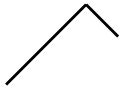
Characteristics of Breath Sounds

	Duration of Sounds	Intensity of Expiratory Sound	Pitch of Expiratory Sound	Locations Where Heard Normally
Vesicular* 	Inspiratory sounds last longer than expiratory ones.	Soft	Relatively low	Over most of both lungs
Broncho-vesicular 	Inspiratory and expiratory sounds are about equal.	Intermediate	Intermediate	Often in the 1st and 2nd interspaces anteriorly and between the scapulae
Bronchial 	Expiratory sounds last longer than inspiratory ones.	Loud	Relatively high	Over the manubrium, if heard at all
Tracheal 	Inspiratory and expiratory sounds are about equal.	Very Loud	Relatively high	Over the trachea in the neck

Adventitious Lung Sounds

DISCONTINUOUS SOUNDS (CRACKLES OR RALES) are intermittent, nonmusical, and brief – like dots in time

Fine crackles (. . . . .) are soft, high pitched, and very brief (5 – 10 msec).

Coarse crackles (• • • • •) are somewhat louder, lower in pitch, and not quite so brief (20-30 msec).

CONTINUOUS SOUNDS are > 250 msec, notably longer than crackles – like dashes in time – but do not necessarily persist throughout the respiratory cycle. Unlike crackles, they are musical.

Wheezes ( ) are relatively high pitched (around 400 Hz or higher) and have a hissing or shrill quality.

Rhounchi ( ) are relatively low pitched (around 200 Hz or lower and have a snoring quality.

Physical Findings in Selected Chest Disorders

The black boxes in this table suggest a framework for clinical sessment. Start with the three boxes under Percussion Note: resonant, dull and hyperresonant. Then move from each of these to other boxes that emphasize some of the key differences among various conditions. The changes described vary with the extent and severity of the disorders. Abnormalities deep in the chest usually produce fewer signs at all. Use the table for the direction of atypical changes, not for absolute distinctions.

Condition	Percussion Note	Trachea	Breath Sounds	Adventitious Sounds	Tactile Fremitus and Transmitted Voice Sounds

Physical Findings in Selected Chest Disorders (cont'd)

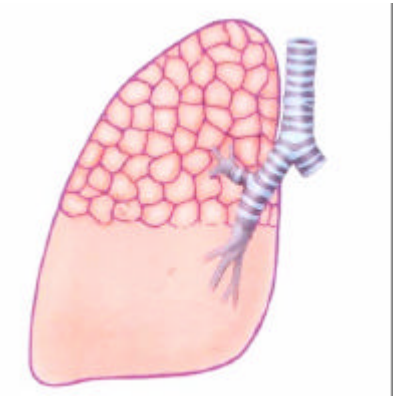
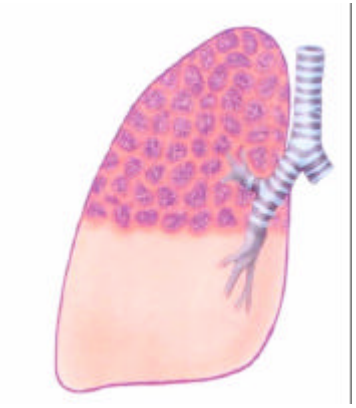
Condition	Percussion Note	Trachea	Breath Sounds	Adventitious Sounds	Tactile Fremitus and Transmitted Voice Sounds

Physical Findings in Selected Chest Disorders (cont'd)

Condition	Percussion Note	Trachea	Breath Sounds	Adventitious Sounds	Tactile Fremitus and Transmitted Voice Sounds
Chronic Obstructive Pulmonary Disease (COPD) Slowly progressive disorder in which the distal air spaces enlarge and lungs become hyperinflated. Chronic bronchitis is often associated.	Diffusely **Hyperresonant**	Midline	*Decreased to absent*	None, or the crackles, wheezes, and ronchi of associated chronic bronchitis	*Decreased*
Asthma Widespread narrowing of the tracheobronchial tree diminishes airflow to a fluctuating degree. During attacks, airflow decreases further and lungs hyperinflate.	**Resonant** to diffusely **hyperresonant**	Midline	*Often obscured by wheezes*	*Wheezes, possibly crackles*	*Decreased*

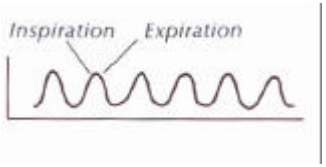
Normal and Altered Breath and Voice Sound

The origins of breath sounds are still unclear. According to leading theories, turbulent air flow in the central airways produces the tracheal and bronchial breath sounds. As these sounds pass through the lungs to the periphery, lung tissue filters out their higher-pitched components and only the soft and lower-pitched components reach the chest wall, where they are heard as vesicular breath sounds. Noramlly, tracheal and bronchial sounds may be heard over the trachea and mainstem bronchi; vesicular breath sounds predominate throughout most of the lungs. When lung tissue loses its air, it transmits high-pitched sounds much better. If the tracheobronchial tree is open, bronchial breath sounds may replace the normal vesicular sounds over airless areas of the lung. This change is seen in lober pneumonia when the alveoli fill with fluid, red cells, and white cells – a process calles *consolidation.* Other causes include pulmonary edema or hemorrhage. Bronchial breath sounds usually correlate with an increase in tactile fremitus and transmitted voice sounds. These findings are summarized below.

	Normal Air-Filled Lung	Airless Lung, as in Lobar Pneumonia
		
Breath Sounds	Predominantly vesicular	Bronchial or bronchovesicular over the involved area
Transmitted Voice Sounds	Spoken words muffled and indistinct Spoken “ee” heards as “ee”	Spoken words louder, clearer (*bronchophony)* Spoken “ee” heard as “ay” (*egophony)*
Tactile Fremitus	Whispered words faint and indistinct, if heard at all Normal	*Whispered words louder, clearer (whispered pectoriloquy*) Increased

Abnormalities in Rate and Rhythm of Breathing

When observing respiratory patterns, think in terms of *rate, depth,* and *regularity* of the patient's breathing. Describe what you see in these terms. Traditional terms, such as tachypnea, are given below so that you will understand them, but simple descriptions are recommended for use.



Normal

The respiratory rate is about 14-20 per min in normal adults and up to 44 per min in infants.

Rapid Shallow Breathing *(Tachypnea)*

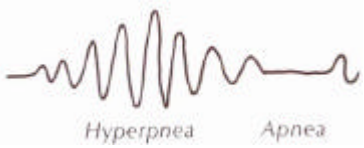
Rapid shallow breathing has a number of causes, including restrictive lung disease, pleuritic chest pain, and an elevated diaphragm.

Rapid Deep Breathing *(Hyperpnea, Hypeventilation)*

Rapid deep breathing has several causes, including exercise, anxiety, and metabolic acidoses. In the comatose patient, consider infarction, hypoxia, or phypoglycemia affecting the midbrain or pons. *Kussmaul breathing* is deep breathing due to metabolic acidosis. It may be fast, normal in rate, or slow.

Slow Breathing (Bradypnea)

Slow breathing may be secondary to such causes as diabetic coma, drug induced respiratory depression, and increased intracranial pressure.



Cheyne-Strokes Breathing

Periods of deep breathing alternate with periods of apnea (no breathing). Children and aging people normally may show this pattern in sleep. Other causes include heart failure, uremia, drug-induced respiratory depression, and brain damage (typically on both sides of the cerebral hemispheres or diencephalon.

Ataxic Breathing *(Biot's Breathing)*

Ataxic breathing is characterized by unpredicted irregularity. Breaths may be shallow or deep, and stop for short periods. Causes include respiratory depression and brain damage, typically at the medullary level.

Sighing Respiration

Breathing punctuated by frequent sighs should alert you to the possibility of hyperventilation syndrome – a common cause of dyspnea and dizziness. Occasional sighs are normal.

Obstructive Breathing

In obstructive lung disease, expiration is prolonged because narrowed airways increase the resistance to airflow. Causes include asthma, chronic bronchitis, and COPD.