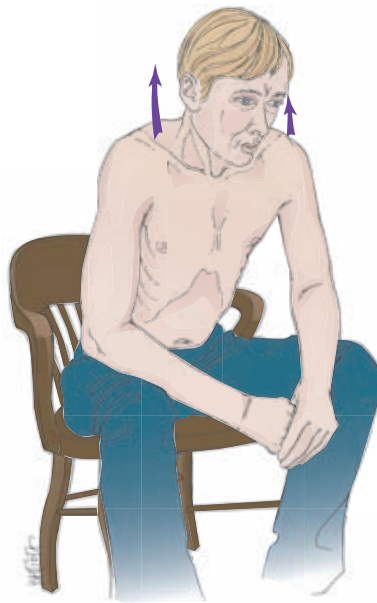


Figure 18-10 Tripod position.



Figure 18-11 Sequence for palpating the posterior thorax.



PROMOTE HEALTH

COPD

Overview

Chronic obstructive pulmonary disease (COPD) is used to describe several conditions that obstruct airflow to and from the alveoli. The two most common conditions are emphysema and chronic bronchitis. Active and passive smoking and fumes from biomass fuels are thought to cause most cases of COPD. In China, where about 50% of men smoke, respiratory

diseases are the fourth leading cause of death in urban areas, but the biomass fuel fumes increase the rural rate to the leading cause of death (COPD statistical, 2002–2004). These statistics estimate that COPD is the fourth leading cause of death in the United States, but will rise to the third for both men and women by 2020.

Risk Factors

- Smoking, both active and passive
- Exposure to biomass fumes
- Male (current rate is markedly higher in males but female rate is increasing)
- Age (increases in those over 50 years)
- Chronic respiratory irritation
- Recurrent respiratory illnesses
- Cold, dry air; hot, humid air; or high altitudes

Teach Risk Reduction Tips

- If smoking, STOP.
- Avoid passive smoke.
- Avoid air pollution and smog.
- Avoid chronic respiratory irritation (fumes, illnesses, allergens).
- Avoid respiratory illnesses (seek primary care advice regarding influenza vaccine).
- Avoid cold, dry air; hot, humid air; or high altitudes when possible (especially prolonged exposure to these).
- Seek early diagnosis if symptoms develop so that treatment and further preventive strategies can be initiated.

PHYSICAL ASSESSMENT *Continued*

Assessment Procedure

Normal Findings

Abnormal Findings

Palpate for crepitus. Crepitus, also called subcutaneous emphysema, is a crackling sensation (like bones or hairs rubbing against each other) that occurs when air passes through fluid or exudate. Use your fingers and follow the sequence in Fig 18-11 (p. 313) when palpating.

The examiner finds no palpable crepitus.

Crepitus can be palpated if air escapes from the lung or other airways into the subcutaneous tissue as occurs after an open thoracic injury, around a chest tube, or tracheostomy. It also may be palpated in areas of extreme congestion or consolidation. In such situations, mark margins and monitor to note any decrease or increase in the crepitant area.

Palpate surface characteristics. Put on gloves and use your fingers to palpate any lesions that you noticed during inspection. Also feel for any unusual masses.

Skin and subcutaneous tissue are free of lesions and masses.

Any unusual palpable mass should be evaluated further by a physician or other appropriate professional.

Assessment Procedure

Palpate for fremitus. Following the above sequence, use the ball or ulnar edge of one hand to assess for fremitus (vibrations of air in the bronchial tubes transmitted to the chest wall). As you move your hand to each area, ask the client to say “ninety-nine.” Assess all areas for symmetry and intensity of vibration.

➤ **Clinical Tip** • *The ball of the hand is best for assessing tactile fremitus because the area is especially sensitive to vibratory sensation.*

Assess chest expansion. Place your hands on the posterior chest wall with your thumbs at the level of T9 or T10 and pressing together a small skin fold. As the client takes a deep breath, observe the movement of your thumbs (Fig. 18-12).

Percussion

Percuss for tone. Start at the apices of the scapulae and percuss across the tops of both shoulders. Then percuss the intercostal spaces across and down, comparing sides. Percuss to the lateral aspects at the bases of the lungs, comparing sides. Figure 18-13 depicts the sequence for percussion.

Normal Findings

Fremitus is symmetric and easily identified in the upper regions of the lungs. If fremitus is not palpable on either side, the client may need to speak louder. A decrease in the intensity of fremitus is normal as the examiner moves toward the base of the lungs. However, fremitus should remain symmetric for bilateral positions.

When the client takes a deep breath, the examiner’s thumbs should move 5 to 10 cm apart symmetrically.



Because of calcification of the costal cartilages and loss of the accessory musculature, the older client’s thoracic expansion may be decreased although it should still be symmetric.

Resonance is the percussion tone elicited over normal lung tissue (Fig. 18-14). Percussion elicits flat tones over the scapula.



Figure 18-12 Starting position for assessing symmetry of chest expansion.

Abnormal Findings

Unequal fremitus is usually the result of consolidation (which increases fremitus) or bronchial obstruction, air trapping in emphysema, pleural effusion, or pneumothorax (which all decrease fremitus). Diminished fremitus even with a loud spoken voice may indicate an obstruction of the tracheobronchial tree.

Unequal chest expansion can occur with severe atelectasis (collapse or incomplete expansion), pneumonia, chest trauma, or pneumothorax (air in the pleural space). Decreased chest excursion at the base of the lungs is characteristic of chronic obstructive pulmonary disease (COPD). This is due to decreased diaphragmatic function.

Hyperresonance is elicited in cases of trapped air such as in emphysema or pneumothorax. Dullness is present when fluid or solid tissue replaces air in the lung or occupies the pleural space such as in lobar pneumonia, pleural effusion, or tumor.



Figure 18-13 Sequence for percussing the posterior thorax.

PHYSICAL ASSESSMENT *Continued*

Assessment Procedure

Percuss for diaphragmatic excursion. Ask the client to *exhale* forcefully and hold the breath. Beginning at the scapular line (T7), percuss the intercostal spaces of the right posterior chest wall. Percuss downward until the tone changes from resonance to dullness. Mark this level and allow the client to breathe. Next ask the client to *inhale* deeply and hold it. Percuss the intercostal spaces from the mark downward until resonance changes to dullness. Mark the level and allow the client to breathe. Measure the distance between the two marks (Fig. 18-15). Perform on both sides of the posterior thorax.

Auscultation

Auscultate for breath sounds. To best assess lung sounds, you will need to hear the sounds as directly as possible. Do not attempt to listen through clothing or a drape, which may produce additional sound or muffle lung sounds that exist. To begin, place the diaphragm of the stethoscope firmly and directly on the posterior chest wall at the apex of the lung at C7. Ask the client to breathe deeply through his or her mouth for each area of auscultation (each placement of the stethoscope) in the auscultation sequence so you can best hear inspiratory and expiratory sounds. Be alert to the client's comfort and offer times for rest and normal breathing if fatigue is becoming a problem.

Normal Findings

Excursion should be equal bilaterally and measure 3 to 5 cm in adults.

The level of the diaphragm may be higher on the right because of the position of the liver.

In well-conditioned clients, excursion can measure up to 7 or 8 cm.

Three types of normal breath sounds may be auscultated—bronchial, bronchovesicular, and vesicular (Table 18-1).

➤ **Clinical Tip •** *Breath sounds are considered normal only in the area specified. Heard elsewhere, they are considered abnormal sounds. For example, bronchial breath sounds are abnormal if heard over the peripheral lung fields.*

Figure 18-16 depicts locations of normal breath sounds.

Sometimes breath sounds may be hard to hear with obese or heavily muscled clients due to increased distance to underlying lung tissue.

Abnormal Findings

Diaphragmatic descent may be limited by atelectasis of the lower lobes or by emphysema in which diaphragmatic movement and air trapping are minimal. The diaphragm remains in a low position on inspiration and expiration.

Other possible causes for limited descent can be pain or abdominal changes such as extreme ascites, tumors, or pregnancy.

Uneven excursion may be seen with inflammation from unilateral pneumonia, damage to the phrenic nerve, or splenomegaly.

Diminished or absent breath sounds often indicate that little or no air is moving in or out of the lung area being auscultated. This may indicate obstruction within the lungs as a result of secretions, mucus plug, or a foreign object. It may also indicate abnormalities of the pleural space such as pleural thickening, pleural effusion, or pneumothorax. In cases of emphysema, the hyperinflated nature of the lungs, together with a loss of elasticity of lung tissue, may result in diminished inspiratory breath sounds. Increased (louder) breath sounds often occur when consolidation or compression results in a denser lung area that enhances the transmission of sound.

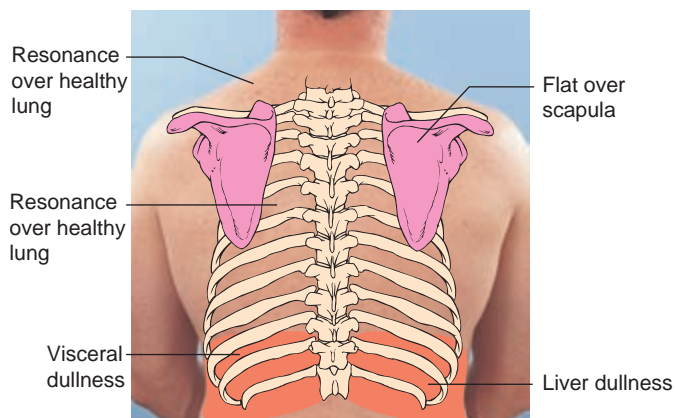


Figure 18-14 Normal percussion tones heard from the posterior thorax.

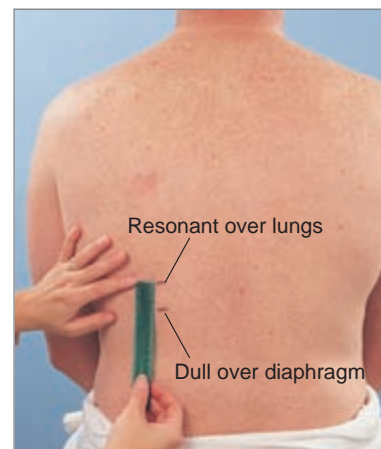


Figure 18-15 Measuring diaphragmatic excursion.

Assessment Procedure **Normal Findings** **Abnormal Findings**



Deep breathing may be especially difficult for the older client, who may fatigue easily. Thus offer rest as needed.

Auscultate from the apices of the lungs at C7 to the bases of the lungs at T10 and laterally from the axilla down to the seventh or eighth rib. Listen at each site for at least one complete respiratory cycle. Follow the auscultating sequence shown in Figure 18-17.

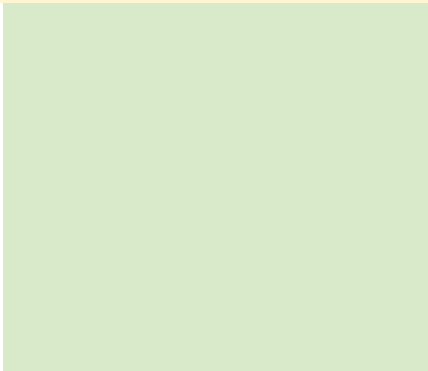


Table 18-1 **Normal Breath Sounds**

Type	Pitch	Quality	Amplitude	Duration	Location	Illustration
Bronchial	High	Harsh or hollow	Loud	Short during inspiration, long in expiration	Trachea and thorax	
Bronchovesicular	Moderate	Mixed	Moderate	Same during inspiration and expiration	Over the major bronchi— <i>posterior</i> : between the scapulae; <i>anterior</i> : around the upper sternum in the first and second intercostal spaces	
Vesicular	Low	Breezy	Soft	Long in inspiration, short in expiration	Peripheral lung fields	

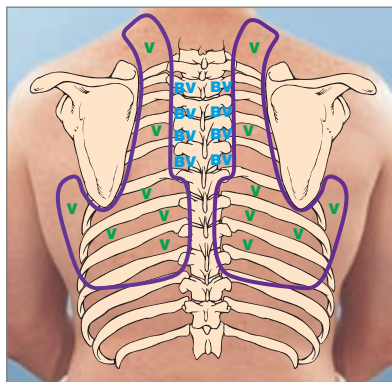


Figure 18-16 Location of breath sounds for the posterior thorax. V, vesicular sounds; BV, bronchovesicular sounds.

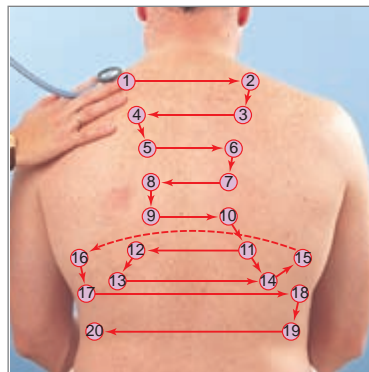


Figure 18-17 Sequence for auscultating the posterior thorax.

PHYSICAL ASSESSMENT *Continued*

Assessment Procedure

Auscultate for adventitious sounds. Adventitious sounds are sounds added or superimposed over normal breath sounds and heard during auscultation. Be careful to note the location on the chest wall where adventitious sounds are heard as well as the location of such sounds within the respiratory cycle.

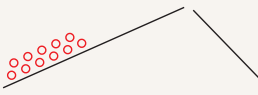
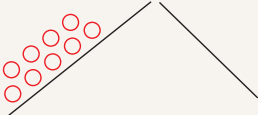
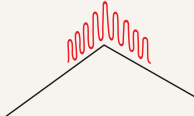
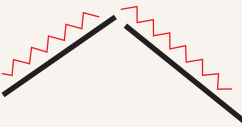

Normal Findings

No adventitious sounds, such as crackles (discrete and discontinuous sounds) or wheezes (musical and continuous), are auscultated.

Abnormal Findings

Adventitious lung sounds, such as crackles (formerly called rales) and wheezes (formerly called rhonchi) are evident. See Table 18-2 for a complete description of each type of adventitious breath sound.


Table 18-2 Adventitious Breath Sounds

Abnormal Sound	Characteristics	Source	Associated Conditions
<p><i>Discontinuous Sounds</i> Crackles (fine)</p> 	<p>High-pitched, short, popping sounds heard during inspiration and not cleared with coughing; sounds are discontinuous and can be simulated by rolling a strand of hair between your fingers near your ear.</p>	<p>Inhaled air suddenly opens the small deflated air passages that are coated and sticky with exudate.</p>	<p>Crackles occurring late in inspiration are associated with restrictive diseases such as pneumonia and congestive heart failure. Crackles occurring early in inspiration are associated with obstructive disorders such as bronchitis, asthma, or emphysema.</p>
<p>Crackles (coarse)</p> 	<p>Low-pitched, bubbling, moist sounds that may persist from early inspiration to early expiration; also described as softly separating Velcro.</p>	<p>Inhaled air comes into contact with secretions in the large bronchi and trachea.</p>	<p>May indicate pneumonia, pulmonary edema, and pulmonary fibrosis. “Velcro rales” of pulmonary fibrosis are heard louder and closer to stethoscope, usually do not change location, and are more common in clients with long-term COPD.</p>
<p><i>Continuous Sounds</i> Pleural friction rub</p> 	<p>Low-pitched, dry, grating sound; sound is much like crackles, only more superficial and occurring during both inspiration and expiration.</p>	<p>Sound is the result of rubbing of two inflamed pleural surfaces.</p>	<p>Pleuritis</p>
<p>Wheeze (sibilant)</p> 	<p>High-pitched, musical sounds heard primarily during expiration but may also be heard on inspiration.</p>	<p>Air passes through constricted passages (caused by swelling, secretions, or tumor).</p>	<p>Sibilant wheezes are often heard in cases of acute asthma or chronic emphysema.</p>
<p>Wheeze (sonorous)</p> 	<p>Low-pitched snoring or moaning sounds heard primarily during expiration but may be heard throughout the respiratory cycle. These wheezes may clear with coughing.</p>	<p>Same as sibilant wheeze. The pitch of the wheeze cannot be correlated to the size of the passageway that generates it.</p>	<p>Sonorous wheezes are often heard in cases of bronchitis or single obstructions and snoring before an episode of sleep apnea. <i>Stridor</i> is a harsh honking wheeze with severe broncholar spasm, such as occurs with croup.</p>

Assessment Procedure	Normal Findings	Abnormal Findings
<p>➤ Clinical Tip • If you hear an abnormal sound during auscultation, always have the client cough, then listen again and note any change. Coughing may clear the lungs.</p>		
<p>Auscultate voice sounds. Bronchophony: Ask the client to repeat the phrase “ninety-nine” while you auscultate the chest wall.</p>	<p>Voice transmission is soft, muffled, and indistinct. The sound of the voice may be heard but the actual phrase cannot be distinguished.</p>	<p>The words are easily understood and louder over areas of increased density. This may indicate consolidation from pneumonia, atelectasis, or tumor.</p>
<p>Egophony: Ask the client to repeat the letter “E” while you listen over the chest wall.</p>	<p>Voice transmission will be soft and muffled but the letter “E” should be distinguishable.</p>	<p>Over areas of consolidation or compression, the sound is louder and sounds like “A.”</p>
<p>Whispered Pectoriloquy: Ask the client to whisper the phrase “one–two–three” while you auscultate the chest wall.</p>	<p>Transmission of sound is very faint and muffled. It may be inaudible.</p>	<p>Over areas of consolidation or compression, the sound is transmitted clearly and distinctly. In such areas, it sounds as if the client is whispering directly into the stethoscope.</p>

Anterior Thorax

Inspection

<p>Inspect for shape and configuration. Have the client sit with her arms at her sides. Stand in front of the client and assess shape and configuration.</p>	<p>The anteroposterior diameter is less than the transverse diameter. The ratio of anteroposterior diameter to the transverse diameter is 1:2.</p>	<p>Anteroposterior equals transverse diameter, resulting in a barrel chest (see Abnormal Findings 18-1). This is often seen in emphysema because of hyperinflation of the lungs.</p>
<p>Inspect position of the sternum. Observe the sternum from an anterior and lateral viewpoint.</p>	<p>Sternum is positioned at midline and straight.</p> <p> The sternum and ribs may be more prominent in the older client because of loss of subcutaneous fat.</p>	<p><i>Pectus excavatum</i> is a markedly sunken sternum and adjacent cartilages (often referred to as funnel chest). It is a congenital malformation that seldom causes symptoms other than self-consciousness. <i>Pectus carinatum</i> is a forward protrusion of the sternum causing the adjacent ribs to slope backward (often referred to as pigeon chest). (See Abnormal Findings 18-1 for illustrations of both conditions.) Both conditions may restrict expansion of the lungs and decrease the lung capacity.</p>
<p>Watch for sternal retractions.</p>	<p>Retractions not observed.</p>	<p>Sternal retractions are noted with severely labored breathing.</p>
<p>Inspect slope of the ribs. Assess the ribs from an anterior and lateral viewpoint.</p>	<p>Ribs slope downward with symmetric intercostal spaces. Costal angle is within 90 degrees.</p>	<p>Barrel-chest configuration results in a more horizontal position of the ribs and costal angle of more than 90 degrees. This often results from long-standing emphysema.</p>

PHYSICAL ASSESSMENT *Continued*

Assessment Procedure

Observe quality and pattern of respiration. Note breathing characteristics as well as rate, rhythm, and depth. Table 18-3 describes respiration patterns.

► **Clinical Tip** • *When assessing respiratory patterns, it is more objective to describe the breathing pattern, rather than just labeling the pattern.*




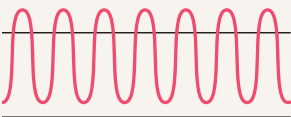

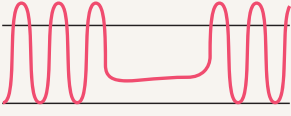
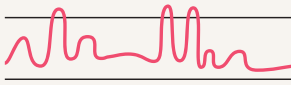
Normal Findings

Respirations are relaxed, effortless, and quiet. They are of a regular rhythm and normal depth at a rate of 10 to 20 per minute in adults. Tachypnea and bradypnea may be normal in some clients.

Abnormal Findings

Labored and noisy breathing is often seen with severe asthma or chronic bronchitis. Abnormal breathing patterns include tachypnea, bradypnea, hyperventilation, hypoventilation, Cheyne-Stokes respiration, and Biot's respiration.

Table 18-3 **Respiration Patterns**

Type	Description	Pattern	Clinical Indication
Normal	12 to 20/min and regular		Normal breathing pattern
Tachypnea	>24/min and shallow		May be a normal response to fever, anxiety, or exercise Can occur with respiratory insufficiency, alkalosis, pneumonia, or pleurisy
Bradypnea	<10/min and regular		May be normal in well-conditioned athletes Can occur with medication-induced depression of the respiratory center, diabetic coma, neurologic damage
Hyperventilation	Increased rate and increased depth		Usually occurs with extreme exercise, fear, or anxiety Kussmaul's respirations are a type of hyperventilation associated with diabetic ketoacidosis. Other causes of hyperventilation include disorders of the central nervous system, an overdose of the drug salicylate, or severe anxiety.
Hypoventilation	Decreased rate, decreased depth, irregular pattern		Usually associated with overdose of narcotics or anesthetics
Cheyne-Stokes respiration	Regular pattern characterized by alternating periods of deep, rapid breathing followed by periods of apnea		May result from severe congestive heart failure, drug overdose, increased intracranial pressure, or renal failure May be noted in elderly persons during sleep, not related to any disease process
Biot's respiration	Irregular pattern characterized by varying depth and rate of respirations followed by periods of apnea		May be seen with meningitis or severe brain damage

Assessment Procedure**Normal Findings****Abnormal Findings**

Inspect intercostal spaces. Ask the client to breathe normally and observe the intercostal spaces.

No retractions or bulging of intercostal spaces are noted.

Retraction of the intercostal spaces indicates an increased inspiratory effort. This may be the result of an obstruction of the respiratory tract or atelectasis. Bulging of the intercostal spaces indicates trapped air such as in emphysema or asthma.

Observe for use of accessory muscles. Ask the client to breathe normally and observe for use of accessory muscles.

Use of accessory muscles (sternomastoid and rectus abdominis) is not seen with normal respiratory effort. After strenuous exercise or activity, individuals with normal respiratory status may use neck muscles for a short time to enhance breathing.

Neck muscles (sternomastoid, scalene, and trapezius) are used to facilitate inspiration in cases of acute or chronic airway obstruction or atelectasis. The abdominal muscles and the internal intercostal muscles are used to facilitate expiration in COPD.

Palpation

Palpate for tenderness, sensation, and surface masses.

No tenderness or pain is palpated over the lung area with respirations.


Tenderness over thoracic muscles can result from exercising (e.g., push ups and the like) especially in a previously sedentary client.

Use your fingers to palpate for tenderness and sensation. Start with your hand positioned over the left clavicle (over the apex of the left lung) and move your hand left to right, comparing findings bilaterally. Move your hand systematically downward toward the midline at the level of the breasts and outward at the base to include the lateral aspect of the lung. The established sequence for palpating the anterior thorax (Fig. 18-18) serves as a guide for positioning your hands.

► **Clinical Tip** • *Anterior thoracic palpation is best for assessing the right lung's middle lobe.*

Palpate for tenderness at costochondral junctions of ribs.

Palpation does not elicit tenderness.

 Tenderness or pain at the costochondral junction of the ribs is seen with fractures, especially in older clients with osteoporosis.

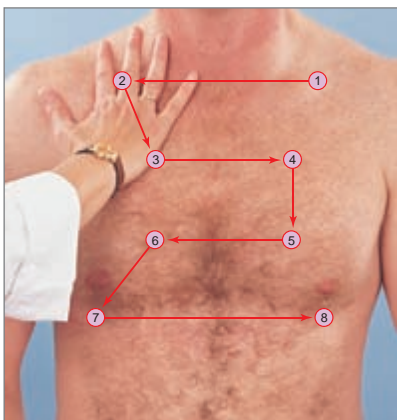


Figure 18-18 Sequence for palpating the anterior thorax.

PHYSICAL ASSESSMENT *Continued*

Assessment Procedure

Assess for crepitus as you would on the posterior thorax (described previously).

Also palpate any surface masses or lesions.

Palpate for fremitus. Using the sequence for the anterior chest above, palpate for fremitus using the same technique as for the posterior thorax.

► **Clinical Tip** • *When you assess for fremitus on the female client, avoid palpating the breast. Breast tissue dampens the vibrations.*

Palpate anterior chest expansion. Place your hands on the client's anterolateral wall with your thumbs along the costal margins and pointing toward the xiphoid process (Fig. 18-19). As the client takes a deep breath, observe the movement of your thumbs.

Percussion

Percuss for tone. Percuss the apices above the clavicles. Then percuss the intercostal spaces across and down, comparing sides (Fig. 18-20).

Normal Findings

No crepitus is palpated.

No unusual surface masses or lesions are palpated.

Fremitus is symmetric and easily identified in the upper regions of the lungs. A decreased intensity of fremitus is expected toward the base of the lungs; however, fremitus should be symmetric bilaterally.

Thumbs move outward in a symmetric fashion from the midline.

Resonance is the percussion tone elicited over normal lung tissue. Figure 18-21 depicts normal tones and their locations.

Percussion elicits dullness over breast tissue, the heart, and the liver. Tympany is detected over the stomach, and flatness is detected over the muscles and bones.

Abnormal Findings

In areas of extreme congestion or consolidation, crepitus may be palpated particularly in clients with lung disease.

Surface masses or lesions may indicate cysts or tumors.

Diminished vibrations, even with a loud spoken voice, may indicate an obstruction of the tracheobronchial tree.

Clients with emphysema may have considerably decreased fremitus as a result of air trapping.

Unequal chest expansion can occur with severe atelectasis, pneumonia, chest trauma, pleural effusion, or pneumothorax. Decreased chest excursion at the bases of the lungs is seen with COPD.

Hyperresonance is elicited in cases of trapped air such as in emphysema or pneumothorax. Dullness may characterize areas of increased density such as consolidation, pleural effusion, or tumor.



Figure 18-19 Palpating anterior chest expansion.



Figure 18-20 Sequence for percussing the anterior thorax.

Assessment Procedure**Normal Findings****Abnormal Findings****Auscultation**

Auscultate for anterior breath sounds, adventitious sounds, and voice sounds. Place the diaphragm of the stethoscope firmly and directly on the anterior chest wall. Auscultate from the apices of the lungs slightly above the clavicles to the bases of the lungs at the sixth rib. Ask the client to breathe deeply through his mouth in an effort to avoid transmission of sounds that may occur with nasal breathing. Be alert to the client's comfort and offer times for rest and normal breathing if fatigue is becoming a problem, particularly for the older client.

Listen at each site for at least one complete respiratory cycle. Follow the sequence for anterior auscultation shown in Figure 18-22.

➤ **Clinical Tip** • *Again, do not attempt to listen through clothing or other materials. However, if the client has a large amount of hair on the chest, listening through a thin T-shirt can decrease extraneous sounds that may be misinterpreted as crackles.*

Figure 18-23 depicts locations for normal breath sounds.

Refer to text in the posterior thorax section for normal voice sounds.

Refer to Table 18-2 for adventitious breath sounds. Refer to text in the posterior thorax section for normal voice sounds.

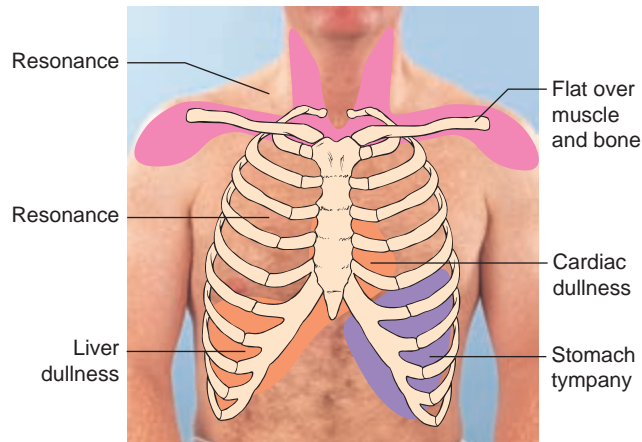


Figure 18-21 Normal percussion tones heard from the anterior thorax.

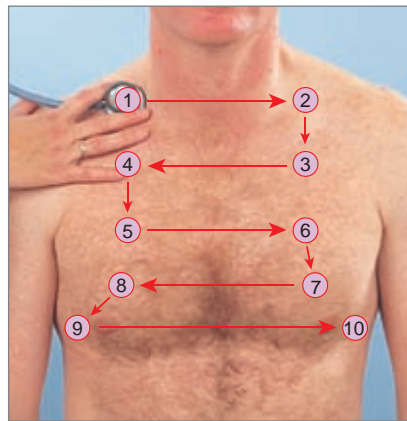


Figure 18-22 Sequence for auscultating the anterior thorax.

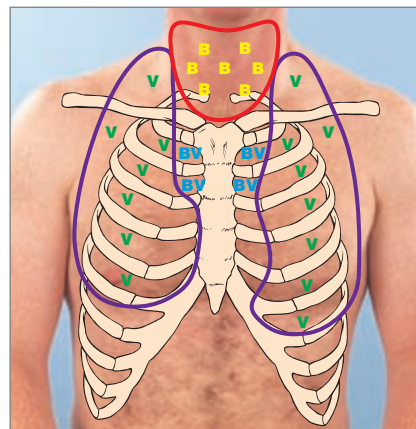
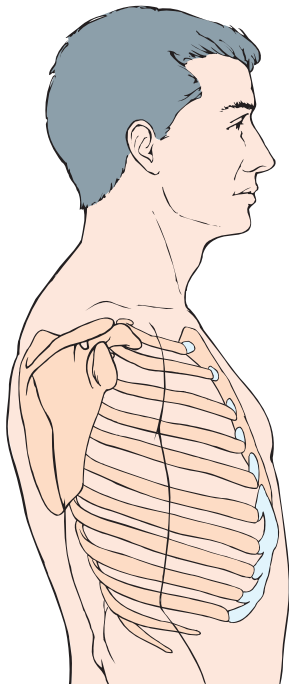


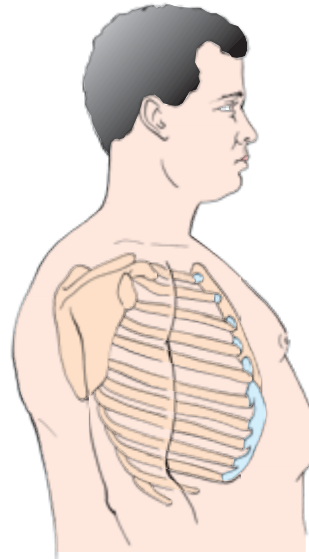
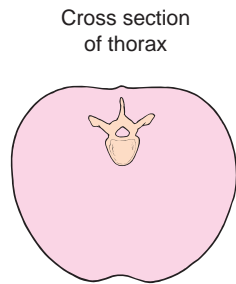
Figure 18-23 Location of breath sounds for the anterior thorax. B, bronchial sounds; V, vesicular sounds; BV, bronchovesicular sounds.

Abnormal Findings 18-1

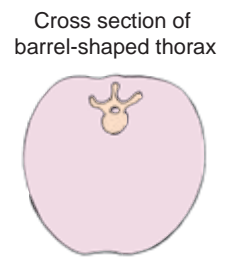
Thoracic Deformities and Configurations



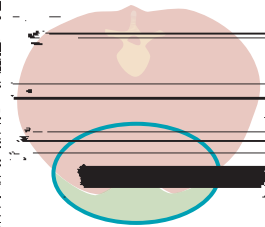
Normal chest configuration.



Barrel chest.



Pectus excavatum (funnel chest).

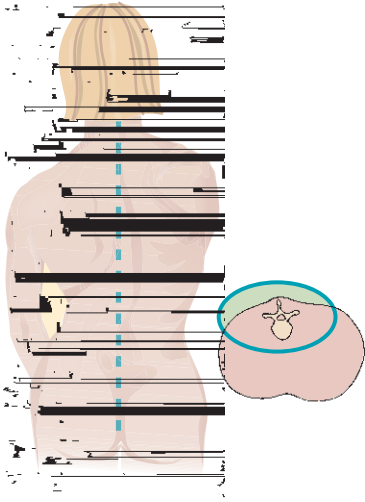


Pectus carinatum (pigeon chest).

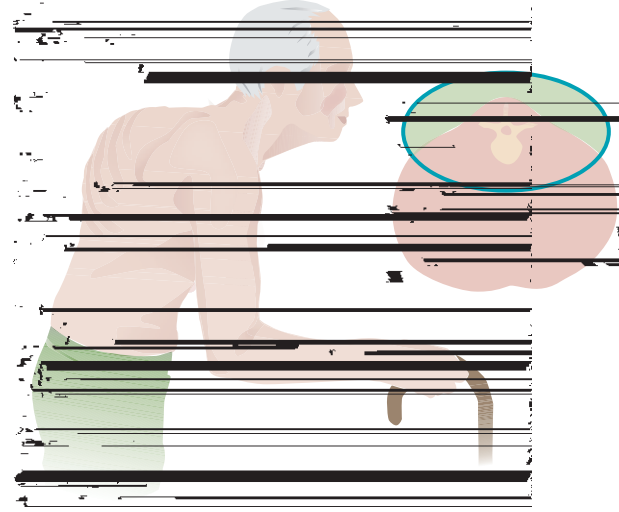


continued

Abnormal Findings 18-1

Thoracic Deformities and Configurations *Continued*

Scoliosis.



Kyphosis.

VALIDATING AND DOCUMENTING FINDINGS

If there are discrepancies between objective and subjective data or if abnormal findings are inconsistent with other data, validate your data. This is necessary to verify that the data are reliable and accurate. Document the assessment data following the health care facility or agency policy.

Sample Documentation of Subjective Data

No dyspnea, cough, or chest pain with breathing at rest or with activity. No past history or family history of respiratory diseases. Has never smoked and works in well-ventilated factory. Reports "one or two" colds per year. No known allergies. Last TB skin test performed 5 months ago with negative results. Last chest x-ray 4 years ago after "minor" car accident. X-ray report at that time was normal.

Sample Documentation of Objective Data

Respirations 18/minute, relaxed and even. Anteroposterior less than transverse diameter. Chest expansion symmetric. No retracting or bulging of intercostal spaces. No pain or tenderness noted on palpation. Tactile fremitus symmetric. Percussion tones resonant over all lung fields. Diaphragmatic excursion 4 cm and equal bilaterally. Vesicular breath sounds auscultated over lung fields. No adventitious sounds present.

After you have collected your assessment data, you will need to use diagnostic reasoning skills to analyze the data.

Analysis of Data

DIAGNOSTIC REASONING: POSSIBLE CONCLUSIONS

After collecting subjective and objective data pertaining to the thorax and lung assessment, identify abnormal findings and client strengths. Then cluster the data to reveal any significant patterns or abnormalities. These data may then be used to make clinical judgments about the status of the client's thorax and lungs.

Selected Nursing Diagnoses

Following is a listing of selected nursing diagnoses (wellness, risk, or actual) that you may identify when analyzing the clue clusters.

Wellness Diagnoses

- Readiness for Enhanced Breathing Patterns
- Health-Seeking Behaviors: Requests information on TB skin testing, how to quit smoking, or on exercises to improve respiratory status

Risk Diagnoses

- Risk for Respiratory Infection related to exposure to environmental pollutants and lack of knowledge of precautionary measures

- Risk for Activity Intolerance related to imbalance between oxygen supply and demand
- Risk for Imbalanced Nutrition: Less Than Body Requirements related to fatigue secondary to dyspnea
- Risk for Ineffective Health Maintenance related to lack of knowledge of condition, infection transmission, and prevention of recurrence
- Risk for Impaired Oral Mucous Membranes related to mouth breathing

Actual Diagnoses

- Anxiety related to dyspnea and fear of suffocation
- Activity Intolerance related to fatigue secondary to inadequate oxygenation
- Ineffective Airway Clearance related to inability to clear thick, mucous secretions secondary to pain and fatigue
- Impaired Gas Exchange related to chronic lung tissue damage secondary to chronic smoking
- Ineffective Airway Clearance related to bronchospasm and increased pulmonary secretions
- Ineffective Breathing Pattern: Hyperventilation related to hypoxia and lack of knowledge of controlled breathing techniques
- Disturbed Sleep Pattern related to excessive coughing
- Impaired Gas Exchange related to poor muscle tone and decreased ability to remove secretions secondary to the aging process

Selected Collaborative Problems

After grouping the data, certain collaborative problems may become apparent. Remember that collaborative problems differ from nursing diagnoses in that they cannot be prevented by nursing intervention. However, these physiologic complications of medical conditions can be detected and monitored by the nurse. In addition, the nurse can use physician- and nurse-prescribed interventions to minimize the complications of these problems. The nurse may also have to refer the client in such situations for further treatment of the problem. Following is a list of collaborative problems that may be identified when obtaining a general impression. These problems are worded as Risk for Complications (or RC), followed by the problem.

- RC: Atelectasis
- RC: Pneumonia
- RC: Chronic obstructive pulmonary disease
- RC: Asthma
- RC: Bronchitis
- RC: Pleural effusion
- RC: Pneumothorax
- RC: Pulmonary edema
- RC: Tuberculosis

Medical Problems

Development of RC and/or other signs and symptoms may clearly require medical treatment and referral to a primary care provider.



CASE STUDY

The case study demonstrates how to analyze thoracic and lung assessment data for a specific client. The critical thinking exercises included in the study guide/lab manual and interactive product that complement this text also offer opportunities to analyze assessment data.

This is your third weekly home visit with George Burney, a 60-year-old Caucasian man who was discharged after being hospitalized for 10 days with acute respiratory failure secondary to chronic obstructive pulmonary disease (COPD).

His eyes sparkling, he tells you he is feeling great and that he was able to walk outside on his patio for a few minutes today without his oxygen. He uses oxygen at 2 L/min when he exercises and prn for shortness of breath. He reports a “chronic cough, as usual” but denies sputum production. He says he still has difficulty “getting off a good cough” because “I just don’t have the energy anymore.”

Upon inspection, you note his facial color and lips are ruddy, but nail beds are pink. His breathing pattern is regular,

unlabored, but tachypneic at 28 respirations per minute, which is his usual rate. Examining his thorax, you note he is barrel-chested with a transverse-to-lateral ratio of about 2.5 to 3. Although he is not using accessory muscles to breathe, you observe slight intercostal bulging and rigidly upright posture in the chair. While auscultating his lungs, you note diminished breath sounds bilaterally in most of lower lobes and a small, discrete area of coarse crackles in the upper portion of the left lower lobe. You also smell the odor of cigarettes on his breath, and, when you confront him with this information, he says, “I didn’t think one would hurt when I was outside.”

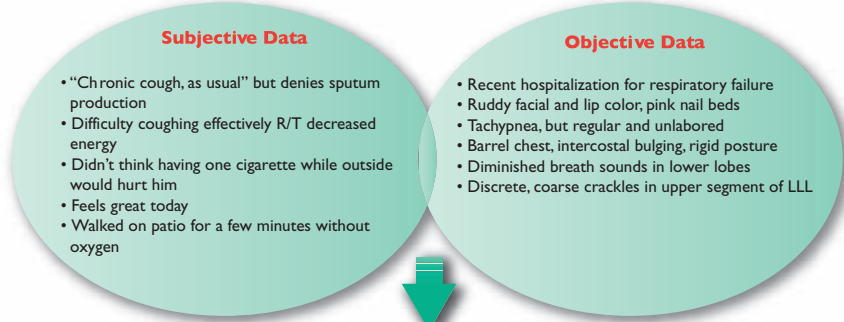
The following concept map illustrates the diagnostic reasoning process.

Applying COLDSPA

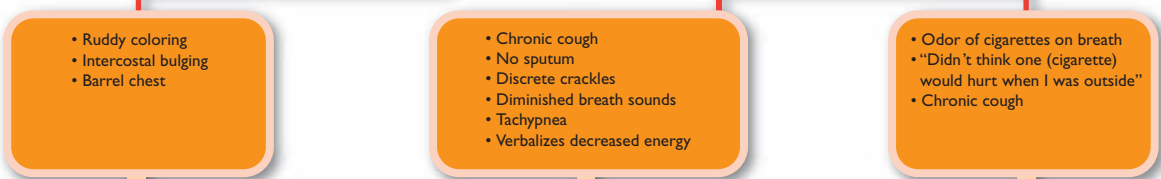
Applying **COLDSPA** for client symptoms: “chronic cough.”

Mnemonic	Question	Data Provided	Missing Data
C haracter	Describe the sign or symptom (feeling, appearance, sound, smell, or taste if applicable).	“Chronic cough.”	
O nset	When did it begin?		“When did you notice you could not bring up sputum when you cough?”
L ocation	Where is it? Does it radiate? Does it occur anywhere else?		“Do you have any chest pain?”
D uration	How long does it last? Does it recur?		“Are you short of breath when you walk or do other activities? How often do you use your oxygen?”
S everity	How bad is it? or How much does it bother you?	“I am feeling great and I went outside on the patio today for a few minutes without my oxygen.”	
P attern	What makes it better or worse?		“What makes your shortness of breath and cough worse? Or better?”
A ssociated factors/How it A ffects the client	What other symptoms occur with it? How does it affect you?	Lacks energy to cough up any real sputum; smokes an occasional cigarette outside.	

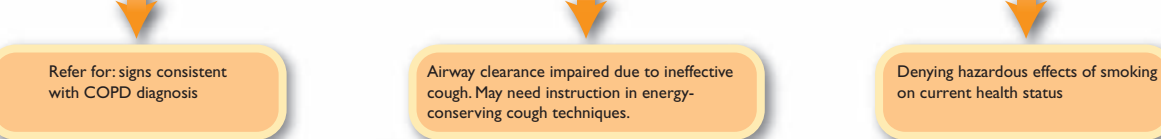
1) Identify abnormal data and client strengths



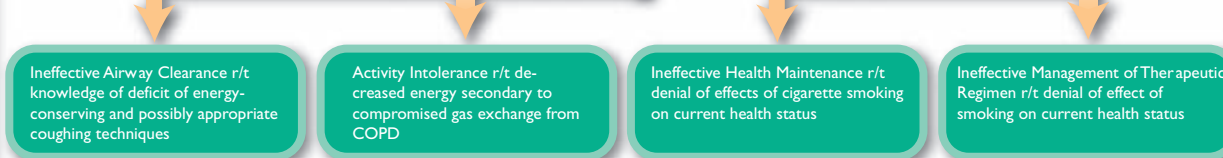
2) Identify cue clusters



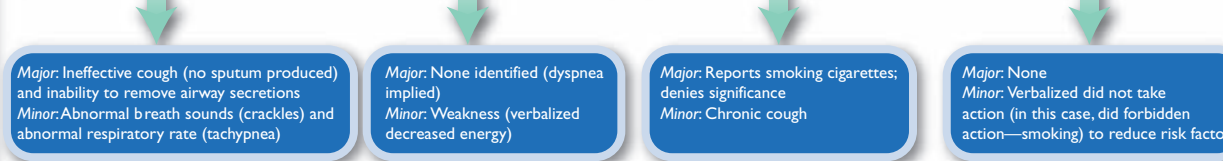
3) Draw inferences



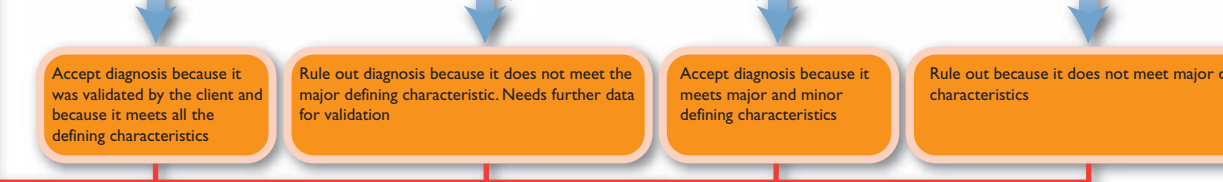
4) List possible nursing diagnoses



5) Check for defining characteristics



6) Confirm or rule out diagnoses



7) Document conclusions



References and Selected Readings

- American Cancer Society (ACS). (2004). Lung Cancer Resource Center. Available at <http://www.cancer.org/cancerinfo/>
- American Lung Association. (2004). Facts about lung cancer. Available at <http://www.lungusa.org>
- Barishansky, R. O., O'Connor, & Perkins, T. (2005). Name that tune: An introduction to auscultating, differentiating and assessing lung sounds. Available at <http://publicsafety.com>
- Braun, P. C., & Zoidis, J. D., (2004). Atypical pneumonia. *RT: The Journal for Respiratory Care Practitioners*, September, 22–42.
- Carolson, B. W., & Mascarella, J. J. (2003). Changes in sleep patterns in COPD. *American Journal of Nursing*, 103(12), 71–74.
- Carroll, P. (2003). Making asthma education more effective to enhance patient outcomes. *RT: The Journal for Respiratory Care Practitioners*, October, 28–32.
- Carter, R., & Tiep, B. (2007). Identifying and assessing lung disease. *RT*. Available <http://www.rtmagazine.com>
- Covey, M. K., & Larson, J. L. (2004). Exercise and COPD. *American Journal of Nursing*, 104(5), 40–43.
- Dunlap, N. E., Bass, J., Fujiwara, P., Hopewell, P., Horsburgh, C. R., Jr., Salfinger, M., et al. (2000). American Thoracic Society. Diagnostic standards and classification of tuberculosis in adults and children. *American Journal of Respiratory and Critical Care Medicine*, 161(4), 1376–1395.
- Edmonds, P., Higginson, I., Altmann, D., Sen-Gupta, G. M., & McDonnell, M. (2000). Is the presence of dyspnea a risk factor for morbidity in cancer patients? *Journal of Pain and Symptom Management*, 19(1), 15–22.
- Eid, N., Yandell, B., Howell, L., Eddy, M., & Sheikh, S. (2000). Can peak expiratory flow predict airflow obstruction in children with asthma? *Pediatrics*, 105(2), 354–358.
- Gates, M. A. (2004). GERD and asthma. *RT: Journal for Respiratory Care Practitioners*, January, 30–31.
- Gerald, L., & Baily, W. (2002). Global initiative for chronic obstructive lung disease. *Journal of Cardiopulmonary Rehabilitation*, 22, 234–244.
- Gift, A. G., & Narsavage, G. (1998). Validity of the numeric rating scale as a measure of dyspnea. *American Journal of Critical Care*, 7(3), 200–204.
- Goldrick, B. A. (2004). Once dismissed, still rampant. *American Journal of Nursing*, 104(9), 68–70.
- Hyatt, R., Scanlon, P., & Nakamura, M. (2003). *Interpretation of pulmonary function tests*. Philadelphia: Lippincott Williams & Wilkins.
- Inzeo, D., & Tyson, L. (2007). Nursing assessment and management of dyspneic patients with lung cancer. *Clinical Journal of Oncology Nursing*, 7, 332–333. Available at <http://ons.metapress.com>
- Jenkins, K., & Ahijevych, K. (2003). Nursing students' beliefs about smoking, their own smoking behaviors, and use of professional tobacco treatment intervention. *Applied Nursing Research*, 16(3), 164–172.
- Kreamer, K. M. (2003). Getting the lowdown on lung cancer. *Nursing*, 33(11), 36–42.
- Marthaler, M., Keresztes, P., & Tazbir, J. (2003). SARS: What have we learned? *RN*, 66(8), 58–64.
- Patel, J. D., Bach, P. B., & Kris, M. G. (2004). Lung cancer in women: A contemporary epidemic. *Journal of the American Medical Association*, 291(14), 1763–1768.
- Pope, B. B. (2004). Chronic obstructive pulmonary disease. *Nursing*, 34(3), 56–57.
- Reinke, L. F., & Hoffman, L. (2000). Asthma education: Creating a partnership. *Heart & Lung*, 29(3), 225–236.
- Sethi, S. (2002). New strains of bacteria and exacerbations of chronic obstructive pulmonary disease. *New England Journal of Medicine*, 347(7), 465–471.
- Sharma, S. K., & Chan, E. D. (2000). Lung disease in the elderly: Diagnosing asthma. *Journal of Respiratory Diseases*, 21(2), 101–106, 111–113.
- Sheahan, S. L., Free, T. A., & Rayena, M. K. (2003). Smoking behavior and desire to quit among low-income female caregivers. *Applied Nursing Research*, 16(3), 156–163.
- Tammemagi, C. M., Neslund-Dudas, C., Simoff, M., & Keale, P. (2004). Smoking and lung cancer survival. *Chest*, 125(1), 27–37.
- Wisnivesky, J. P. (2002). Management of asthma in the elderly. *Annals of Long Term Care*, 10(4), 61–70.
- Wright, S. (2002). Verbal advice plus an information leaflet reduced antibiotic use in patients presenting with acute bronchitis. *Evidence-Based Nursing*, 5(3), 79.
- Zoidis, J. D. (2003). New onset COPD. *RT: The Journal for Respiratory Care Practitioners*, October, 46–48.

Promote Health—Lung Cancer

- American Cancer Society (ACS). (2004). *Cancer facts and figures for African Americans 2000–2002*. Atlanta.
- American Lung Association. (2000). Facts about lung cancer. Available at <http://lungusa.org>
- It's Time to Focus on Lung Cancer (2005). Lung cancer 101. Available <http://www.lungcancer.org>
- Lung cancer news. (1998–2004). Available at <http://CancerConsultants.com>
- National Cancer Institute. (2003). Cancer: Study finds increased lung cancer risk following treatment for Hodgkin's disease. Available at <http://cis.nci.nih.gov>

Promote Health—COPD

- COPD statistical information. (2002–2004). Available at <http://www.copd-international.com/library/statistics.htm>
- How to prevent chronic obstructive pulmonary disease. (2005). Available at <http://respiratory-lung.health-cares.net/copd-prevention.php>