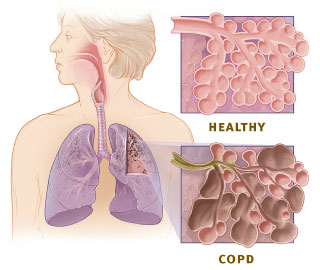
**RESPIRATORY DISORDERS: ASTHMA AND COPD**

**Self-Study Module**

Key Medical Resources, Inc.

***Compiled by Terry Rudd, RN, MSN***

**

http://fromyourdoctor.com/topic.do?title=COPD+Emphysema+and+Chronic+Bronchitis&t=7697

15.0 Contact Hours

## California Board of Registered Nursing CEP#15122

Key Medical Resources, Inc.

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**Developed 9/2010Title:** **RESPIRATORY DISORDERS: ASTHMA AND COPD Self Study Module**

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Please place your answers on this form.

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**Title:** **RESPIRATORY DISORDERS: ASTHMA AND COPD**

**Self Study Exam 15.0 C0NTACT HOURS**

*Choose the Single Best Answer for the Following Questions and Place Answers on Form:*

1. **The lungs take in and remove oxygen. The percentage of oxygen that is inhaled is:**
   1. **10%**
   2. **16%**
   3. **21%**
   4. **35%**
2. **The control center for respiratory rate is in the:**
   1. **Medulla**
   2. **Cerebrum**
   3. **Cerebellum**
   4. **Hypothalamus**
3. **The thin flap of tissue that covers the windpipe when swallowing is called the:**
   1. **Trachea**
   2. **Epiglottis**
   3. **Larynx**
   4. **Uvula**
4. **The main muscle used for breathing is/are the:**
   1. **Diaphragm**
   2. **Trapezium**
   3. **Intercostals muscles**
   4. **Abdominal muscles**

**Match the abbreviation to the meaning:**

1. **\_\_\_\_\_ V a. arterial blood**
2. **\_\_\_\_\_ Sp02 b. partial pressure of oxygen in the artery**
3. **\_\_\_\_\_ Pa02 c. arterial oxygen saturation determined by pulse oximetry**
4. **\_\_\_\_\_ a d. volume or amount of gas**
5. **Lung function tests measure:**
   1. **How much air is taken in to the lungs**
   2. **How strong the breathing muscles are**
   3. **How much air can be blown out of the lungs**
   4. **All of the above**

**Match the Lung volume term to the definition:**

1. **\_\_\_\_\_ tidal volume a. the maximum volume of air that can be exhaled after inflation**
2. **\_\_\_\_\_ IRV b. additional volume that can be inspired with effort**
3. **\_\_\_\_\_ Vital Capacity c. amount of air left after maximum expiratory effort**
4. **\_\_\_\_\_ residual volume d. the air that moves in and out of the lungs**
5. **The confidence level of the pulse oximeter reading as a good reading is only as good as the practitioner’s knowledge of the patient’s \_\_\_\_\_\_.**
   1. **Blood pressure**
   2. **Pa02**
   3. **Skin color**
   4. **Hemoglobin**
6. **Prior to obtaining arterial blood gases from the radial artery, the following assessment must be performed to determine patency of the arterial blood supply:**
   1. **Radial pulse**
   2. **Ulnar pulse**
   3. **Pulse oximeter reading**
   4. **Allen’s test**
7. **Which arterial blood gas reading is considered abnormal?**
   1. **pH 7.40**
   2. **PaC02 55**
   3. **HC03 24**
   4. **Pa02 95**
8. **Which arterial blood gas result would cause the greatest concern?**
   1. **Pa02 95 on room air oxygen**
   2. **Pa02 80 on 100% oxygen**
   3. **Pa02 140 on 40% oxygen**
   4. **Pa02 180 on 60% oxygen**
9. **Which assessment technique would be best to determine if the patient has wheezing?**
   1. **Inspection**
   2. **Palpation**
   3. **Auscultation**
   4. **Percussion**
10. **To determine the patient’s risk for respiratory problems, one of the most important aspect for assessment is:**
    1. **Chest X-ray**
    2. **ABG’s**
    3. **Patient’s Family History**
    4. **Pulse Oximeter reading**
11. **Which respiratory rate indicated below would be indicative of eupnea?**
    1. **8**
    2. **14**
    3. **24**
    4. **36**
12. **Which adventitious respiratory sound is coarse and grating?**
    1. **Crackles**
    2. **Rales**
    3. **Wheezes**
    4. **Rhonchi**

**Match the terms to the description:**

1. \_\_\_\_\_ Ventilation a. movement of gas in and out of the lungs
2. \_\_\_\_\_ Perfusion b. movement of gases across the alveolar-capillary membrane
3. \_\_\_\_\_ Diffusion c. transport of oxygenated blood to the tissues

Match the category of lung disease to the description:

1. \_\_\_\_\_ Obstructive a. destruction of air sacs or alveoli
2. \_\_\_\_\_ Restrictive b. caused by bacteria invading the lungs
3. \_\_\_\_\_ Parenchymal c. loss of airway compliance
4. \_\_\_\_\_ infectious d. increased airway resistance
5. Asthma is considered an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lung disorder.
   1. Obstructive
   2. Restrictive
   3. Parenchymal
   4. Infectious
   5. Obstructive and parenchymal
6. Bronchitis is considered an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lung disorder
   1. Obstructive
   2. Restrictive
   3. Parenchymal
   4. Infectious
   5. Obstructive and parenchymal
7. Emphysema is considered an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lung disorder
   1. Obstructive
   2. Restrictive
   3. Parenchymal
   4. Infectious
   5. Obstructive and parenchymal
8. The most common cause of lung cancer in the United States is:
   1. Asbestos
   2. Air pollution
   3. Smoking
   4. Emphysema
9. Mortality rates for asthma have been:
   1. On the decline
   2. The same
   3. Rising
10. Asthma is:
    1. Reversible
    2. Not reversible
11. The pathophysiology of asthma is related to:
    1. Airway inflammation
    2. Intermittent airflow obstruction
    3. Bronchial hyperresponsiveness
    4. All of the above
12. Which factor DOES NOT contribute to exercise induced bronchospasm?
    1. Coexisting respiratory infection
    2. Environmental pollutants
    3. Duration of exercise
    4. Exposure to warm, moist air

Match the drug category for asthma treatment to the description:

1. \_\_\_\_\_ Long-acting beta agonist a. no use once an asthma attack has begun
2. \_\_\_\_\_ Inhaled corticosteroids b. works with immune system to inhibit chemicals
3. \_\_\_\_\_ Leukotriene inhibitors c. reduce inflammation by blocking chemicals
4. \_\_\_\_\_ Mast cell stabilizers d. acts locally to reduce inflammation
5. \_\_\_\_\_ Anti IGE monoclonal antibodies e. dilate air passages for 12 hours or longer
6. COPD includes which two of the following conditions?
   1. Asthma and emphysema
   2. Asthma and chronic bronchitis
   3. Chronic bronchitis and emphysema
   4. Asthma and pneumonia
7. Which statistic relating to COPD is true?
   1. 1st leading cause of death
   2. More women than men have asthma
   3. Air pollution is the primary risk factor
   4. Affects more younger than older persons
8. The American Thoracic Society stages COPD according to lung function. Which stage reflects a FEV1 of 35-49% of the predicted value?
   1. I
   2. II
   3. III
   4. IV
9. The goal of COPD treatment is:
   1. Improvement of daily living an quality of life
   2. Reduce the patient’s smoking by 50%
   3. Have oxygen level consistently in the high 90’s
   4. Maintain PaC02 levels between 35 and 40
10. Successful smoking cessation programs have the following resources and tools:
    1. Patient education
    2. A quit date
    3. Relapse prevention
    4. Adjuncts to treatment such as medications
    5. All of the above

Match the medication or treatment to the description.

1. \_\_\_\_\_ bupropion (Zyban) a. bronchodilate
2. \_\_\_\_\_ bullectomy b. a nonnicotine aid - antidepressant
3. \_\_\_\_\_ lung reduction surgery c. to remove large air-filled spaces
4. \_\_\_\_\_ anticholinergic agents d. removal 20-30% upper part each lung

*This is the end of the test.*

*Please fax or scan then email your answer sheet.*

*Your certificate will be emailed to you.*

*Thank you for completing this module.*

**Title:** **RESPIRATORY DISORDERS: ASTHMA AND COPD**

**Compiled by Terry Rudd, RN, MSN**

Respiratory and lung diseases account for the most frequently diagnosed conditions today. Lung cancer is the second most commonly diagnosed cancer in men and women and is still the most common cause of cancer death. Asthma affects 23 million persons, with children accounting for 7 million. COPD, which includes emphysema and chronic bronchitis is the fourth leading cause of death in the United States. Many of these conditions, especially emphysema and chronic bronchitis are preventable. Smoking is the identified cause of 90% of lung cancers and the cause of many respiratory disorders. As healthcare professionals, we are often working with patients with respiratory problems. Our ability to help these persons and educate them as to cause, treatment and prevention can improve outcome. The goal for working this module is to overview the respiratory structure and function, define the diseases and identify the necessary assessment and treatment. This module will overview respiratory physiology and will emphasize the disorders of asthma and COPD (Bronchitis and Emphysema).

**RESPIRATORY PATHOPHYSIOLOGY, DISORDERS, ASSESSMENT AND TREATMENT OBJECTIVES**

At the completion of this module, the learner will be able to:

1. Describe the anatomy and physiology of the respiratory system.

2. Identify categories of respiratory disorders.

3. Differentiate the terms ventilation, diffusion and perfusions as they relate to respiratory disorders.

4. Describe assessment techniques as they relate to the respiratory system.

5. Define the different respiratory disorders.

6. Describe the pathophysiology of major respiratory disorders of asthma and COPD.

7. Describe the actions, uses, and adverse effects of commonly used respiratory drugs.

8. Complete exam at 70 % competency.

**RESPIRATORY STRUCTURE AND FUNCTION**

## Anatomy

The basic components of the respiratory system are divided into upper and lower tracts to aid in the description of symptoms). The organs of the respiratory system are designed for the major functions of air distribution and gas exchange for the body. The respiratory system ensures that oxygen is supplied to and carbon dioxide is removed from the body cells.

## The Lungs

The lungs are organs in the chest that allow the body to take in oxygen from the air. Room air is comprised of 21% oxygen. The lungs also help remove carbon dioxide, water and oxygen (16 – 17%) from the body. The lungs facilitate this gas exchange through VENTILATION; the movement of gas in and out of the lungs. For ventilation to occur, other organs and tissues help make breathing possible. The diaphragm and intercostals muscles assist with the muscles necessary to move gas. The medulla in the brain functions as the control center for respiratory rate.

## The Respiratory System

The respiratory system is a group of organs and tissues that help you breathe. The main parts of this system are the airways, the lungs and linked blood vessels, and the muscles that enable breathing.

### The Respiratory System

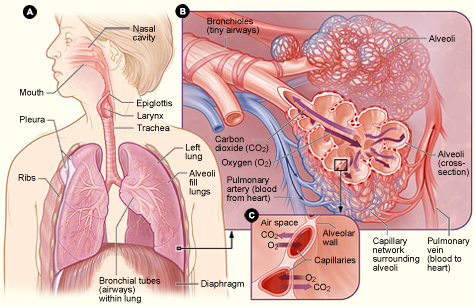


Figure A shows the location of the respiratory structures in the body. Figure B is an enlarged image of airways, alveoli, and the capillaries. Figure C shows the location of gas exchange between the capillaries and alveoli.

## Airways

The airways are pipes that carry oxygen-rich air (21%) to the lungs and carbon dioxide, water and 16 – 17% oxygen out of the lungs. The airways include the:

* Nose and linked air passages called nasal cavities
* Mouth
* Larynx or voice box
* Trachea or windpipe
* Tubes called bronchial tubes or bronchi, and their branches

Air first enters the body through the nose or mouth, which wets and warms the air. (Cold, dry air can irritate the lungs.) The air then travels through larynx and down the windpipe. The windpipe splits into two bronchi that enter the lungs. A thin flap of tissue called the epiglottis covers the windpipe when swallowing. This prevents food or drink from entering the air passages which could result in aspiration. Except for the mouth and some parts of the nose, all of the airways have special hairs called cilia that are coated with sticky mucus. The cilia trap germs and other foreign particles that enter the airways when you breathe in air. The person who has a tracheostomy or endotracheal tube do not have the effects of the cilia to help prevent entry of bacteria in to the lungs. The cilia then sweep the particles up to the nose or mouth. There, they're swallowed, coughed, or sneezed out of the body. Nose hairs and mouth saliva also trap particles and bacteria.

## Lungs and Blood Vessels

The venous system returns blood with carbon dioxide and 16-17% oxygen from the capillaries in the tissues to the right side of the heart. The pulmonary artery and its branches deliver blood rich in carbon dioxide to the capillaries that surround the air sacs. Inside the air sacs, carbon dioxide and lesser concentrations of oxygen to the outside air. Oxygen at 21%, room air concentration moves from the air into the blood in the lungs. The lungs and linked blood vessels deliver oxygen to the body and remove carbon dioxide. The lungs lie on either side of the breastbone and fill the inside of the chest cavity. The left lung is slightly smaller than the right lung to allow room for the heart. The left lung basically has two major lobes while the right side has three lobes. Within the lungs, the bronchi branch into thousands of smaller, thinner tubes called bronchioles. These tubes end in bunches of tiny round air sacs called alveoli. Each of these air sacs is covered in a mesh of tiny blood vessels called capillaries. Each alveolus is surrounded by a capillary. The alveolar-capillary membranes resemble a cluster of grapes with each grape surrounded by capillaries. Another depiction is that of a sponge with large holes. The holes would depict the alveolus while the sponge material would represent the capillaries. The capillaries, which carry red blood cells allow, through the process of DIFFUSION, oxygen to be transported from the alveolus to the hemoglobin of the red blood cell. The oxygen-rich blood then travels to the heart through the pulmonary vein and its branches. The heart pumps the oxygen-rich blood out to the body. The capillaries then transport the oxygenated red blood cell to the left side of the heart. The heart will then pump the oxygenated blood to the capillaries of all body systems.

## Muscles Used for Breathing

Muscles near the lungs help expand and contract (tighten) the lungs to allow breathing. These muscles include the:

* Diaphragm
* Intercostal muscles
* Abdominal muscles
* Muscles in the neck and collarbone area

The diaphragm is a dome-shaped muscle located below the lungs. It separates the chest cavity from the abdominal cavity. The diaphragm is the main muscle used for breathing. If neurological innervation to the diaphragm is disrupted in conditions such as spinal cord injury (above the C-5) level, brain injury, or syndromes such as Guillain Barre, or amyotrophic lateral sclerosis, the diaphragm will no longer function and the person will need to be placed on a ventilator. The intercostal muscles are located between the ribs. They also play a major role in helping with breathing. Beneath the diaphragm are abdominal muscles. These help to breathe out when breathing fast (for example, during physical activity). Muscles in the neck and collarbone area help you breathe in when other muscles involved in breathing don't work properly, or when lung disease impairs the breathing. Persons are most often placed on a ventilator when they are exhausted from breathing. Breathing normally takes about 10% of the body energy. When a person is in respiratory distress the act of breathing can consume up to 90% of the body energy. The person then may need to be placed on a ventilator.

## Breathing In (Inhalation)

When you breathe in, the diaphragm contracts (tightens) and moves downward. This increases the space in the chest cavity, into which the lungs expand. The intercostal muscles between the ribs also help enlarge the chest cavity. They contract to pull the rib cage both upward and outward when you inhale. As the lungs expand, air is sucked in through the nose or mouth. The air travels down the windpipe and into the lungs. After passing through the bronchial tubes, the air finally reaches and enters the alveoli (air sacs). Through very thin walls of the alveoli, oxygen from the air passes to the surrounding capillaries (blood vessels). A red blood cell protein called hemoglobin helps move oxygen from the air sacs to the blood. (Oxygen is especially drawn to hemoglobin.) At the same time, carbon dioxide and oxygen moves from the capillaries into the air sacs. The gas has traveled in the bloodstream from the right side of the heart through the pulmonary artery. Oxygen-rich blood from the lungs is carried through a network of capillaries, which become the pulmonary vein. This vein delivers the oxygen-rich blood to the left side of the heart. The left side of the heart pumps the blood to the rest of the body. There, the oxygen in the blood moves from blood vessels into surrounding tissues.

## Breathing Out (Exhalation)

When you breathe out, the diaphragm relaxes and moves upward into the chest cavity. The intercostal muscles between the ribs also relax to make the chest cavity size smaller. As the chest cavity gets smaller, air rich in carbon dioxide and lesser amounts of oxygen is forced out of the lungs and windpipe, and then out of the nose or mouth. Breathing out requires no effort from the body unless there is a lung disease or the person is involved in activity. When physically active, the abdominal muscles contract and push the diaphragm even more so against the lungs. This pushes the air in the lungs out rapidly.

## Control of Breathing

A respiratory control center at the base of the brain, the medulla, controls the breathing. This center sends ongoing signals down the spine and to the nerves of the muscles involved in breathing. These signals ensure the breathing muscles contract (tighten) and relax regularly. This allows the breathing to happen automatically, without you being aware of it. To a limited degree, you can change the breathing rate, such as by breathing faster or holding the breath. The emotions also can change the breathing. For example, being scared or angry can affect the breathing pattern. The breathing will change depending on how active the person is and the condition of the air that surrounds. For example, physical activity will increase respiratory rate. In contrast, the body needs to restrict how much air inhaled if the air contains irritants or toxins. To adjust the breathing to changing needs, the body has a number of sensors in the brain, blood vessels, muscles, and lungs. Sensors in the brain and in two major blood vessels, the carotid arteries and the aorta detect carbon dioxide or oxygen levels in the blood and change the breathing rate as needed. Sensors in the airways detect lung irritants. The sensors can trigger sneezing or coughing. In people who have asthma, the sensors may cause the muscles around the airways in the lungs to contract. This makes the airways smaller. Sensors in the alveoli detect a buildup of fluid in the lung tissues. These sensors are thought to trigger rapid, shallow breathing. Sensors in the joints and muscles detect movement of the arms or legs. These sensors may play a role in increasing the breathing rate when the person is physically active.

## Lung Diseases and Conditions

Many steps are involved in breathing. If injury, disease, or other factors affect any of the steps, the person may have trouble breathing. For example, the fine hairs (cilia) that line the upper airways may not trap all of the microorganisms inhaled. These microorganisms can cause an infection in the bronchi (bronchitis) or deep in the lungs (pneumonia). These infections cause a buildup of mucus and/or fluid that narrows the airways and hinders airflow in and out of the lungs. In asthma, breathing in certain substances that cause sensitivity can trigger the airways to narrow. This makes it hard for air to flow in and out of the lungs. Over a long period, breathing in cigarette smoke or air pollutants can damage the airways and the air sacs. This can lead to a condition called [COPD](http://www.nhlbi.nih.gov/health/dci/Diseases/Copd/Copd_WhatIs.html) (chronic obstructive pulmonary disease). COPD prevents proper airflow in and out of the lungs and can hinder gas exchange in the air sacs. An important step to breathing is the movement of the diaphragm and other muscles in the chest, neck, and abdomen. This movement lets you inhale and exhale. Nerves that run from the brain to these muscles control their movement. Damage to these nerves in the upper spinal cord can cause breathing to stop, unless a ventilator is used to assist with breathing. A steady flow of blood in the small blood vessels that surround the air sacs is vital for gas exchange. Long periods of inactivity or surgery can cause a blood clot called a [pulmonary embolism](http://www.nhlbi.nih.gov/health/dci/Diseases/pe/pe_what.html) to block the lung artery. This reduces or stops the flow of blood in the small blood vessels and interferes with gas exchange.

## Key Points

* The lungs are organs in the chest that allow the body to take in oxygen from the air. They also help remove carbon dioxide (a waste gas that can be toxic) from the body.
* The respiratory system is a group of organs and tissues that help with breathing. The main parts of this system are the airways, the lungs and linked blood vessels, and the muscles that enable breathing.
  + The airways are pipes that carry oxygen-rich air to the lungs and remove carbon dioxide from the lungs.
  + The lungs and linked blood vessels deliver oxygen to the body and remove carbon dioxide.
  + Muscles near the lungs expand and contract (tighten) to allow breathing. These muscles include the diaphragm, intercostal muscles, abdominal muscles, and muscles in the neck and collarbone area.
* When you breathe in, the diaphragm and intercostal muscles contract to increase the space in the chest cavity, into which the lungs expand. As the lungs expand, air is sucked in through the nose or mouth. The air travels down the windpipe and into the lungs' air sacs.
* In the air sacs, oxygen moves from the air into the blood in the lungs. At the same time, carbon dioxide moves from the blood in the lungs into the air in the air sacs. Surrounding blood vessels carry the oxygen-rich air to the rest of the body.
* When you breathe out, the diaphragm and intercostal muscles relax to make the size of the chest cavity smaller. As the chest cavity gets smaller, air rich in carbon dioxide is forced out of the lungs and windpipe, and then out of the nose or mouth.
* The breathing is controlled by the base of the brain and sensors located in the brain, blood vessels, muscles, and lungs. These sensors adjust the breathing to changing needs.
* Many steps are involved in breathing. If injury, disease, or other factors affect any of the steps, the person have trouble breathing.

**RESPIRATORY SYSTEM ASSESSMENT**

Respiratory system assessment involves diagnostic tests as well as physical exam. During respiratory assessment many terms and abbreviations are utilized. This “alphabet soup” can be confusing to the patient. Some of the common abbreviations are listed in the table below.

|  |  |
| --- | --- |
| **Abbreviation** | **Meaning of the Abbreviation** |
| V | volume or amount of gas |
| Q | perfusion of blood flow |
| P | pressure (usually partial) of a gas |
| S | percentage of hemoglobin saturation with a gas (usually oxygen) |
| F | fraction of a gas, or gas flow |
| E | expired gas |
| i | inspired gas |
| A | alveolar gas |
| a | Arterial blood |
| V | mixed venous or pulmonary artery blood |
| D | dead space |
| PaO2 | Partial pressure of oxygen in the artery. |
| PaCO2 | Partial pressure of carbon dioxide in the artery. |
| PAO2 | Partial pressure of oxygen in the mixed venous blood |
| P (A-a)O2 | Difference between alveolar and arterial partial pressure of oxygen A-a gradient |
| SaO2 | Arterial oxygen saturation determined by arterial blood gas analysis |
| SpO2 | Arterial oxygen saturation determined by pulse oximetry |
| TV or Vt | Tidal volume or average breath volume |
| V/Q | ratio of ventilation to perfusion |
| FiO2 | Fractional inspired oxygen |

Many abbreviations are utilized with the respiratory system. Of note is the lower case ‘a’ refers to arterial blood while the upper case ‘A’ refers to alveolar gas or mixed venous gas. When a pulse oximetry reading obtained from a device on the finger, the abbreviation is Sp02. When analyzed through arterial blood gases, the abbreviation is Sa02.

## Lung Function Tests

Lung function tests measure the size of the lungs, how much air the patient can breathe in and out, how fast the patient can breathe air out, and how well the lungs deliver oxygen to the blood. These tests also are called pulmonary function tests. Lung function tests are used to look for the cause of breathing problems (like shortness of breath). These tests are used to check for conditions such as [asthma](http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma_WhatIs.html), [lung tissue scarring](http://www.nhlbi.nih.gov/health/dci/Diseases/ipf/ipf_whatis.html), [sarcoidosis](http://www.nhlbi.nih.gov/health/dci/Diseases/sarc/sar_whatis.html), and [COPD](http://www.nhlbi.nih.gov/health/dci/Diseases/Copd/Copd_WhatIs.html) (chronic obstructive pulmonary disease). Lung function tests also are used to see how well treatments for breathing problems, such as asthma medicines, are working. The tests may be used to check on whether a condition, such lung tissue scarring, is getting worse. Lung function tests usually are painless and rarely cause side effects. Patients may feel some discomfort during the arterial blood gas testing as the needle is stuck directly in to an artery. Since nerves lie close to the arteries, pain is felt.

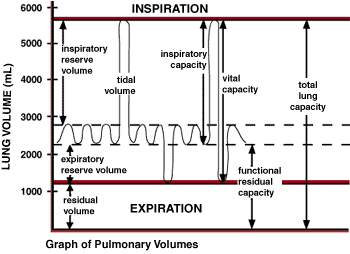
## Other Names for Lung Function Tests

* Lung diffusion testing; also called diffusing capacity and diffusing capacity of the lung for carbon monoxide, or DLCO
* Pulmonary function tests, or PFTs
* Arterial blood gas tests also are called blood gas analyses, or ABGs.

## Overview

Lung function tests measure:

* How much air is taken into the lungs. This amount is compared to that of other people the age, height, and sex. This allows the medical practitioner to determine normal ranges..
* How much air can be blown out of the lungs and how fast this can be done.
* How well the lungs deliver oxygen to the blood.
* How strong the breathing muscles are.



http:/gfx/ehb\_lungvol.gif

**This diagram is utilized to depict various lung volumes.**

Tidal Volume (TV, vT) - is the air that moves in and out of the lungs. For the average adult this can be 500 to 600 ml of air. This is shown on the graph as the squiggly lines between the 2000 and 3000 ml. The other volumes reflected are reserve volumes which pulmonary function tests attempt to obtain.

Inspiratory Capacity (IC) - the maximal volume that can be inspired after a normal (non forced) expiration

Inspiratory Reserve Volume (IRV) - additional volume that can be inspired with maximum effort after a normal inspiration.

Inspiratory Vital Capacity (IVC) - The volume change of the lung between a maximal expiration to residual volume and a full inspiration to total lung capacity.

Total Lung Capacity (TLC) - volume of the lungs after a maximum voluntary inspiration

Residual Volume (RV) – amount of air left behind after a maximum expiratory effort; lowest voluntary volume obtainable The RV is usually about 1000ml.

Vital Capacity (VC) - the maximum volume of air that can be exhaled following a complete lung inflation. The difference between [Total Lung Capacity](http://noairtogo.tripod.com/gloss.htm#TLC#TLC) (TLC) and [Residual Volume](http://noairtogo.tripod.com/gloss.htm#RV#RV) (RV).

## Breathing Tests

The breathing tests most often used are:

* Spirometry). This test measures how much air the patient can breathe in and out. It also measures how fast the patient can blow air out. **Spirometry** is the best pulmonary function test available in primary care for early detection of many lung disorders, this procedure provides following key parameters:
  + Forced Vital Capacity (FVC)
  + Forced Expiratory Volume in 1st second (FEV1)
  + Forced Expiratory Ratio in 1st second (FEV1/FVC%)
  + Peak Expiratory Flow Rate (PEFR)
* Peak flow meter. This meter is a small, hand-held device that’s sometimes used by people who have asthma. The meter helps track their breathing.
* Lung volume measurement. This test, in addition to spirometry, measures how much air is left in the lungs after breathing out completely.
* Lung diffusing capacity. This test measures how well oxygen passes from the lungs to the bloodstream.

These tests may not show what’s causing breathing problems. Other tests, such as a cardiopulmonary exercise test, also may be done. This test measures how well the lungs and heart work while the patient exercise on a treadmill or bicycle.

## Measuring Oxygen Levels

Pulse oximetry and arterial blood gas are two tests used to measure the oxygen level in the blood.

**Pulse oximetry** -During this test, a small light is placed over the fingertip, earlobe, or toe using a clip or flexible tape. It's then attached to a cable that leads to a small machine called an oximeter. The oximeter shows the amount of oxygen in the blood.

|  |  |
| --- | --- |
| pulse_oximeter | The pulse oximeter measures how much oxygen is on available hemoglobin. If the available hemoglobin is full, the pulse oximeter will read within normal ranges of 95-98% +/- 2. When a pulse oximetry reading obtained from a device on the finger, the abbreviation is Sp02. When analyzed through arterial blood gases, the abbreviation is Sa02In the picture the device measures the heart rate at 66 per minute as well as measuring the pulse oximeter reading of 97%. |

It is very important to understand the pulse oximeter only measures oxygen on available hemoglobin, or the saturation level of oxygen. The normal range for hemoglobin is 12 – 16 grams. If the persons hemoglobin is 14 grams and Sp02 reading is 97%, that is a good indicator that there is adequate amounts of oxygen available to deliver to the body tissues. If the hemoglobin, however is only 6 grams, if all 6 grams are filled with oxygen, the device will still read a high percentage such as 98%. The confidence level of the pulse oximeter reading is only as good as the knowledge of the hemoglobin. The person with a low hemoglobin cannot carry enough oxygen to adequately perfuse the body tissues.

## Arterial Blood Gas – ABG’s

With ABG’s blood is obtained from an artery, usually the radial artery to determine oxygen levels of the blood sample. Prior to obtaining arterial blood gases, the respiratory therapist or nurse performing the procedure will do an Allen’s Test to assure the radial and ulnar arteries are patent.

|  |  |
| --- | --- |
| **Allen’s Test**  To perform the Allen test, the radial and ulnar arteries are occluded at the same time for seconds. A release on one side, with “pink color return” to the hand would indicate good arterial blood flow from that artery. The procedure is then repeated and the other side is released.  Release of the radial and then the ulnar artery should result in a pinking of the hand. If there is good, bilateral arterial blood flow, then the radial artery may be utilized for arterial blood gas draw. After the draw, pressure should be maintained on the site to prevent bleeding. | radial_access_web |

Arterial blood gases yield important information about acid-base status, oxygen levels in the blood. Normal ranges for arterial blood gases are as follows:

|  |  |  |
| --- | --- | --- |
| **pH 7.35 – 7.45**  Low = acidosis High = alkalosis | **PaC02 35 – 45**  Is the lung parameter | **HC03 22 – 26**  Is the kidney parameter |
| **Base Excess +/- 2**  High = alkalosis Low = acidosis | **Pa02 80 – 100**  Actual oxygen level in the blood with room air. | **Sa02 95 – 98% +/-2**  Oxygen saturation on hemoglobin - Oximetry |

Arterial blood gas values can be helpful in determining the best interventions for the person. When an individual is inhaling room air, 21% oxygen, the oxygen levels in the blood should be between 80 and 100. When additional oxygen is given, the Pa02, or oxygen levels in the blood can exceed 400. Weighing the amount of oxygen the patient is receiving against the measured level can be a variable to determine the type of interventions needed. If someone is receiving 60% oxygen, and the Pa02 levels are only 70, this would represent a compromised situation as they should be between 80-100 without supplemental oxygen.

## Lung and Heart Tests

Based on the medical history and physical exam, chest X-ray, pulmonary function tests, an EKG, and or EKG stress test may be performed. Spirometry testing may be done to determine lung volumes as described before.

## Spirometry

The patient is asked to take a deep breath and then exhale as fast and as hard as he/she can into the tube. With spirometry, medications such as bronchodilators may be given to see if there is an improvement in results. Spirometry can show whether the patient has:

* Blockage (obstruction) in the airways. This may be a sign of [asthma](http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma_WhatIs.html), [COPD](http://www.nhlbi.nih.gov/health/dci/Diseases/Copd/Copd_WhatIs.html) (chronic obstructive pulmonary disease), or another obstructive lung condition.
* Smaller than normal lungs (restriction). This may be a sign of [heart failure](http://www.nhlbi.nih.gov/health/dci/Diseases/Hf/HF_WhatIs.html), damage or [scarring of the lung tissues](http://www.nhlbi.nih.gov/health/dci/Diseases/ipf/ipf_whatis.html), or another restrictive lung condition.

## Peak Flow Meter

In this test, the patient is asked to take a deep breath and then exhale as fast and as hard as possible into a small, hand-held device that's connected to a mouthpiece. A peak flow meter shows the fastest rate at which you can blow air out of the lungs. People who have asthma use this device to help track their breathing.

## Lung Volume Measurement

For this test, the patient sits in a clear glass booth and breathes through the tube attached to the testing machine. The changes in pressure inside the booth are measured to show how much air can be breathed in to the lungs. Sometimes the patient breathes in nitrogen or helium gas and then breathes it out. The gas that is exhaled is then measured. This test shows the size of the lungs. Abnormal test results may show that the patient has lung tissue scarring or a stiff chest wall.

## Lung Diffusion Capacity

During this test, the patient breathes in gas through the tube, holds the breath for 10 seconds, and then rapidly blows it out. This test can show a problem with oxygen moving from the lungs into the bloodstream. This may be a sign of loss of lung tissue, emphysema (a type of COPD), or problems with blood flow through the body's arteries.

## Key Points

* Lung function tests measure the size of the lungs, how much air the patient can breathe in and out, how fast you can breathe air out, and how well the lungs deliver oxygen to the blood.
* Lung function tests are used to look for the cause of breathing problems (like shortness of breath). These tests are used to check for conditions such as [asthma](http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma_WhatIs.html), [lung tissue scarring](http://www.nhlbi.nih.gov/health/dci/Diseases/ipf/ipf_whatis.html), and [COPD](http://www.nhlbi.nih.gov/health/dci/Diseases/Copd/Copd_WhatIs.html) (chronic obstructive pulmonary disease). They're also used to see how well treatments for breathing problems, such as asthma medicine, are working.
* Lung function tests look at how much air the patient can take into the lungs, how much air the patient can blow out of the lungs and how fast the patient can do it, how well the lungs deliver oxygen to the blood, and how strong the breathing muscles are.
* Breathing tests include spirometry, peak flow meter, lung volume measurement, and lung diffusion capacity. Pulse oximetry and arterial blood gas tests are used to measure the oxygen level in the blood.
* People who have breathing problems, such as shortness of breath, may need lung function tests. These tests help find the cause of the breathing problems.
* If the patient takes respiratory medications, the doctor may ask the patient to stop them for a short time before spirometry, a lung volume measurement test, or a lung diffusion capacity test. No special preparation is needed before pulse oximetry and arterial blood gas tests.
* For breathing tests, the patient will breathe through a tube that's attached to a testing machine. The patient may be asked to breathe normally, slowly, or rapidly. The patient also may be asked to inhale and then exhale a small amount of gas.
* For the tests that measure oxygen level in the blood, either a small light will be attached to the fingertip, earlobe, or toe to measure the oxygen level, or the doctor will take a small sample of the blood to measure the oxygen level.
* Lung function tests can show whether the patient has signs of a lung or heart condition. These tests also can show how well treatments for breathing problems, such as asthma medicines, are working.

### Physical Assessment Techniques

Physical assessment of the patient involves obtaining a history and the physical examination. With the frail elderly patient, the history may be a combination of admission information, answers from the next of kin, and comments from the patient. The assessment is divided into the data base and the focused assessment. Prior to assessing any patient, be sure that the procedure is explained to the patient and provision for privacy is assured. The physical examination portion of the assessment requires the techniques of inspection, palpation, percussion, and auscultation.

**Inspection** - is informed observation, or looking at your patient with a purpose. Adequate lighting is an important tool for inspection. Inspection takes place during all components of the assessment from the health history through the physical examination.

**Palpation** - all parts of the body can be palpated including tissues, bones, muscles, glands, organs, hair, and skin. When palpating, make sure that your hands are warm. Try to get the patient to relax, since tension can tighten muscles and alter the palpation technique. One method for helping the patient to relax is to have him/her take some slow deep breaths in and out of the mouth. This serves the purpose of relaxing the muscles and helping the patient to focus on something else. Palpation can be done with different parts of the hands for assessing different qualities.

**Auscultation** - involves listening with the ear or a stethoscope. Try to keep the environment free of extraneous sounds. For example, turn the T.V. off when auscultating. Essential to auscultation is a good stethoscope. The stethoscope should have short, thick, tubing and contain a bell and a diaphragm.

**Percussion** - involves tapping one finger on top of the finger of the other hand to determine sounds from underlying structures. Helpful to determine if there is air or consolidation. For the lungs, percussion is performed at the location of the intercostals spaces.

## History

## Medical History and Family History

Significant variable on the medical history may be asked of the patient:

* You can't get enough air
* Does your chest feel tight
* Do you have periods of coughing or wheezing
* Do you ever have chest pain?
* Can you walk or run as fast as other people of the same age
* Significant family and other history variables:
* History of asthma and/or allergies
* History of heart disease
* Smoking
* Traveled to places where there may have been exposure to tuberculosis
* Has there been a job that exposed the person to dust, fumes, or particles (like asbestos)

## Past Health History

* Respiratory System - ask if patient has had pneumonia, asthma, bronchitis, emphysema, tuberculosis, and how often he/she gets colds.
* Cardiovascular disease - a history of Congestive Heart Failure or
* Pulmonary Edema may in fact be the problem that is presented to you which would have symptoms of shortness of breath.
* Chest surgery - find out if patient has had any surgery on the lungs.
* Allergies - chronic allergies may predispose client t oother respiratory disorders.

## Present Illness

* Progression of symptoms
* Dyspnea or shortness of breath with chronic obstructive pulmonary disease (COPD)
  + usually progresses over a long period of time.
* An acute situation produces dyspnea at rest. Acute onset of dyspnea or shortness
  + of breath is important for assessing pneumonia, pneumothorax, hemothorax, or
  + pulmonary embolism.
* Cough occurring daily over 2 or more years is indicative of chronic bronchitis.
  + Coughing is usually caused by irritants such as smoking.
* Sputum production
  + purulent sputum is associated with lung abscess
  + viscous sputum associated with chronic obstructive pulmonary disease (COPD)
  + Blood tinged sputum can occur with tuberculosis, carcinoma, or pulmonary embolism.
* Chest pain - may be associated with cardiovascular disorders or musculoskeletal
  + chest pain. The lungs do not have pain-sensitive nerves. The pleura and
  + tracheobronchial tree are sensitive to pain. Pleuritic pain usually hurts more during
  + deep breaths.

## Review of systems

* actual pulmonary problems
* cardiovascular difficulties - differentiate if the shortness of breath is from
  + a cardiac or respiratory origin. Acute onset of congestive heart failure is treated
  + differently than pneumonia or bronchitis.
* neurological problems - since the stimulus for breathing is in the brain, the breathing pattern you see could represent a neurological problem.

## Inspection

* Respiratory Rate and Pattern - to observe your patient, make sure that he/she is at rest and unaware that you are observing the respirations.
  + Rate - normal respiratory rate is 12 to 20 / minute
    - eupnea - normal rate and rhythm
    - tachypnea - fast respiratory rate
    - bradypnea - slow respiratory rate
  + Patterns
    - apnea - absence of breathing, may be periodic
    - hyperpnea - deeper respirations with normal rate
    - Cheyne-Stokes - respirations gradually become faster and deeper than normal, than slower with periods of apnea.
    - Biot's - faster and deeper respirations than normal, with abrupt pauses in between. Each breath has the same depth. May occur in spinal meningitis or other central nervous system conditions.
    - Kussmaul's - faster and deeper respirations without pauses. Can occur from renal failure or metabolic acidosis (especially in diabetes with hyperglycemia).
    - Apneustic - prolonged gasping inspiration followed by short inefficient expiration.
    - Can occur from lesions in the brain's respiratory center.
* Chest Wall Movements
  + Asymmetrical - can occur with tension pneumothorax, a large pleural effusion, consolidation, and atelectasis.
  + Retractions - can be seen with bronchial plugging that may be seen in asthma or COPD.
  + Use of accessory muscles - Increases work of breathing common during an acute phase of COPD.
  + Expiratory bulging of chest - this is an opposite or paradoxical observation. Can be seen with flail chest.
* General Signs and Symptoms
  + Pursed-lip breathing - seen with the COPD patient that needs to breath this way to get trapped air in the alveoli expelled.
  + Nasal flaring - seen in respiratory distress.
  + Tracheal deviation - the trachea is normally midline. When tracheal deviation occurs, it will shift to the side of least resistance.
    - pneumothorax - to affected side
    - tension pneumothorax - unaffected side
    - pleural effusion - unaffected side
    - atelectasis - affected side
  + Restlessness, anxiety, apprehension, headache, confusion, disorientation, impaired judgment, hypotension, tachycardia, yawning,
  + Central cyanosis (on mouth and lips) are related to hypoxia (decreased oxygen in the blood). This hypoxia can result from COPD, pneumonia, central nervous system depression,
  + neuromuscular disorders, musculoskeletal disorders, Adult Respiratory Distress Syndrome (ARDS), or pulmonary edema.
  + Drowsiness, tremors, confusion, generalized seizures, or headache are related to hypercapnia (increased levels of carbon dioxide). This results from hypoventilation that can be seen in COPD or central nervous system depression.

## Palpation

* Posterior Chest
  + Chest Expansion - Place both hands on the back with the thumbs pointed to the spine. Have the patient take a deep breath. Watch for equal movement of your hands. This is called checking for bilateral chest excursion. In the COPD patient, they tend to have a barrel shaped chest. You will notice that chest excursion is decreased. Try this on a co-worker to determine normal chest excursion.
  + Vocal or tactile fremitus - use the top portion of each palm and place on the back. For vocal fremitus have the patient say "99". Vibrations will be transmitted from the tracheobronchial tree to your palms and fingers. Check for symmetry of vibrations. Fremitus will be more pronounced in the upper airways where there is a greater amount of air flow. The level where you no longer feel vibration is the diaphragm.
    - diminished or absent - pleural effusion, thickened pleura, or pneumothorax
    - slightly increased - consolidation
* Anterior Chest
  + Tracheal position - normally trachea is midline. Gently place fingers in the space between the sternum and the clavicle to determine position.
  + Sternum and cartilages - palpate for tenderness or deformity.

## Percussion

Overview - the lungs normally have a resonant or hollow sound. To percuss place the middle finger on the surface of the chest and tap firmly with the middle finger of the other hand (mediate percussion). When percussing the lungs be sure to place your finger in the intercostal spaces and not on the ribs. Percuss in a side to side manner on the anterior and posterior chest walls.

* Percussion Notes
  + Resonance - represents air-filled spaces. This is normal over the peripheral lung fields.
  + Hyperresonance (tympany) - drumlike sound representing excess air in the space. Seen in
  + pneumothorax or emphysema.
  + Dullness or flatness - represents fluid or solid tissue in area and will vary with patient's position if fluid is gravity dependent. Seen in emothorax, hydrothorax, empyema, or pleuraleffusion.

## Auscultation

Overview - auscultation is one of the most useful assessment techniques for evaluating changes in the respiratory system. Breath sounds are produced by turbulent airflow through the airways. Crackles, rhonchi and wheezing are heard through auscultation. Auscultation should be done in the same sequencing as shown for palpation. Auscultation of the right middle lobe is accomplished by listening on the right side in the mid-axillary line. The diaphragm of the stethoscope is used. When listening to lungs you will listen to a full inspiration and expiration at each location.

**Breath Sounds Assessment via Auscultation**

***AUSCULTATION OF BREATH SOUNDS - WHAT YOU'LL HEAR***

**NORMAL SOUNDS**

Bronchial

Pitch: High

Intensity: Loud, predominantly on

expiration

Normal findings: A sound like air blown through a hollow tube, heard over suprasternal area and lower trachea or mainstem bronchus

Abnormal findings: If heard over peripheral lung, may indicate atelectasis or consolidation

Bronchovesicular

Pitch: Moderate

Intensity: Moderate

Normal findings: A blowing sound heard over airways on either side of sternum, at angle of Louis, and between scapulae

Abnormal findings: If heard over peripheral lung, may indicate consolidation

Vesicular

Pitch: High on inspiration, low on expiration

Intensity: Loud on inspiration, soft to absent on expiration

Normal findings: Quiet, rustling sounds, heard over periphery

Abnormal findings: If decreased over periphery, may indicate early pneumonia, emphysema, pneumothorax, pleural effusion, or atelectasis

**Auscultate in this pattern:**

1 🡪 2

4 🡨 3

5 🡪 6

**Avoid bony areas**

**ADVENTITIOUS (Abnormal) SOUNDS**

Crackles (Rales)

Where to auscultate: Over lung fields and airways; heard in lung bases first with pulmonary edema

Timing:More obvious during inspiration

Cause: Moisture, especially in small airways and alveoli

Description: Light crackling, bubbling; nonmusical

Rhonchi (Gurgles) or Coarse Crackles

Where to auscultate: Over larger airways

Timing: More pronounced during expiration

Cause: Airways narrowed by bronchospasm or secretions

Description: Coarse rattling, usually louder and lower-pitched than crackles; described as sonorous, musical, or sibilant

Wheezes

Where to auscultate: Over lung fields and airways

Timing: Inspiration or expiration

Cause: Narrowed airways

Description: Creaking, Whistling; high-pitched, musical squeaks

Pleural Friction Rub

Where to auscultate: Front and side of the lung field

Timing: Inspiration

Cause: Inflamed parietal and visceral pleural surfaces rubbing together.

Description: Grating or squeaking

Listening sequence (front): Place stethoscope diaphragm above each clavicle to hear lung apexes. Alternating from side to side of sternum, listen down the chest until you reach lung bases (8th to 10th rib)

Listening sequence (back): Place stethoscope diaphragm above scapulae (toward the neck) to hear lung apexes. Alternating from side to side of spine, listen down the back until you reach lung bases (10th to 12th spinous process).

#### TIPS

1. Press diaphragm firmly against patient's skin. Ask patient to inhale and exhale slowly through his mouth.
2. Proceed systematically, always comparing one side of patient's chest or back with the other.
3. Document your findings.

## Assessment of the Chest X-Ray

# A01813-18-2-A99

Heart

Aorta

s

Diaphragms

# The chest x-ray is one of the most important assessment tools for the respiratory system. Chest X-rays are very helpful to determine pneumonia, atelectasis, congestive heart failure, tuberculosis, pneumothorax, heart size and many other assessments. Chest X-rays are done in a PA (posterior, anterior) and lateral (side view) which visualizes the right middle lobe.

# This X-ray shows the anterior or front part of the chest and is a normal chest X-ray. Lung fields are shown as darkened areas, yet white shadows are normal to indicate the presence of lung tissue. If the chest X-ray were completely black, this might indicate a pneumothorax or collapse of a portion of the lungs. Other important observations include clear angles from the diaphragm to the rib cage (costophrenic angle) and the heart margin to the diaphragm termed the cardiophrenic angle.

# Note that the lung fields, at the top, termed the apex extend above the clavicle. When listening to breath sounds, start above the clavicle as part of the assessment.

**A Systematic Approach Respiratory Disorders**

# Respiratory problems can be classified in various ways. One method is by dividing the respiratory system in to three stages:

# Ventilation – Movement of gas (oxygen and carbon dioxide) in and out of the lungs.

# Diffusion – Exchange of gas (oxygen) across the alveolar capillary membrane to the hemoglobin of the red blood cell.

# Perfusion – Delivery of gas (oxygen) to tissues.

The physiology of respiration by which oxygen is transferred from the air to the tissues and carbon dioxide is excreted in the expired air is divided into three stages of **ventilation, diffusion, and perfusion.** In order for respiration to occur, all three of these processes must be present.

* **ventilation** - is the flow of a mixture of gases in and out of the lungs. Pressure gradients between the atmosphere and the alveoli are created by muscular mechanical means. During inspiration the diaphragm goes down and the ribs go up. During expiration the diaphragm goes up and the ribs go down. Ventilatory problems relate to these mechanics and include disorders such as polio,spinal cord injury (paralyzes diaphragm), asthma, or bronchitis. In other words, any condition which prevents air from reaching the alveoli.
* **diffusion** - is the movement of gases across the alveolar-capillary membrane. Factors affecting diffusion are:
* the greater the pressure the faster the rate
* the larger the area of pulmonary membrane, the larger the quantity of gas that can diffuse
* the thinner the membrane, more rapid the diffusion

Conditions which affect diffusion are those that prevent or alter the flow of gases across the alveolar membrane. Some conditions are emphysema, pneumonia, atelectasis, or pulmonary fibrosis.

* **perfusion** - is related to the transport of oxygenated blood from the alveolar capillary area to the tissues and transport of carbon dioxide. Oxygen is transported to the tissues by combining with the hemoglobin. There has to be an adequate supply of hemoglobin receptor sites available for oxygen to piggyback on to the hemoglobin. As a result, when there is not enough hemoglobin, as is seen in conditions of anemia or excessive bleeding, the individual becomes hypoxic (decreased oxygen the body tissues). On the other hand, if the person's blood pressure is too low and the system cannot get the oxygenated blood to the tissues, hypoxia can also occur. This situation can be seen in shock states or when the blood pressure is too low.

In order for respiration to occur, oxygen has to be able to reach the lungs via **ventilation**, must then **diffuse** across the alveolar-capillary membrane, and then be transported on the hemoglobin to the body tissues so that **perfusion** can occur. All three of these mechanisms must be functioning for adequate respiration to occur.

# Categorizing Lung Diseases

# Another method is to divide respiratory orders by categories of:

# Obstructive Lung Diseases – Increased airway resistance.

# Restrictive Lung Diseases – Loss of airway compliance.

# Parenchymal Lung Diseases – Destruction of the air sacs or alveoli.

# Vascular Lung Diseases – Affect the pulmonary capillary blood vessels that impair the exchange of oxygen and carbon dioxide.

# Infectious Lung Diseases – Caused by bacteria invading the lungs.

# Respiratory Tumors – Masses, cysts, or tumors invading the lungs.

# Analyzing the respiratory system from both of these perspectives can be helpful as the gas needs to be moved in or ventilated with the help of muscles and the brain. The oxygen then needs to be carried or diffused across the alveolar-capillary membrane so that the oxygen can be transported to the hemoglobin of the red blood cells. Lastly, provided there are enough red blood cells to carry the oxygen rich hemoglobin, the heart needs to be strong enough and the blood pressure high enough to adequately deliver the oxygen or perfuse the tissues. If the tissues are not perfused with oxygen, they simply die.

# All respiratory disorders either affect ventilation, diffusion and/or perfusion resulting in poor delivery to tissues. The respiratory diseases are classified physiologically (obstructive or restrictive) where flow in and out of the lungs is impeded or anatomically where the anatomically such as upper or lower respiratory problems. The division of these categories was excerpted from the web site: <http://www.statemaster.com/encyclopedia/Respiratory-disease>. Some diseases also cross between the various categories causing problems with both.

## Obstructive Lung Disease

Obstructive Lung Diseases (OLD) are characterized by an increase in [airway resistance](http://en.wikipedia.org/wiki/Airway_resistance), evidenced by a decrease in Peak Expiratory Flow Rate (PEFR; measured in [spirometry](http://en.wikipedia.org/wiki/Spirometry) by the Forced Expiratory Volume in 1 Second, FEV1). The Residual Volume, the volume of air left in the lungs following full expiration, is greatly increased in OLD, leading to the clinical sign of chest over-inflation in patients with severe disease. Many patients with chronic OLD present with "barrel chest" - a deformity of outward rib displacement due to chronic over-inflation of the lungs. Patients with OLD typically have 'large, floppy lungs'. In Obstructive Lung Disease, the lung volume (Total Lung Capacity, TLC), Vital Capacity (VC), Tidal Volume (VT) and Expiratory Reserve Volume (ERV) remain relatively unchanged. In some cases of OLD there is a mismatch in the FEV1/FVC ratio, due to the FEV1 decrease observed in OLD. In normal people, the FEV1/FVC ratio will equal 0.8, meaning that 80% of the total amount of expired air is expelled in the first second (the FEV1). Patients with OLD will typically have a lower FEV1, meaning that their FEV1/FVC ratio will typically be less than 0.8.

Some obstructive lung diseases are:

* [Emphysema](http://en.wikipedia.org/wiki/Emphysema)
* [Bronchitis](http://en.wikipedia.org/wiki/Bronchitis)
* [Asthma](http://en.wikipedia.org/wiki/Asthma)
* [Chronic obstructive pulmonary disease](http://en.wikipedia.org/wiki/Chronic_obstructive_pulmonary_disease) (COPD)
* [Bronchiectasis](http://en.wikipedia.org/wiki/Bronchiectasis)
* [Byssinosis](http://en.wikipedia.org/wiki/Byssinosis)
* [Bronchiolitis](http://en.wikipedia.org/wiki/Bronchiolitis)
* [Asbestosis](http://en.wikipedia.org/wiki/Asbestosis)

## 

## Restrictive Lung Disease

Restrictive Lung Diseases (RLD) are characterized by a loss of [airway compliance](http://en.wikipedia.org/wiki/Pulmonary_compliance), causing incomplete lung expansion (i.e. via increased lung 'stiffness'). This change manifests itself in a reduced Total Lung Capacity, Inspiratory Capacity and Vital Capacity.

In contrast to OLD, RLD values for Tidal Volume, Expiratory Reserve Volume, Functional Residual Capacity and Respiratory Volume are unchanged. The FEV1 for a patient with RLD will either be normal or slightly increased, and thus the FEV1/FVC ratio will also be normal or increased for a RLD patient. Notable restrictive lung diseases include:

* [Acute respiratory distress syndrome](http://en.wikipedia.org/wiki/Acute_respiratory_distress_syndrome) (ARDS)
* [Asbestosis](http://en.wikipedia.org/wiki/Asbestosis)
* [Fibrosis](http://en.wikipedia.org/wiki/Fibrosis)
* [Hypersensitivity pneumonitis](http://en.wikipedia.org/wiki/Hypersensitivity_pneumonitis)
* [Infant respiratory distress syndrome](http://en.wikipedia.org/wiki/Infant_respiratory_distress_syndrome) (IRDS)
* [Lung Cancer](http://en.wikipedia.org/wiki/Lung_Cancer)
* Mechanical diseases affecting pulmonary musculature, including [myasthenia gravis](http://en.wikipedia.org/wiki/Myasthenia_gravis)
* Neurologic diseases affecting the ability of the body to alter respiration rate, including [spinal cord injury](http://en.wikipedia.org/wiki/Spinal_cord_injury)
* [Pleural effusion](http://en.wikipedia.org/wiki/Pleural_effusion)
* [Pleurisy](http://en.wikipedia.org/wiki/Pleurisy)
* [Sarcoidosis](http://en.wikipedia.org/wiki/Sarcoidosis)
* [Severe acute respiratory syndrome](http://en.wikipedia.org/wiki/Severe_acute_respiratory_syndrome) (SARS)

## Parenchymal Lung Disease

The basic functional units of the lung, the [alveoli](http://en.wikipedia.org/wiki/Alveoli), are referred to as the lung parenchyma. Diseases such as [COPD](http://en.wikipedia.org/wiki/COPD) are characterized by destruction of the alveoli and are therefore referred to as parenchymal lung diseases. Signs of parenchymal lung disease include, but are not limited to, [hypoxemia](http://en.wikipedia.org/wiki/Hypoxemia) (low oxygen in the blood) and [hypercapnea](http://en.wikipedia.org/wiki/Hypercapnoea) (high carbon dioxide in the blood). Chronic complications of parenchymal lung disease include reduced respiratory drive, [right ventricular hypertrophy](http://en.wikipedia.org/wiki/Right_ventricular_hypertrophy), and right [heart failure](http://en.wikipedia.org/wiki/Heart_failure) ([cor pulmonale](http://en.wikipedia.org/wiki/Cor_pulmonale)). Notable parenchymal diseases include:

* [COPD](http://en.wikipedia.org/wiki/COPD)
* [Sarcoidosis](http://en.wikipedia.org/wiki/Sarcoidosis)
* [Pulmonary fibrosis](http://en.wikipedia.org/wiki/Pulmonary_fibrosis)
* [Emphysema](http://en.wikipedia.org/wiki/Emphysema)

## Vascular Lung Disease

Vascular lung disease refers to conditions which affect the [pulmonary capillary vasculature](http://en.wikipedia.org/wiki/Pulmonary_circulation). Alterations in the vasculature manifest in a general inability to exchange blood gases such as oxygen and carbon dioxide, in the vicinity of the vascular damage (other areas of the lung may be unaffected). Signs of vascular lung disease include, but are not limited to, [hypoxemia](http://en.wikipedia.org/wiki/Hypoxemia) (low oxygen in the blood) and [hypercapnea](http://en.wikipedia.org/wiki/Hypercapnoea) (high carbon dioxide in the blood). Chronic complications of vascular lung disease include reduced respiratory drive, [right ventricular hypertrophy](http://en.wikipedia.org/wiki/Right_ventricular_hypertrophy), and right [heart failure](http://en.wikipedia.org/wiki/Heart_failure) ([cor pulmonale](http://en.wikipedia.org/wiki/Cor_pulmonale)).

Notable vascular lung diseases include:

* [Pulmonary edema](http://en.wikipedia.org/wiki/Pulmonary_oedema)
* [Pulmonary embolism](http://en.wikipedia.org/wiki/Pulmonary_embolism)
* [Pulmonary hypertension](http://en.wikipedia.org/wiki/Pulmonary_hypertension)

## Infectious Lung Disease

Infectious Lung Diseases are, as the name suggests, typically caused by one of many infectious agents able to infect the mammalian respiratory system (for example the bacterium [Streptococcus pneumonia](http://en.wikipedia.org/wiki/Streptococcus_pneumoniae)).

The clinical features and treatment options vary greatly between infectious lung disease sub-types as each type may be caused by a different infectious agent, with different pathogenesis and virulence. Features also vary between:

* [Upper respiratory tract infection](http://en.wikipedia.org/wiki/Upper_respiratory_tract_infection), including [strep throat](http://en.wikipedia.org/wiki/Strep_throat) and the [common cold](http://en.wikipedia.org/wiki/Common_cold); and
* [Lower respiratory tract infection](http://en.wikipedia.org/wiki/Lower_respiratory_tract_infection), including [pneumonia](http://en.wikipedia.org/wiki/Pneumonia) and [pulmonary tuberculosis](http://en.wikipedia.org/wiki/Tuberculosis)

## Respiratory Tumor

"Respiratory tumor" can refer to either neoplastic (cancerous) or non-neoplastic masses within the lungs or lung parenchyma. Neoplastic respiratory tumors: [Respiratory neoplasms](http://en.wikipedia.org/wiki/Lung_cancer) are abnormal masses of tissue within the lungs or parenchyma whose cell of origin may or may not be lung tissue (many other neoplasms commonly metastasize to lung tissue). Respiratory neoplasms are most often malignant, although there are non-malignant neoplasms which can affect lung tissue. Respiratory neoplasms include the following:

* [Mesothelioma](http://en.wikipedia.org/wiki/Mesothelioma)
* [Small cell lung cancer](http://en.wikipedia.org/wiki/Small_cell_lung_cancer)
* [Non-small cell lung cancer](http://en.wikipedia.org/wiki/Non-small_cell_lung_cancer)
* Non-neoplastic respiratory tumors: Tuberculosis cysts, other non-neoplastic masses

## Respiratory Disorders with Suggested Classifications

The Table below has a listing of many of the respiratory disorders, the definition and how that disorder may fit in to the categories of ventilation, diffusion, perfusion or the type of lung disorder.

| **Disorder** | **Definition** | **Suggested**  **Classification** |
| --- | --- | --- |
| **Acute Respiratory Distress Syndrome (ARDS)** | A sudden failure of the respiratory system that occurs when fluid builds up in alveoli, resulting in destruction. In a short time, breathing becomes difficult, resulting in hypoxemia. Most often occurs in critically ill persons. Severe shortness of breath — the main symptom of ARDS — usually develops within a few hours to a few days after the original disease or trauma. ARDS is fatal in 25 to 40 percent of the people who develop it. | **Restrictive**  **Diffusion** |
| **Alpha1 Antitrypsin Deficiency (A1AD** | Alpha1 Antitrypsin Deficiency (A1AD) - an inherited recessive disorder resulting in low or no production of Alpha1 Antitrypsin. Lack of this protein leads to organ damage, mainly to the liver and lung. | **Diffusion** |
| **Asbestosis** | Asbestosis is a disease that involves a scarring of lung tissue as a result of breathing in asbestos fibers. The scarring makes it hard for you to breathe and for oxygen to get into the blood. | **Obstructive**  **Restrictive**  **Diffusion** |
| **Asthma** | Asthma is a chronic lung disease that inflames and narrows the airways. Asthma causes recurring periods of wheezing, chest tightness, shortness of breath, and coughing. | **Obstructive**  **Ventilation** |
| **Bronchiectasis** | Bronchiectasis is a condition in which the lungs’ airways are abnormally stretched and widened. This stretching and widening is caused by mucus blockage. More and more mucus builds up in the airways, allowing bacteria to grow. This leads to infection. | **Obstructive**  **Ventilation** |
| **Bronchiolitis** | Bronchiolitis is an inflammation of the bronchioles, the small airways in the lungs. It is most common in early infancy. It often occurs due to viral infections, over half of which are caused by the respiratory syncytial virus ( RSV). | **Obstructive**  **Ventilation** |
| **Bronchitis** | inflammation of the bronchial tubes, the major airways into the lungs. It may be caused by a variety of bacteria and viruses. Acute bronchitis can last from a few days to 10 days. But the cough that comes with acute bronchitis may last for several weeks after the infection has gone. | **Obstructive**  **Ventilation** |
| **Bronchopulmonary dysplasia (BPD)** | Bronchopulmonary dysplasia (BPD) is a serious lung disease in infants. It is usually a complication in premature babies being treated for respiratory distress syndrome. Many infants with BPD recover and improve with time and go on to live normal, active lives. | **Ventilation**  **Diffusion** |
| **Byssinosis** | Byssinosis (brown lung disease) is a lung disease caused by exposure to dusts from cotton processing, hemp and flax. The small airways become blocked, severely harming lung function. In the United States, byssinosis is almost completely limited to workers who handle unprocessed cotton. | **Obstructive**  **Diffusion** |
| **Cancer - Non-small Cell Lung Cancer** | A group of lung cancers that are named for the kinds of cells found in the cancer and how the cells look under a microscope. The three main types of non-small cell lung cancer are squamous cell carcinoma, large cell carcinoma, and adenocarcinoma. Non-small cell lung cancer is the most common kind of lung cancer. | **Tumor**  **Restrictive** |
| **Cancer - Small Cell Lung Cancer** | An aggressive cancer that forms in tissues of the lung that can metastasize. Cells look small when viewed. Types are oat cell and combined small cell. | **Tumor** |
| **Chronic obstructive pulmonary disease (COPD)** | Chronic obstructive pulmonary disease (COPD) refers to a group of lung diseases that block airflow and make it increasingly difficult for to breathe. Emphysema and chronic bronchitis are the two main conditions that make up COPD, but COPD can also refer to damage caused by chronic asthmatic bronchitis. | **Obstructive**  **Parenchymal**  **Diffusion** |
| **Coccidioidomycosis** | Coccidioidomycosis (cocci) is an infection of the lungs caused by inhaling spores of the fungus Coccidioides immitis. The infection is rarely fatal in healthy people. Most people with the infection do not get sick at all. Of those who do get sick, most have flu-like symptoms. | **Diffuison** |
| **Cystic Fibrosis** | Cystic fibrosis (CF) is an inherited disease that affects the lungs and digestive system. Thick, sticky mucus forms in the lungs, pancreas and other organs. People with CF have a shorter-than-normal life expectancy. | **Parenchymal** |
| **Emphysema** | Emphysema is a condition that limits the flow of air when breathing out. Emphysema occurs when the air sacs at the ends of your smallest air passages (bronchioles) are gradually destroyed. Smoking is the leading cause of emphysema. As it worsens, emphysema turns the alveoli — into large, irregular pockets with gaping holes in their inner walls. This reduces the number of air sacs and keeps some of the oxygen entering your lungs from reaching your bloodstream. In addition, the elastic fibers that hold open the alveoli are slowly destroyed, so that they collapse when exhaling preventing gas from leaving the lungs. | **Obstructive**  **Parenchymal**  **Diffusion** |
| **Fibrosis** | Pulmonary fibrosis is a disease marked by scarring in the lungs. Tissue deep in the lungs becomes thick, stiff and scarred. | **Restrictive**  **Parenchymal**  **Diffusion** |
| **Fibrosis - Idiopathic Pulmonary Fibrosis (IPF)-** | Idiopathic Pulmonary Fibrosis (IPF)- a specific form of chronic fibrosing interstitial pneumonia of unknown origin, associated with the histologic appearance of Usual Interstitial Pneumonia (UIP) on surgical biopsy. IPF is synonymous with Cryptogenic Fibrosing Alveolitis (CFA), a term used in European countries | **Restrictive**  **Parenchymal**  **Diffusion** |
| **Hantavirus pulmonary syndrome (HPS)** | Hantavirus pulmonary syndrome (HPS) is a disease that comes from contact with infected rodents or their urine, droppings or saliva. The HPS infection cannot be transmitted from one person to another. HPS is potentially deadly. There is no specific treatment for HPS, and there is no cure. But early diagnosis and treatment in an intensive care unit may improve a person’s chances of recovery. | **Diffusion** |
| **Histoplasmosis** | Histoplasmosis is an infection in the lungs caused by inhaling the spores of a fungus. Many histoplasmosis infections do not produce symptoms. | **Diffusion** |
| **Human metapneumovirus (hMPV)** | Human metapneumovirus (hMPV) is a recently identified member of a family of viruses. HMPV can cause upper and lower respiratory tract infections in people of all ages. Respiratory illnesses caused by hMPV most often occur in young children or older adults. Most people have mild symptoms but some people have more severe illness. | **Ventilation**  **Diffusion** |
| **Hypersensitivity Pnuemonitis** | Hypersensitivity pneumonitis is a disease in which your lungs become inflamed when you breathe in certain dusts to which you are allergic. These dusts contain fungus spores from moldy hay or the droppings of birds. | **Restrictive**  **Diffusion** |
| **Infant Respiratory Distress Syndrome (IRDS)** | Infant respiratory distress syndrome ("RDS", also called "Respiratory distress syndrome of newborn", previously called hyaline membrane disease), is a [syndrome](http://en.wikipedia.org/wiki/Syndrome) caused in [premature](http://en.wikipedia.org/wiki/Premature_birth)[infants](http://en.wikipedia.org/wiki/Infant) by developmental insufficiency of [surfactant](http://en.wikipedia.org/wiki/Pulmonary_surfactant) production and structural immaturity in the [lungs](http://en.wikipedia.org/wiki/Lung). It can also result from a genetic problem with the production of surfactant associated proteins. RDS affects about 1% of newborn infants and is the leading cause of death in [preterm](http://en.wikipedia.org/wiki/Premature_birth) infants.[[1]](http://www.bing.com/health/article.aspx?id=articles%2fwp%2fpages%2fi%2fn%2ff%2fInfant_respiratory_distress_syndrome.html&br=lv&q=infant+respiratory+distress+syndrome#_note-0) The incidence decreases with advancing [gestational age](http://en.wikipedia.org/wiki/Gestational_age), from about 50% in babies born at 26-28 weeks, to about 25% at 30-31 weeks. The syndrome is more frequent in infants of diabetic mothers and in the second born of premature twins. | **Restrictive**  **Diffusion** |
| **Influenza** | Influenza, commonly called the flu, is a contagious lung disease caused by a virus. It usually makes people feel very ill for about a week, and can lead to serious complications. The best way to avoid getting the flu is to get vaccinated every year | **Diffusion** |
| **Lung Cancer** | Lung cancer is the second-most commonly diagnosed cancer in both men and women. However it is still the most common cause of cancer death. | **Restrictive**  **Tumor**  **Ventilation** |
| **Mesothelioma** | Cancer affecting the mesothelium which lines the lungs, heart and other organs. Often secondary to asbestosis. | **Tumor**  **Restrictive**  **Diffusion** |
| **Myasthenia Gravis** | A mechanical disease affecting the pulmonary musculature. | **Restrictive**  **Ventilation** |
| **Nontuberculous (or nontuberculosis) mycobacterium infections** | Nontuberculous (or nontuberculosis) mycobacterium infections are a group of lung infections. These lung infections are caused by mycobacteria that are part of the broader family of bacteria that includes the germ that causes tuberculosis | **Infectious** |
| **Pertussis** | Pertussis—known as whooping cough—is a serious, very contagious disease that causes severe, uncontrollable coughing fits. The coughing makes it difficult to breathe and often ends with a “whoop” noise | **Infectious**  **Ventilation** |
| **Pleural Effusion** | Pleural effusion is excess fluid that accumulates in the [pleural cavity](http://en.wikipedia.org/wiki/Pleural_cavity), the fluid-filled space that surrounds the [lungs](http://en.wikipedia.org/wiki/Lung). Excessive amounts of such fluid can impair breathing by limiting the expansion of the lungs during [inhalation](http://en.wikipedia.org/wiki/Inhalation). | **Restrictive**  **Ventilation** |
| **Pleurisy** | Pleurisy occurs when the double membrane (pleura) that lines your chest cavity and surrounds each of your lungs becomes inflamed. Also called pleuritis, pleurisy typically causes sharp pain, almost always when you take a breath. | **Restrictive**  **Ventilatrion** |
| **Pneumonia** | Pneumonia is a common lung infection caused by bacteria, a virus or fungi. Pneumonia and its symptoms can vary from mild to severe | **Infectious**  **Diffusion** |
| **Pneumothorax**  **Spontaneous** | Spontaneous Pneumothorax (SP) - an inherited condition characterized by weak areas in the pleural lining of the lung. Small air-filled blisters, called [blebs](http://noairtogo.tripod.com/gloss.htm#blebs#blebs), may form which occasionally rupture causing air to leak from the lung into the chest cavity. Also called Blebs Disease | **Diffusion** |
| **Pneumothorax**  **Tension** | Pneumothorax (PTX)- presence of air in the pleural cavity, caused by by rupture of the plural membrane or by trauma through the chest wall; often referred to as a collapsed lung. | **Ventilation**  **Diffusion** |
| **Primary ciliary dyskinesia (PCD)** | Primary ciliary dyskinesia (PCD) is a lung disorder that is genetic (something you have at birth). In PCD, the tiny hair-like structures (cilia) that move mucus out of respiratory passages are abnormal or do not move. | **Ventilation** |
| **Pulmonary Edema** | Pulmonary Edema (PE) - condition (usually acute, but sometimes chronic) that occurs when too much fluid accumulates in the lungs, blocking transport of [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) into the blood. | **Vascular**  **Diffusion** |
| **Pulmonary Embolism** | Pulmonary Embolism (PE) - the closure or narrowing of the [pulmonary artery](http://noairtogo.tripod.com/gloss.htm#PA#PA), or one of its branches, by an embolus | **Vascular**  **Diffusion**  **Perfusion** |
| **Pulmonary Fibrosis** | Pulmonary fibrosis is a disease marked by scarring in the lungs. Tissue deep in the lungs becomes thick, stiff and scarred. | **Parenchymal**  **Diffusion** |
| **Pulmonary Hypertension** | Primary pulmonary hypertension (PPH) is a lung disease in which there is high blood pressure in the lungs’ arteries. Pulmonary arterial hypertension (PAH) is a disease that causes stress on the heart when the blood pressure in a person’s pulmonary arteries gets dangerously high. | **Vascular**  **Diffusion**  **Perfusion** |
| **Pulmonary vascular disease** | Pulmonary vascular disease describes any condition that affects the blood circulation in the lungs. They include pulmonary embolism, chronic thromboembolic disease, pulmonary arterial hypertension, pulmonary veno-occlusive disease, arteriovenous malformations, and pulmonary edema. | **Vascular**  **Diffusion**  **Perfusion** |
| **Reactive Airway Disease (RAD)** | Reactive Airway Disease (RAD) - condition caused by reaction to a trigger (i.e. allergen, odor or hypersensitivity).  [Asthma](http://noairtogo.tripod.com/gloss.htm#asthma#asthma) and Hypersensitivity Pneumonitis are examples of RAD. | **Obstructive**  **Diffusion** |
| **Respiratory Distress Syndrome (RDS)** | Respiratory Distress Syndrome (RDS) - breathing complications experienced by newborns when immature lungs lack enough surfactant to keep air spaces open.  Also called hyaline membrane disease. | **Restrictive**  **Diffusion** |
| **Respiratory syncytial virus (RSV)** | Respiratory syncytial virus (RSV) is a virus that can infect the lungs and breathing passages. RSV also can affect the mouth, nose and throat. Most children will have RSV by the time they are two years old. It can cause more severe illnesses in infants | **Ventilation** |
| **Sarcoidosis** | Sarcoidosis is a disease caused by small areas of inflammation. It can affect any part of the body but is most common in the lungs—called pulmonary sarcoidosis. | **Restrictive**  **Parenchymal**  **Diffusion** |
| **Severe Acute Respiratory Syndrome (SARS)** | Severe Acute Respiratory Syndrome—known as SARS—is a virus that was identified during an outbreak in Asia in 2003. SARS is caused by a group of virus called the coronaviruses. SARS can be moderate or may be severe; most people with SARS develop pneumonia. Scientists believe the main way that SARS seems to spread is by close person-to-person contact, when someone infected with SARS coughs or sneezes | **Restrictive**  **Diffusion** |
| **Silicosis** | Silicosis is a lung disease that is caused by inhaling tiny bits of silica. Silica is a common mineral that is part of sand, rock and mineral ores like quartz. | **Restrictive**  **Diffusion** |
| **Sleep Apnea**  **Obstructive Sleep Apnea (OSA)** | Obstructive Sleep Apnea (OSA) - a common respiratory sleep disorder characterized by snoring and episodes of breathing cessation that causes blood [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) levels to fall below acceptable levels. | **Obstructive**  **Ventilation** |
| **Spinal Cord Injury** | Neurological disease altering the ability of the diaphragm of move gas. | **Restrictive**  **Ventilation** |
| **Strep Throat** | Strep throat is a bacterial throat infection If untreated, strep throat can sometimes cause complications such as kidney inflammation and rheumatic fever. Rheumatic fever can lead to painful and inflamed joints, a rash and even damage to heart valves. | **Infectious** |
| **Tuberculosis** | Tuberculosis (TB) is an infectious disease that usually infects the lungs, but can attack almost any part of the body. Tuberculosis is spread from person to person through the air. | **Infectious**  **Ventilation** |
| **Tuberculosis Extensively-drug resistant tuberculosis (XDR TB)** | Extensively-drug resistant tuberculosis (XDR TB) is a strain of TB resistant to at least isoniazied and rifampin among the first-line anti-TB drugs and to any fluoroquinolone and at least one of the three second-line injectable drugs: capreomycin, kanamycin, or amikan | **Infectious**  **Ventilation** |
| **Upper Respiratory Infection (URI)** | Upper Respiratory Infection (URI) - affecting any, or a combination, of the five parts comprising the upper respiratory tract: nose, sinuses, pharynx, larynx, trachea | **Infectious**  **Ventilation** |
| **Vanishing Lung Syndrome** | Vanishing Lung Syndrome - a progressive disorder characterized by presence of large upper lobe [bullae](http://noairtogo.tripod.com/gloss.htm#bullae#bullae) occupying at least one-third of the hemithorax, and compressing surrounding normal lung.  Also called "type 1 bullous disease" and "primary bullous disease of the lung. | **Diffusion** |

# Having defined and categorized many of the respiratory disorders, the main disorders of Asthma, Emphysema and Bronchitis will be discussed in-depth. Lung cancer will be discussed in brief below.

# Smoking-Attributable Lung Cancer Deaths (from www.lungusa.org)

According to the American Lung Association, the most important cause of lung cancer in the United States is cigarette smoking. It is estimated that 80 percent of lung cancer deaths in women and 90 percent in men, respectively, are caused by smoking. Compared to non-smokers, men who smoke are 23 times more likely to develop lung cancer, while women are 13 times more likely. The risk increases with the duration of smoking and amount smoked per day.

Between 1997 and 2001, an average of 123,836 Americans (79,026 males and 44,810 females) died of smoking-attributable lung cancer annually. Smoking-attributable annual lung cancer death rates range from a high in Kentucky of 126.3 per 100,000 to a low in Utah of 35.5 per 100,000. As expected, smoking prevalence rates are also highest in Kentucky and lowest in Utah.

Lung cancer is the leading cause of cancer mortality in both men and women in the United States. An estimated 215,020 new cases are expected to be diagnosed in 2008, accounting for almost 15% of all cancer diagnoses. It has been shown that rises and declines in lung cancer incidence and mortality rates parallel past trends of cigarette smoking. It has been estimated that active smoking is responsible for close to 90 percent of lung cancer cases; radon causes 10 percent, occupational exposures to carcinogens account for approximately 9 to 15 percent and outdoor air pollution 1 to 2 percent. Because of the interactions between exposures, the combined attributable risk for lung cancer can exceed 100 percent. Five-year survival rates are low compared to other common cancers at 15.2 percent.

In 1991, for the first in more than 25 years of observation, more than half of the U.S. adult population were non-smokers or had smoked less than 100 cigarettes during their lifetime. Specifically, most women, blacks, Hispanics, and those with a college degree had never smoked. Continuing this trend is important because preventing smoking initiation is a significant way to reduce smoking-attributable mortality.

For U.S. males, smoking prevalence peaked in the 1940s and 1950s at approximately 67%. For females, smoking prevalence peaked in the 1960’s at approximately 44%. In the past 25 years, the gap between men and women smoking rates has narrowed. In 1965, 51.9% of men and 33.9% of women were cigarette smokers; in 2008, 23.1% of men and 18.3% of women smoked. Although most smokers in the U.S. report that they want to stop smoking, 20.6% of adults or 45.3 million continue to smoke, as of 2008.

# Asthma

# Summarized from National Heart, Lung and Blood Institute http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma\_WhatIs.html

Asthma is a chronic (long-term) lung disease that inflames and narrows the airways. Asthma causes recurring periods of wheezing (a whistling sound when you breathe), chest tightness, shortness of breath, and coughing. The coughing often occurs at night or early in the morning. Asthma affects people of all ages, but it most often starts in childhood. In the United States, more than 22 million people are known to have asthma. Nearly 6 million of these people are children.

According to the American Lung Association, after a long period of steady increase, evidence suggests that asthma mortality and morbidity rates continue to plateau and/or decrease. Mortality figures due to asthma have been continuing to decline for the past 6 years. The number of deaths due to asthma in 2006 was approximately 22.4% lower than the number of deaths seen in 1999.

Hospital discharges have been declining since 1995. The number of hospital discharges has decreased 13% between 1995 and 2006 while the hospital discharge rate has declined 24% since it peaked at 19.5 per 10,000 in 1995.

Lifetime and attack prevalence rates have fluctuated over the past eight years but have remained stable. There are only eight years of data on current asthma. Therefore, more years of data from the revised National Health Interview Survey are needed to accurately assess the current prevalence trend.

However, asthma remains a major public health concern. In 2008, approximately 23.3 million Americans had asthma. In 2008, the condition accounted for an estimated 14.4 million lost school days in children and 14.2 million lost work days in adults. Asthma is a leading cause of activity limitation and costs our nation $20.7 billion in health care costs annually.

|  |  |
| --- | --- |
| [American Lung Association - Fighting For Air](http://www.lungusa.org/) | **Asthma in Adults Fact Sheet**  February 2010  http://www.lungusa.org/lung-disease |

**Asthma in Adults Fact Sheet**

* Asthma is a reversible obstructive lung disease, caused by increased reaction of the airways to various stimuli. It is a chronic inflammatory condition with acute exacerbations. Asthma can be a life-threatening disease if not properly managed.
* In 2008, it was estimated that 23.3 million Americans currently have asthma. Of these, 12.7 million Americans (4.1 million children under 18) had an asthma attack.[1](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#1)
* Current asthma prevalence in adults ranged from 6.6% in Florida to 10.5% in Rhode Island.[2](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#2)
* After a long period of steady increase, evidence suggests that asthma death and prevalence rates continue to plateau and/or decrease. In 2006, there were 3,613 deaths attributed to asthma – an age-adjusted rate of 1.2 per 100,000. Approximately 64% of these deaths occurred in women.[3](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#3)
* The number and rate of hospital discharges for asthma peaked in 1995. Since that time, the number of discharges has decreased by 13% and the discharge rate has declined 24%. During 2006, 444,000 discharges (14.9 per 10,000) were due to asthma.[4](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#4)
* Close to 1.7 million emergency room visits were attributed to asthma in 2006.[5](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#5)
* In 2008, asthma accounted for an estimated 14.2 million lost work days in adults.[6](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#6)
* The annual direct health care cost of asthma is approximately $15.6 billion; indirect costs (e.g. lost productivity) add another $5.1 billion, for a total of $20.7 billion dollars. Prescription drugs represented the largest single direct cost, at $5.6 billion.[7](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#7)
* Asthma breathing problems usually happen in "episodes" or “attacks,” but the inflammation underlying asthma is continuous. An asthma episode is a series of events that result in narrowed airways. These include: swelling of the lining, tightening of the muscle, and increased secretion of mucus in the airway. The narrowed airway is responsible for the difficulty in breathing with the familiar "wheeze."
* Lung function declines faster than average in people with asthma, particularly in people who smoke and in those with excessive mucus production (an indicator of poor treatment control).
* Asthma medications help reduce underlying inflammation in the airways and relieve or prevent symptomatic airway narrowing. Control of inflammation should lead to reduction in airway sensitivity and help prevent airway obstruction.
* Two classes of medications have been used to treat asthma—anti-inflammatory or controller agents and bronchodilators or relievers. Anti-inflammatory drugs interrupt the development of bronchial inflammation and have a preventive action. They may also modify or terminate ongoing inflammatory reactions in the airways. These agents include corticosteroids, cromolyn sodium, and other anti-inflammatory compounds. A new class of anti-inflammatory medications known as leukotriene modifiers, which work in a different way by blocking the activity of chemicals called leukotrienes that are involved in airway inflammation have recently come on the market.
* Bronchodilators act principally to open the airways by relaxing bronchial muscle. They include beta-adrenergic agonists, methylxanthines, and anticholinergics.
* Asthma is characterized by excessive sensitivity of the lungs to various stimuli. Triggers range from viral infections to allergies, to irritating gases and particles in the air. Each person reacts differently to the factors that may trigger asthma, including:
* respiratory infections and colds
* cigarette smoke
* allergic reactions to such allergens as pollen, mold, animal dander, feather, dust, food, and cockroaches
* indoor and outdoor air pollutants, including ozone and particle pollution
* exposure to cold air or sudden temperature change
* excitement/stress
* exercise
* Asthma may also be triggered by over the counter drugs. One study found that one adult asthmatic in five can suffer an attack from taking aspirin.[8](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#8)
* A study by the American Lung Association Asthma Clinical Research Center (ACRC) found that the inactivated influenza vaccine is safe to administer to adults and children with asthma, including those with severe asthma.[9](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#9) Influenza causes substantial illness in adults and children with asthma requiring emergency room visits and hospitalization, and vaccination can mostly prevent influenza and its complications. Currently, 45.6% of adults with asthma receive the influenza vaccine.[10](http://www.lungusa.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#10)

**Asthma Overview**

The [airways](http://www.nhlbi.nih.gov/health/dci/Diseases/hlw/hlw_what.html) are tubes that carry air into and out of the lungs. People who have asthma have inflamed airways. This makes the airways swollen and very sensitive. They tend to react strongly to certain substances that are breathed in. When the airways react, the muscles around them tighten. This causes the airways to narrow, and less air flows to the lungs. The swelling also can worsen, making the airways even narrower. Cells in the airways may make more mucus than normal. Mucus is a sticky, thick liquid that can further narrow the airways. This chain reaction can result in asthma symptoms. Symptoms can happen each time the airways are irritated.

### Asthma

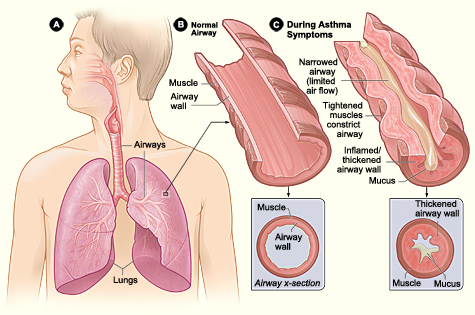


Figure A shows the location of the lungs and airways in the body. Figure B shows a cross-section of a normal airway. Figure C shows a cross-section of an airway during asthma symptoms.

**Asthma Pathophysiology**

Asthma is an airway disorder that causes respiratory hypersensitivity, inflammation, and intermittent obstruction. Asthma commonly causes constriction of the smooth muscles in the airway, wheezing, and dyspnea.

Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role, in particular, mast cells, eosinophils, T lymphocytes, macrophages, neutrophils, and epithelial cells. In susceptible individuals, this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment. The inflammation also causes an associated increase in the existing bronchial responsiveness to a variety of stimuli. Reversibility of airflow limitation may be incomplete in some patients with asthma.

Asthma is a common chronic disorder of the airways that is complex and characterized by variable and recurring symptoms, airflow obstruction, bronchial hyperresponsiveness, and an underlying inflammation. The interaction of these features of asthma determines the clinical manifestations and severity of asthma and the response to treatment.

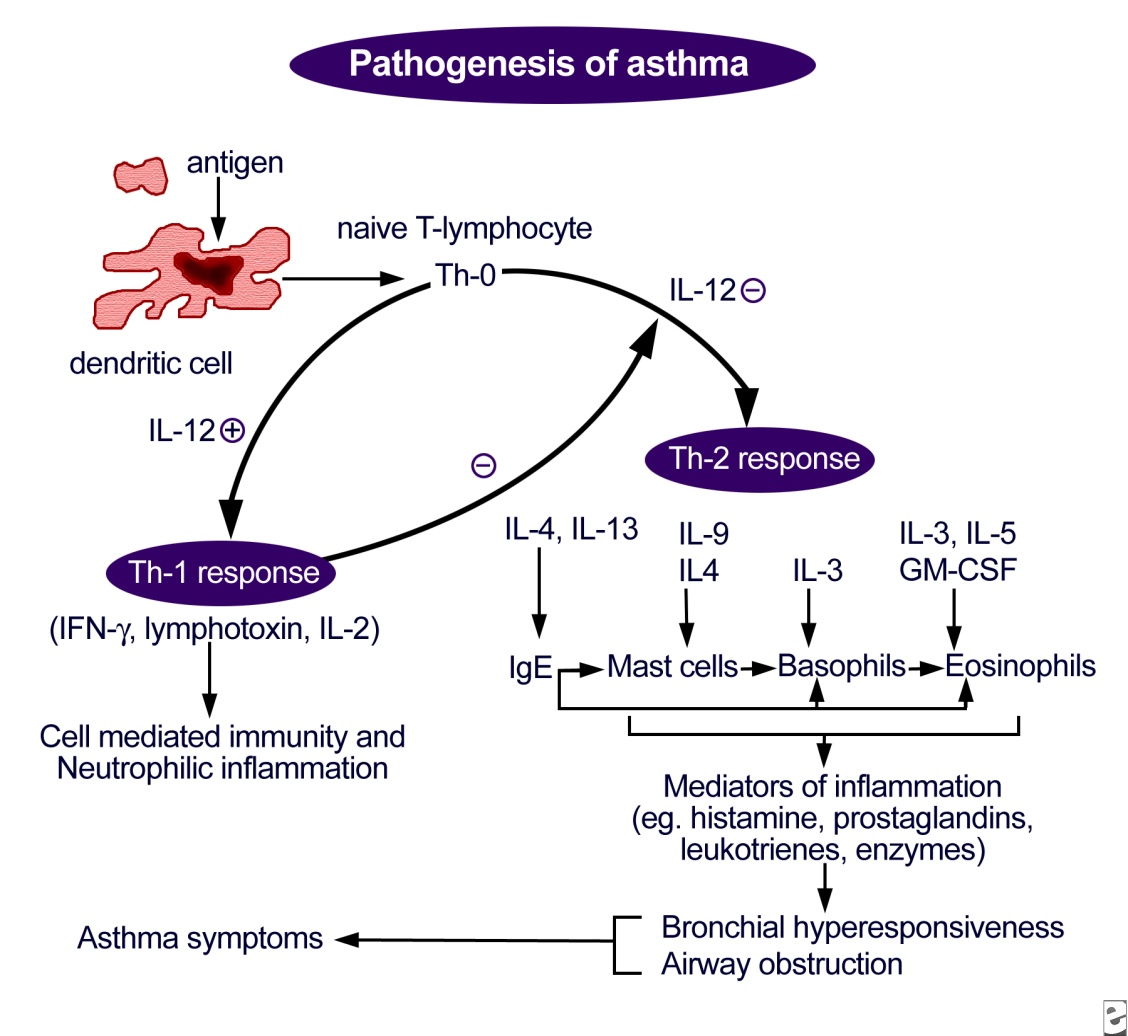
The most recent and updated Expert Panel Report 3 was recently published in 2007 and emphasizes new areas of severity, control, impairment, and risk that are key to maintaining asthma control.[2](javascript:showcontent('active','references');) A major difference is the emphasis on asthma control. The revised paradigm for asthma management now recommends that asthma management and assessment decisions should be initially based on categorization of asthma severity and, subsequently, on assessment of asthma control.

[Exercise-induced asthma](http://emedicine.medscape.com/article/88849-overview) (EIA), or exercise-induced bronchospasm (EIB), is an asthma variant defined as a condition in which exercise or vigorous physical activity triggers acute bronchospasm in persons with heightened airway reactivity. It is observed primarily in persons who have asthma (exercise-induced bronchospasm in asthmatic persons) but can also be found in patients with normal resting spirometry findings with atopy, [allergic rhinitis](http://emedicine.medscape.com/article/134825-overview), or [cystic fibrosis](http://emedicine.medscape.com/article/1001602-overview) and even in healthy persons, many of whom are elite athletes (exercise-induced bronchospasm in athletes). Exercise-induced bronchospasm is often a neglected diagnosis, and the underlying asthma may be silent in as many as 50% of patients, except during exercise.

The pathophysiology of asthma is complex and involves the following components:

* Airway inflammation
* Intermittent airflow obstruction
* Bronchial hyperresponsiveness

The mechanism of inflammation in asthma may be acute, subacute, or chronic, and the presence of airway edema and mucus secretion also contributes to airflow obstruction and bronchial reactivity. Varying degrees of mononuclear cell and eosinophil infiltration, mucus hypersecretion, desquamation of the epithelium, smooth muscle hyperplasia, and airway remodeling are present.



Asthma causes and symptoms. Antigen presentation by the dendritic cell with the lymphocyte and cytokine response leading to airway inflammation and asthma symptoms.

Some of the principal cells identified in airway inflammation include mast cells, eosinophils, epithelial cells, macrophages, and activated T lymphocytes. T lymphocytes play an important role in the regulation of airway inflammation through the release of numerous cytokines. Other constituent airway cells, such as fibroblasts, endothelial cells, and epithelial cells, contribute to the chronicity of the disease. Other factors, such as adhesion molecules (eg, selectins, integrins), are critical in directing the inflammatory changes in the airway. Finally, cell-derived mediators influence smooth muscle tone and produce structural changes and remodeling of the airway.

The presence of airway hyperresponsiveness or bronchial hyperreactivity in asthma is an exaggerated response to numerous exogenous and endogenous stimuli. The mechanisms involved include direct stimulation of airway smooth muscle and indirect stimulation by pharmacologically active substances from mediator-secreting cells such as mast cells or nonmyelinated sensory neurons. The degree of airway hyperresponsiveness generally correlates with the clinical severity of asthma.

Airflow obstruction can be caused by a variety of changes, including acute bronchoconstriction, airway edema, chronic mucous plug formation, and airway remodeling. Acute bronchoconstriction is the consequence of immunoglobulin E–dependent mediator release upon exposure to aeroallergens and is the primary component of the early asthmatic response. Airway edema occurs 6-24 hours following an allergen challenge and is referred to as the late asthmatic response. Chronic mucous plug formation consists of an exudate of serum proteins and cell debris that may take weeks to resolve. Airway remodeling is associated with structural changes due to long-standing inflammation and may profoundly affect the extent of reversibility of airway obstruction.

The 2007 Expert Panel Report 3 noted several key new differences in the pathophysiology of asthma, as follows:

* The critical role of inflammation has been further substantiated, but evidence is emerging for considerable variability in the pattern of inflammation, thus indicating phenotypic differences that may influence treatment responses.
* Of the environmental factors, allergic reactions remain important. Evidence also suggests a key and expanding role for viral respiratory infections in these processes.
* The onset of asthma for most patients begins early in life, with the pattern of disease persistence determined by early, recognizable risk factors including atopic disease, recurrent wheezing, and a parental history of asthma.
* Current asthma treatment with anti-inflammatory therapy does not appear to prevent progression of the underlying disease severity.

The pathogenesis of exercise-induced bronchospasm is controversial. The disease may be mediated by water loss from the airway, heat loss from the airway, or a combination of both. The upper airway is designed to keep inspired air at 100% humidity and body temperature at 37°C (98.6°F). The nose is unable to condition the increased amount of air required for exercise, particularly in athletes who breathe through their mouths. The abnormal heat and water fluxes in the bronchial tree result in bronchoconstriction, occurring within minutes of completing exercise. Results from bronchoalveolar lavage studies have not demonstrated an increase in inflammatory mediators. These patients generally develop a refractory period, during which a second exercise challenge does not cause a significant degree of bronchoconstriction.

The clinical history findings for exercise-induced bronchospasm are typical of asthma but are only associated with exercise. Typical symptoms include cough, wheezing, shortness of breath, and chest pain or tightness. Some individuals also may report sore throat or GI upset.

* Asthma symptoms are usually associated with exercise but may be related to exposure to cold air or other triggers, such as seasonal allergens, pollutants (eg, sulfur, nitrous oxide, ozone), or upper respiratory tract infections.
* Initially, airway dilation is noted during exercise. If exercise continues beyond approximately 10 minutes, bronchoconstriction supervenes, resulting in asthma symptoms. If the exercise period is shorter, symptoms may develop up to 5-10 minutes after completion of exercise. A higher intensity level of exercise results in a more intense attack. Running produces more symptoms than walking.
* Patients may note asthma symptoms are related to seasonal changes or the ambient temperature and humidity in the environment in which a patient exercises. Cold, dry air generally provokes more obstruction than warm, humid air. Consequently, many athletes have good exercise tolerance in sports such as swimming. Athletes who are more physically fit may not notice the typical asthma symptoms and may only report a reduced or more limited level of endurance.
* Several modifiers in the history should prompt an evaluation for causes other than exercise-induced bronchospasm. While patients may report typical obstructive symptoms, a history of a choking sensation with exercise, inspiratory wheezing, or stridor should prompt an evaluation for evidence of vocal cord dysfunction.

**Physical Exam and Signs and Symptoms of Asthma**

* General asthma physical findings
  + Evidence of respiratory distress manifests as increased respiratory rate, increased heart rate, diaphoresis, and use of accessory muscles of respiration.
  + Marked weight loss or severe wasting may indicate severe emphysema.
* Pulsus paradoxus: This is an exaggerated fall in systolic blood pressure during inspiration and may occur during an acute asthma exacerbation.
* Depressed sensorium: This finding suggests a more severe asthma exacerbation with impending respiratory failure.
* Chest examination
  + End-expiratory wheezing or a prolonged expiratory phase is found most commonly, although inspiratory wheezing can be heard.
  + Diminished breath sounds and chest hyperinflation (especially in children) may be observed during acute asthma exacerbations.
  + The presence of inspiratory wheezing or stridor may prompt an evaluation for an upper airway obstruction such as vocal cord dysfunction, vocal cord paralysis, thyroid enlargement, or a soft tissue mass (eg, malignant tumor).
* Upper airway
  + Look for evidence of erythematous or boggy turbinates or the presence of polyps from sinusitis, allergic rhinitis, or upper respiratory tract infection.
  + Any type of nasal obstruction may result in worsening of asthma or symptoms of exercise-induced bronchospasm.
* Skin: Observe for the presence of [atopic dermatitis](http://emedicine.medscape.com/article/1049085-overview), eczema, or other manifestations of allergic skin conditions.

**Causes of Asthma**

* Factors that can contribute to asthma or airway hyperreactivity may include any of the following:
  + Environmental allergens: House dust mites, animal allergens (especially cat and dog), cockroach allergens, and fungi are most commonly reported.
  + Viral respiratory tract infections
  + Exercise; hyperventilation
  + Gastroesophageal reflux disease
  + Chronic sinusitis or rhinitis
  + Aspirin or nonsteroidal anti-inflammatory drug (NSAID) hypersensitivity, sulfite sensitivity
  + Use of beta-adrenergic receptor blockers (including ophthalmic preparations)
  + Obesity: Based on a prospective cohort study of 86,000 patients, those with an elevated body mass index are more likely to have asthma.
  + Environmental pollutants, tobacco smoke
  + Occupational exposure
  + Irritants (eg, household sprays, paint fumes)
  + Various high and low molecular weight compounds: A variety of high and low molecular weight compounds are associated with the development of occupational asthma, such as insects, plants, latex, gums, diisocyanates, anhydrides, wood dust, and fluxes.
  + Emotional factors or stress
  + Perinatal factors: Prematurity and increased maternal age increase the risk for asthma; breastfeeding has not been definitely shown to be protective. Both maternal smoking and prenatal exposure to tobacco smoke also increase the risk of developing asthma.
* Factors that contribute to exercise-induced bronchospasm symptoms (in both people with asthma and athletes) include the following:
  + Exposure to cold or dry air
  + Environmental pollutants (eg, sulfur, ozone)
  + level of bronchial hyperreactivity
  + Chronicity of asthma and symptomatic control
  + Duration and intensity of exercise
  + Allergen exposure in atopic individuals
  + Coexisting respiratory infection

 Close

**Treatment for Asthma (http://www.emedicinehealth.com/asthma/page9\_em.htm)**

**Medications**

Controller medicines help minimize the inflammation that causes an [acute](http://www.emedicinehealth.com/script/main/art.asp?articlekey=2133) asthma attack.

* **Long-acting beta-agonists**: This class of drugs is chemically related to [adrenaline](http://www.emedicinehealth.com/script/main/art.asp?articlekey=2155), a [hormone](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3783) produced by the adrenal glands. Inhaled long-acting beta-agonists work to keep breathing passages open for 12 hours or longer. They relax the muscles of the breathing passages, [dilating](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3002) the passages and decreasing the resistance to exhaled airflow, making it easier to breathe. They may also help to reduce inflammation, but they have no effect on the underlying cause of the asthma attack. Side effects include rapid heartbeat and shakiness. [Salmeterol](http://www.emedicinehealth.com/script/main/art.asp?articlekey=103482) (Serevent) and [formoterol](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102943) (Foradil) are long-acting beta-agonists.
* **Inhaled corticosteroids** are the main class of medications in this group. The inhaled steroids act locally by concentrating their effects directly within the breathing passages, with very few side effects outside of the lungs. They function to reduce inflammation. Beclomethasone (Vancenase, Beclovent) and [triamcinolone](http://www.emedicinehealth.com/script/main/art.asp?ArticleKey=102115) (Nasacort, Atolone) are examples of inhaled corticosteroids.
* [**Leukotriene**](http://www.emedicinehealth.com/script/main/art.asp?articlekey=22052) **inhibitors** are another group of controller medications. Leukotrienes are powerful chemical substances that promote the [inflammatory response](http://www.emedicinehealth.com/script/main/art.asp?articlekey=19510) seen during an acute asthma attack. By blocking these chemicals, leukotriene inhibitors reduce inflammation. The leukotriene inhibitors are considered a second line of defense against asthma and usually are used for asthma that is not severe enough to require oral corticosteroids. [Zileuton](http://www.emedicinehealth.com/script/main/art.asp?articlekey=103570) (Zyflo), [zafirlukast](http://www.emedicinehealth.com/script/main/art.asp?articlekey=101759) (Accolate), and [montelukast](http://www.emedicinehealth.com/script/main/art.asp?articlekey=103277) (Singulair) are examples of leukotriene inhibitors.
* **Xanthines** are another group of controller medications useful in the treatment of asthma. This group of medications is chemically related to [caffeine](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11068). Xanthines work as long-acting bronchodilators. At one time, xanthines were commonly used to treat asthma. Today, because of significant caffeine-like side effects, they are being used less frequently in the routine management of asthma. [Theophylline](http://www.emedicinehealth.com/script/main/art.asp?ArticleKey=102796) and [aminophylline](http://www.emedicinehealth.com/script/main/art.asp?ArticleKey=102027) are examples of xanthine medications.
* **Mast Cell Stabilizers such as** [**Cromolyn sodium**](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102599) is another medication that can prevent the release of chemicals that cause asthma-related inflammation. This drug is especially useful for people who develop asthma attacks in response to certain types of allergic exposures. When taken regularly prior to an exposure, cromolyn sodium can prevent the development of an asthma attack. However, this medicine is of no use once an asthma attack has begun.
* **Anti IGE Monoclonal Antibodies such as** [**Omalizumab**](http://www.emedicinehealth.com/script/main/art.asp?articlekey=103354) belongs to a newer class of agents that works with the body's immune system. In people with asthma who have an elevated level of Immunoglobulin E (Ig E), an allergy antibody, this drug given by injection may be helpful with symptoms that are more difficult to control. This agent inhibits IgE binding to cells that release chemicals that worsen asthma symptoms. This binding prevents release of these mediators, thereby helping in controlling the disease.
* **Rescue medications** are taken after an asthma attack has already begun. These do not take the place of controller drugs. Do not stop taking your controller drug(s) during an asthma attack.
* **Short-acting beta-agonists** are the most commonly used rescue medications. Inhaled short-acting beta-agonists work rapidly, within minutes, to open the breathing passages, and the effects usually last four hours. [Albuterol](http://www.emedicinehealth.com/script/main/art.asp?articlekey=101922) (Proventil, Ventolin) is the most frequently used short-acting beta-agonist medication.
* **Anticholinergics** are another class of drugs useful as rescue medications during asthma attacks. Inhaled anticholinergic drugs open the breathing passages, similar to the action of the beta-agonists. Inhaled anticholinergics take slightly longer than beta-agonists to achieve their effect, but they last longer than the beta-agonists. An anticholinergic drug is often used together with a beta-agonist drug to produce a greater effect than either drug can achieve by itself. [Ipratropium](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102166) bromide (Atrovent) is the inhaled anticholinergic drug currently used as a rescue asthma medication.

**Key Points for Asthma**

* Asthma is a chronic (long-term) lung disease that inflames and narrows the airways and makes them more reactive to certain substances breathed in. The exact cause of asthma isn't known.
* Asthma affects people of all ages, but it most often starts in childhood. In the United States, more than 22 million people are known to have asthma. Nearly 6 million of these people are children.
* Asthma causes recurring periods of wheezing (a whistling sound when you breathe), chest tightness, shortness of breath, and coughing. The coughing often occurs at night or early in the morning.
* Sometimes symptoms are mild and go away on their own or after minimal treatment with an asthma medicine. Other times, the symptoms continue to get worse. When symptoms get more intense and/or additional symptoms appear, this is an asthma attack.
* It's important to treat asthma symptoms when you first notice them. This will help prevent the symptoms from worsening and causing a severe attack. Severe asthma attacks may require emergency care, and they can cause death.
* The doctor will diagnose asthma based on the medical history, a physical exam, and results from tests. Asthma is difficult to diagnose in children younger than 5 years old.
* There's no cure for asthma. Asthma is a long-term disease that requires long-term care. Successful asthma treatment requires you to take an active role in the care. Learn how to manage the asthma, get ongoing care, and watch for signs that the asthma is getting worse.
* The goal of asthma treatment is to control the disease by following the asthma action plan you create with the doctor, taking asthma medicines as prescribed, learning what things make the asthma worse and taking steps to avoid exposure to them, tracking the level of asthma control, and responding quickly to worsening symptoms.
* Asthma is treated with two types of medicines: long-term control medicines and quick-relief medicines. You use a device called an inhaler to take many of these medicines. This device allows the medicine to go right to the lungs.
* The amounts and types of medicine you need to treat the asthma depend on how well controlled the asthma is when you're closely following the asthma action plan. This may change over time.
* Track the asthma by recording the symptoms, using a [peak flow meter](http://www.nhlbi.nih.gov/health/dci/Diseases/lft/lft_types.html), and getting regular asthma checkups. Let the doctor know if the asthma is getting worse.
* Most people who have asthma are able to manage the disease. They have few, if any, symptoms and can live normal, active lives.

# COPD – Emphysema and Bronchitis

# Summarized from <http://www.nhlbi.nih.gov/health/dci/Diseases/Copd/Copd_WhatIs.html>

COPD, or chronic obstructive pulmonary disease, is a progressive disease that makes it hard to breathe. "Progressive" means the disease gets worse over time. COPD can cause [coughing](http://www.nhlbi.nih.gov/health/dci/Diseases/cough/cough_whatis.html) that produces large amounts of mucus (a slimy substance), wheezing, shortness of breath, chest tightness, and other symptoms. Cigarette smoking is the leading cause of COPD. Most people who have COPD smoke or used to smoke. Long-term exposure to other lung irritants, such as air pollution, chemical fumes, or dust, also may contribute to COPD.

**Overview**

To understand COPD, it helps to understand [how the lungs work](http://www.nhlbi.nih.gov/health/dci/Diseases/hlw/hlw_what.html). The air that you breathe goes down your windpipe into tubes in your lungs called bronchial tubes or airways. Within the lungs, your bronchial tubes branch into thousands of smaller, thinner tubes called bronchioles. These tubes end in bunches of tiny round air sacs called alveoli. Small blood vessels called capillaries run through the walls of the air sacs. When air reaches the air sacs, the oxygen in the air passes through the air sac walls into the blood in the capillaries. At the same time, carbon dioxide (a waste gas) moves from the capillaries into the air sacs. This process is called gas exchange. The airways and air sacs are elastic (stretchy). When you breathe in, each air sac fills up with air like a small balloon. When you breathe out, the air sacs deflate and the air goes out.

In COPD, less air flows in and out of the airways because of one or more of the following:

* The airways and air sacs lose their elastic quality.
* The walls between many of the air sacs are destroyed.
* The walls of the airways become thick and inflamed.
* The airways make more mucus than usual, which tends to clog them.

In the United States, the term "COPD" includes two main conditions—[emphysema](http://www.nlm.nih.gov/medlineplus/emphysema.html) and [chronic bronchitis](http://www.nhlbi.nih.gov/health/dci/Diseases/brnchi/brnchi_whatis.html).

In emphysema, the walls between many of the air sacs are damaged, causing them to lose their shape and become floppy. This damage also can destroy the walls of the air sacs, leading to fewer and larger air sacs instead of many tiny ones. If this happens, the amount of gas exchange in the lungs is reduced.

In chronic bronchitis, the lining of the airways is constantly irritated and inflamed. This causes the lining to thicken. Lots of thick mucus forms in the airways, making it hard to breathe.

Most people who have COPD have both emphysema and chronic obstructive bronchitis. Thus, the general term "COPD" is more accurate.

COPD is a major cause of disability, and it's the fourth leading cause of death in the United States. More than 12 million people are currently diagnosed with COPD. Many more people may have the disease and not even know it.

COPD develops slowly. Symptoms often worsen over time and can limit your ability to do routine activities. Severe COPD may prevent you from doing even basic activities like walking, cooking, or taking care of yourself. Most of the time, COPD is diagnosed in middle-aged or older people. The disease isn't passed from person to person—you can't catch it from someone else. COPD has no cure yet, and doctors don't know how to reverse the damage to the airways and lungs. However, treatments and lifestyle changes can help you feel better, stay more active, and slow the progress of the disease.

**Normal Lungs and Lungs With COPD**

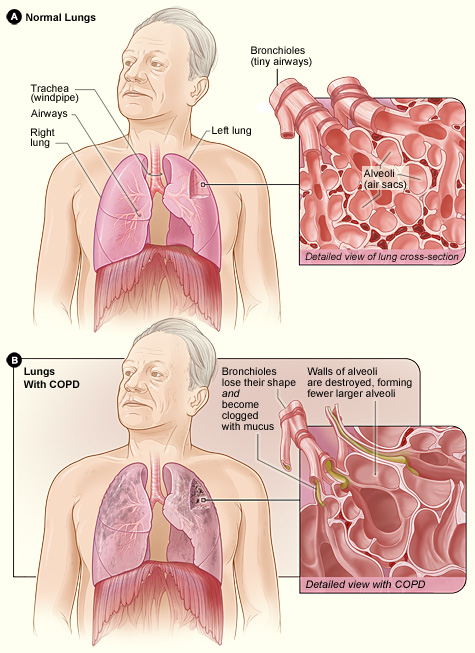


Figure A shows the location of the lungs and airways in the body. The inset image shows a detailed cross-section of the bronchioles and alveoli. Figure B shows lungs damaged by COPD. The inset image shows a detailed cross-section of the damaged bronchioles and alveolar walls.

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| --- | --- |
| [American Lung Association - Fighting For Air](http://www.lungusa.org/) | **Chronic Obstructive Pulmonary Disease (COPD) Fact Sheet** February 2010  http://www.lungusa.org/lung-disease |

**Chronic Obstructive Pulmonary Disease (COPD) Fact Sheet**

Chronic obstructive pulmonary disease (COPD) is a term referring to two lung diseases, chronic bronchitis and emphysema, that are characterized by obstruction to airflow that interferes with normal breathing. Both of these conditions frequently co-exist, hence physicians prefer the term COPD. It does not include other obstructive diseases such as asthma.

* COPD is the fourth leading cause of death in America, claiming the lives of 120,970 Americans in 2006.[1](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_01)
* This is the seventh consecutive year in which women have exceeded men in the number of deaths attributable to COPD. In 2006, almost 63,000 females died compared to almost 58,000 males.[2](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_02)
* Smoking is the primary risk factor for COPD. Approximately 85 to 90 percent of COPD deaths are caused by smoking. Female smokers are nearly 13 times as likely to die from COPD as women who have never smoked. Male smokers are nearly 12 times as likely to die from COPD as men who have never smoked.[3](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_03) Any current or former smoker over age 40 or never-smoker with a family history of COPD, emphysema or chronic bronchitis, those with expo¬sure to occupational or environmental pollutants and those with a chronic cough, sputum (matter discharged from air passages) production or breathless¬ness, should seek testing for COPD with spirometry.[4](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_04)
* Other risk factors of COPD include exposure to air pollution, second-hand smoke and occupational dusts and chemicals, heredity, a history of childhood respiratory infections and socioeconomic status.[5](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_05) Particulate matter from cigarette smoke and air pollution, including smoke from poorly ventilated wood stoves and the burning of biomass, are related to lung damage.[6](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_06)
* Occupational exposure to certain industrial pollutants also increases the risk for COPD. One study found that the fraction of COPD attributed to work was estimated as 19.2% overall and 31.1% among never smokers.[7](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_07)
* In 2007, 12.1 million U.S. adults (aged 18 and over) were estimated to have COPD.[8](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_08) However, close to 24 million U.S. adults have evidence of impaired lung function, indicating an under diagnosis of COPD.[9](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_09)
* An estimated 672,000 hospital discharges were reported in 2006; a discharge rate of 22.5 per 100,000 population. COPD is an important cause of hospitalization in our aged population. Approximately 64% of discharges were in the 65 years and older population in 2006.[10](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_10)
* A Lung Association survey revealed that half of all COPD patients (51%) say their condition limits their ability to work. It also limits them in normal physical exertion (70%), household chores (56%), social activities (53%), sleeping (50%) and family activities (46%).[11](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_11)
* In 2010, the cost to the nation for COPD was projected to be approximately $49.9 billion, including $29.5 billion in direct health care expenditures, $8.0 billion in indirect morbidity costs and $12.4 billion in indirect mortality costs.[12](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_12)
* **Chronic bronchitis** is the inflammation and eventual scarring of the lining of the bronchial tubes. When the bronchi are inflamed and/or infected, less air is able to flow to and from the lungs and a heavy mucus or phlegm is coughed up. The condition is defined by the presence of a mucus-producing cough most days of the month, three months of a year for two successive years without other underlying disease to explain the cough.
* This inflammation eventually leads to scarring of the lining of the bronchial tubes. Once the bronchial tubes have been irritated over a long period of time, excessive mucus is produced constantly, the bronchial tubes lining thickens, an irritating cough develops, air flow may be hampered, and the lungs become scarred. The bronchial tubes then make an ideal breeding place for bacterial infections within the airways, which eventually impedes airflow.[13](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_13)
* In 2008, an estimated 9.8 million Americans reported a physician diagnosis of chronic bronchitis. Chronic bronchitis affects people of all ages, although people aged 65 years or more have the highest rate at 56.0 per 1,000 persons.[14](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_14)
* Females are about twice as likely to be diagnosed with chronic bronchitis as males. In 2008, 3.1 million males had a diagnosis of chronic bronchitis compared to 6.7 million females.[15](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_15)
* Symptoms of chronic bronchitis include chronic cough, increased mucus, frequent clearing of the throat and shortness of breath.[16](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_16)
* Chronic bronchitis does not strike suddenly and is often neglected by individuals until it is in an advanced state as people mistakenly believe that the disease is not life-threatening. By the time a patient goes to their health care provider the lungs have frequently been seriously injured. Then the patient may be in danger of developing serious respiratory problems or heart failure.
* **Emphysema** begins with the destruction of air sacs (alveoli) in the lungs where oxygen from the air is exchanged for carbon dioxide in the blood. The walls of the air sacs are thin and fragile. Damage to the air sacs is irreversible and results in permanent "holes" in the tissues of the lower lungs. As air sacs are destroyed, the lungs are able to transfer less and less oxygen to the bloodstream, causing shortness of breath. The lungs also lose their elasticity, which is important to keep airways open. The patient experiences great difficulty exhaling.[17](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_17)
* Emphysema does not develop suddenly. It comes on very gradually. Years of exposure to the irritation of cigarette smoke usually precede the development of emphysema. Of the estimated 3.7 million Americans ever diagnosed with emphysema, 94 percent are 45 or older.[18](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_18)
* Historically, men have been more likely than women to receive a diagnosis of emphysema. However, in 2008 more women reported a diagnosis of emphysema than men; over 2.0 million (17.3 per 1,000 population) compared to almost 1.8 million (16.3 per 1,000 population), respectively.[19](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_19)
* Symptoms of emphysema include cough, shortness of breath and a limited exercise tolerance. Diagnosis is made by pulmonary function tests, along with the patient's history, examination and other tests.[20](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_20)
* **Alpha1 antitrypsin deficiency-related (AAT) emphysema** is caused by the inherited deficiency of a protein called alpha1-antitrypsin (AAT) or alpha1-protease inhibitor. AAT, produced by the liver, is a "lung protector." In the absence of AAT, emphysema is almost inevitable. It is responsible for only 2-3% of the emphysema in the United States.[21](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_21)
* An estimated 100,000 Americans, primarily of northern European descent, have AAT deficiency emphysema. Another 20 million Americans carry a single deficient gene that causes Alpha-1 and may pass the gene onto their children.[22](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_22)
* One study suggested that there are at least 116 million carriers among all racial groups, worldwide.[23](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_23)
* Symptoms of AAT deficiency include shortness of breath and decreased exercise capacity. They rarely appear before 25 years of age and sometimes never develop, mostly in nonsmokers. In those who smoke, symptoms occur between 32 and 41 years of age on average. Smoking significantly increases the severity of emphysema in AAT-deficient individuals.[24](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_24)
* Blood screening is primarily used to diagnose whether a person is a carrier or AAT-deficient. In addition, a DNA-based cheek swab test has been developed for the diagnosis of AAT-deficiency.[25](http://www.lungusa.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html#note_25)

# Chronic Obstructive Pulmonary Disease (COPD) - Chronic Bronchitis & Emphysema

# Summarized from emedicinehealth.com (http://www.emedicinehealth.com/script/main/art.asp?articlekey=59045&pf=3&page=1)

**COPD Overview**

Chronic obstructive pulmonary disease, or [COPD](http://www.emedicinehealth.com/script/main/art.asp?articlekey=7786), is a long-lasting [obstruction](http://www.emedicinehealth.com/script/main/art.asp?articlekey=23660) of the airways that occurs with [chronic bronchitis](http://www.emedicinehealth.com/script/main/art.asp?articlekey=7792), [emphysema](http://www.emedicinehealth.com/script/main/art.asp?articlekey=58849), or both. This obstruction of airflow is [progressive](http://www.emedicinehealth.com/script/main/art.asp?articlekey=10697) in that it happens over time. Chronic bronchitis is defined as a chronic (ongoing, long-term) [cough](http://www.emedicinehealth.com/script/main/art.asp?articlekey=2852) not caused by another condition that produces [sputum](http://www.emedicinehealth.com/script/main/art.asp?articlekey=5539) ([mucus](http://www.emedicinehealth.com/script/main/art.asp?articlekey=4450)) for 3 or more months during each of the 2 consecutive years.   
    
In chronic bronchitis, the [mucous](http://www.emedicinehealth.com/script/main/art.asp?articlekey=10681) glands in the [lungs](http://www.emedicinehealth.com/script/main/art.asp?articlekey=4209) become larger. The airways become inflamed, and the bronchial walls thicken. These changes and the loss of supporting [alveolar](http://www.emedicinehealth.com/script/main/art.asp?articlekey=25927) (air space) attachments limit airflow by allowing the [airway](http://www.emedicinehealth.com/script/main/art.asp?articlekey=10665) walls to deform and narrow the airway [lumen](http://www.emedicinehealth.com/script/main/art.asp?articlekey=20106) (the inside of the airway tube). Emphysema is an [abnormal](http://www.emedicinehealth.com/script/main/art.asp?articlekey=22433), permanent enlargement of the air spaces ([alveoli](http://www.emedicinehealth.com/script/main/art.asp?articlekey=2212)) located at the end of the [breathing](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11056) passages of the lungs (terminal bronchioles). Emphysema also destroys the walls of these air spaces.   
    
There are 3 types of emphysema: centriacinar emphysema, panacinar emphysema, and distal acinar emphysema or paraseptal emphysema. In the United States, approximately 14.2 million people have been diagnosed with COPD, 12.5 million people have chronic bronchitis, and 1.7 million people have emphysema. It is estimated that there may be an additional equal number of US citizens that have COPD but who have not been diagnosed with the disorder. The number of people with COPD has increased by 41.5% since 1982.

* An estimated 8-17% American men and 10-19% American women suffer from chronic [airway obstruction](http://www.emedicinehealth.com/script/main/art.asp?articlekey=8541). This obstruction decreases the rate of airflow through the lungs when a person exhales (breathes out). During the last decade, COPD has increased in women by 30%.
* According to a 1985 study, death rates from COPD for patients aged 55-84 years were 200 per 100,000 men and 80 per 100,000 women in the United States.  Although men had a higher death rate than women, the [mortality rate](http://www.emedicinehealth.com/script/main/art.asp?articlekey=10118) due to COPD in women is expected to increase.

**COPD Causes**

* Cigarette smoking or exposure to tobacco smoke-[Cigarette smoking](http://www.emedicinehealth.com/script/main/art.asp?articlekey=58939) or exposure to [tobacco](http://www.emedicinehealth.com/script/main/art.asp?articlekey=13294) smoke is the primary cause of COPD. While COPD occurs in 15% of cigarette smokers, tobacco use accounts for as much as 90% of the risk for the development of this disease. [Secondhand smoke](http://www.emedicinehealth.com/script/main/art.asp?articlekey=93817) or [environmental tobacco smoke](http://www.emedicinehealth.com/script/main/art.asp?articlekey=13297) also increase the risk of [respiratory](http://www.emedicinehealth.com/script/main/art.asp?articlekey=5329) infections and can result in a decrease in lung function. People with COPD experience a more rapid decline in what is called [forced expiratory volume](http://www.emedicinehealth.com/script/main/art.asp?articlekey=20404), or FEV. FEV is the maximum volume of air that can be exhaled within a specified time period, starting from maximal inhalation. A subscript indicates the time period in seconds. For example, FEV1 is the maximum volume of air that can be exhaled within 1 second. A decline in FEV causes a person to become short of breath and to have difficulty breathing.
* Air pollution - It is not clear if air pollution causes COPD. However, if it does, the effect is small when compared to cigarette smoking. The use of solid fuels for cooking and heating may cause high levels of indoor air pollution, which may then lead to the development of COPD.
* Airway hyperresponsiveness Some patients who develop COPD have airway hyperresponsiveness, a condition in which their airways overreact to airborne irritants, such as secondhand smoke and air pollution. The role of airway hyperresponsiveness as a [risk factor](http://www.emedicinehealth.com/script/main/art.asp?articlekey=5377) for COPD in people who smoke is unclear. However, according to one hypothesis, patients who have airway hyperreactivity and who smoke are at an increased risk of COPD and an accelerated rate of decreased lung function.
* Alpha1-antitrypsin (AAT) deficiency Alpha1-antitrypsin (AAT) is a [protein](http://www.emedicinehealth.com/script/main/art.asp?articlekey=6554) in the body that is produced by the [liver](http://www.emedicinehealth.com/script/main/art.asp?articlekey=4179) and helps protect the lungs from damage. In AAT deficiency, the liver does not produce enough of this protein. AAT deficiency is an inherited condition, and it is the only known [genetic](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3573) risk factor for COPD. It accounts for less than 1% of all cases of COPD in the United States. Severe AAT deficiency leads to emphysema at an early age; in nonsmokers, the average age of [onset](http://www.emedicinehealth.com/script/main/art.asp?articlekey=31474) of emphysema is 53 years, and in smokers, it is 40 years.

**COPD Symptoms**

Most people with COPD have smoked at least 10-20 cigarettes per day for 20 or more years before experiencing any symptoms. Thus, COPD is typically not diagnosed until the fifth decade of life (in people aged 40-49 years).

Common signs and symptoms of COPD are as follows:

* A productive cough or an acute breathlessness or being short of breath (called [dyspnea](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3145)) is the most significant [symptom](http://www.emedicinehealth.com/script/main/art.asp?articlekey=5610), but it does not usually occur until the sixth decade of life (in people aged 50-59 years).
* [Wheezing](http://www.emedicinehealth.com/script/main/art.asp?articlekey=9401) is a musical, whistling, or hissing sound with breathing. Some people may wheeze, especially during exertion and when their condition worsens.
* The following may occur as COPD worsens:
  + Intervals between acute periods of worsening of dyspnea (exacerbations) become shorter.
  + [Cyanosis](http://www.emedicinehealth.com/script/main/art.asp?articlekey=10671) (discoloration of the skin) and failure of the right side of the [heart](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3668) may occur.
  + [Anorexia](http://www.emedicinehealth.com/script/main/art.asp?articlekey=2268) and [weight loss](http://www.emedicinehealth.com/script/main/art.asp?articlekey=53393) often develop and suggest a worse [prognosis](http://www.emedicinehealth.com/script/main/art.asp?articlekey=5061).
* The American Thoracic Society (ATS) recommends the following clinical staging of COPD severity according to lung function:
  + Stage I is FEV1 of equal or more than 50% of the predicted value.
  + Stage II is FEV1 of 35-49% of the predicted value.
  + Stage III is FEV1 of less than 35% of the predicted value.

**Exams and Tests**

* Sputum analysis
* A [chest x-ray](http://www.emedicinehealth.com/script/main/art.asp?articlekey=110395) or a high-resolution [computerized tomography](http://www.emedicinehealth.com/script/main/art.asp?articlekey=10349) scan (an HRCT scan) may be taken. An HRCT scan is often taken because it provides more detail than a chest x-ray. It is very useful in detecting emphysema.
* A pulmonary function test should be used because it detects and assesses the severity of lung disease. This test is also helpful in following the progress of lung disease. Using a device called a spirometer, a [pulmonary function test](http://www.emedicinehealth.com/script/main/art.asp?articlekey=12163) can determine how well your lungs are functioning by measuring how much air you can breathe in and how much and how fast the patient can breathe out.
* Arterial Blood Gases.
* A pulse oximeter for oxygen saturation.

**COPD Treatment**

The goal of the treatment of COPD is to improve daily living and [quality of life](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11815) by preventing symptoms and exacerbations, thereby preserving optimal lung function.

**Smoking Cessation**

Smoking cessation is essential. Most patients with COPD are currently smoking or have smoked in the past. A plan to stop smoking is an essential part of a comprehensive treatment plan. Smoking cessation success rates, however, are low because of the following:

* The addictive power of [nicotine](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102567)
* The conditioned response to smoking-associated stimuli
* Psychological problems, including [depression](http://www.emedicinehealth.com/script/main/art.asp?articlekey=58644), poor education, and forceful promotional campaigns by the tobacco industry

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The transition from smoking to not smoking occurs in 5 stages:

* + Precontemplation
  + Contemplation
  + Preparation
  + Action
  + Maintenance

The process of smoking cessation involves multiple interventions. Smoking [intervention](http://www.emedicinehealth.com/script/main/art.asp?articlekey=34214) programs include the following:

* + Self-help
  + Group
  + Physician delivered
  + Workplace
  + Community programs

Successful cessation programs typically use the following resources and tools:

* + Patient education
  + A quit date
  + Follow-up support
  + [Relapse](http://www.emedicinehealth.com/script/main/art.asp?articlekey=5292) prevention
  + Advice for healthy lifestyle changes
  + Social support systems
  + Adjuncts to treatment (eg, medications)

Many people with COPD are unable to enjoy life to the fullest because of shortness of breath, physical limitations, and inactivity. Pulmonary [rehabilitation](http://www.emedicinehealth.com/script/main/art.asp?articlekey=5288) programs are designed to improve quality of life by decreasing airflow limitation, preventing secondary medical complications, and alleviating respiratory symptoms.   Pulmonary rehabilitation programs are first conducted in an [outpatient](http://www.emedicinehealth.com/script/main/art.asp?articlekey=4700) setting and then can be continued at home. Guidelines for continuing this program at home will be provided for you. A rehabilitation program may include a number of components and will be tailored to your needs.   
 

**Medical Treatment**

The 3 major goals of the comprehensive treatment of COPD are as follows:

* Lessen airflow limitation
* Prevent and treat secondary medical complications (eg, hypoxemia, [infection](http://www.emedicinehealth.com/script/main/art.asp?articlekey=12923))
* Decrease respiratory symptoms and improve quality of life

Acute [exacerbation](http://www.emedicinehealth.com/script/main/art.asp?articlekey=24661) of COPD is one of the major reasons for hospital admission in the United States.   
  
Patients may need to be hospitalized if they develop severe respiratory [dysfunction](http://www.emedicinehealth.com/script/main/art.asp?articlekey=13498). There may be progression to other serious respiratory diseases (eg, [pneumonia](http://www.emedicinehealth.com/script/main/art.asp?articlekey=4962), acute bronchitis). The purpose of hospitalization is to treat symptoms and to prevent further deterioration.

**Medications**

**Smoking cessation using nicotine replacement therapies**

The supervised use of medications is an important adjunct to smoking cessation programs. Nicotine is the ingredient in cigarettes primarily responsible for the [addiction](http://www.emedicinehealth.com/script/main/art.asp?articlekey=81119). Withdrawal from nicotine may cause the patient to have unpleasant side effects, such as [anxiety](http://www.emedicinehealth.com/script/main/art.asp?articlekey=58900), irritability, difficulty concentrating, anger, fatigue, drowsiness, depression, and [sleep](http://www.emedicinehealth.com/script/main/art.asp?articlekey=59135) disruption. These effects usually occur during the first several weeks after you stop smoking.

Nicotine replacement therapies reduce these [withdrawal symptoms](http://www.emedicinehealth.com/script/main/art.asp?articlekey=9974). If the patient requires his/her first cigarette within 30 minutes of waking up, he/she is most likely highly addicted and would benefit from nicotine replacement therapy. Several nicotine replacement therapies are available.

**Nicotine polacrilex** is a chewing gum. Chewing pieces come in 2 strengths (ie, 2 mg, 4 mg). For persons who smoke 1 pack per day, they should use 4-mg pieces. If the person smokes less than 1 pack per day, he/she should use 2-mg pieces. Patients should chew hourly and also chew when needed for any initial cravings within the first 2 weeks. The patient should gradually reduce the amount chewed over the next 3 months.

**Transdermal nicotine patches** are also available. Patches are well tolerated. The most common side effect is slight skin irritation where the patch is placed. Nicotine replacement therapy patches are sold under the following trade names: Nicoderm, Nicotrol, and Habitrol. Each product has a scheduled decrease in nicotine over 6-10 weeks.

[**Bupropion**](http://www.emedicinehealth.com/script/main/art.asp?articlekey=707), an antidepressant [bupropion](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102325) (Zyban) can be effective. It is a nonnicotine aid to smoking cessation. [bupropion](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102325) (Zyban) may also be effective for those people who have not been able to quit smoking with nicotine replacement therapies.

**Inhaled steroids**

Some people with COPD who respond well to oral corticosteroids can be maintained on long-term inhaled steroids. The use of these drugs is widespread, despite little evidence of efficacy in the treatment of COPD. Inhaled corticosteroids do not slow the decline in lung function. They do, however, decrease the frequency of exacerbations and improve disease-specific and health-related quality of life issues for some people with COPD. Inhaled corticosteroids have fewer side effects than oral steroids, but they are less effective than oral steroids, even at high doses.

**Beta2 Agonists - Bronchodilators**

Inhaled beta2-agonist bronchodilators relax and open the breathing passages. They work rapidly, typically within minutes. Beta2 agonists are primarily used to relieve symptoms of COPD. Inhaled beta2 agonists are the treatment of choice for acute exacerbations of COPD.    
**Long-acting beta2 agonists** (ie, [formoterol](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102943), [salmeterol](http://www.emedicinehealth.com/script/main/art.asp?articlekey=103482)) are available. They may be useful if for patients who frequently use short-acting beta2-bronchodilators or if you experience symptoms at night.

**Anticholinergic agents** – Bronchodilators. These agents provide maintenance treatment with aerosolized [anticholinergic](http://www.emedicinehealth.com/script/main/art.asp?articlekey=2281) agents (eg, [ipratropium](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102166) bromide) and may be more effective than beta2 agonists for people with COPD, particularly in relieving shortness of breath. Ipratropium bromide opens the breathing passages and has minimal side effects. It is administered by a [metered-dose inhaler](http://www.emedicinehealth.com/script/main/art.asp?articlekey=25819), at 2-4 puffs 4 times a day. Beta2 agonists can be added as needed. Although it is slower to take effect (eg, 30-60 min) than inhaled beta2 agonists, ipratropium bromide lasts longer. Because of this, it is less suitable for use on an as-needed basis. People undergoing exacerbations of COPD respond well to inhaled beta2-agonists and anticholinergic aerosols (eg, ipratropium bromide). reatment usually begins with an inhaled beta2-agonist delivered via a spacer or a [nebulizer](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11737), which creates a mist of the drug. Delivering the drug this way also reduces the side effects. Inhaled ipratropium bromide is also usually added.

**Long-acting bronchodilators**

Methylxanthines, such as [theophylline](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102796), are a group of medications chemically related to [caffeine](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11068). They work in COPD by opening the breathing passages. In addition, methylxanthines reduce [inflammation](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3979), improve respiratory muscle function, and stimulate the [brain](http://www.emedicinehealth.com/script/main/art.asp?articlekey=2516) respiratory center. Adding theophylline to the combination of bronchodilators can be beneficial, although the response to theophylline may vary among people with COPD. Their use has decreased over the last decade because of the risks of unwanted side effects. Side effects include anxiety, tremors, [insomnia](http://www.emedicinehealth.com/script/main/art.asp?articlekey=59408), [nausea](http://www.emedicinehealth.com/script/main/art.asp?articlekey=4510), cardiac arrhythmia, and seizures.

**Oral steroids**

Corticosteroids are used for people who do not improve sufficiently after trying other drugs or who develop an exacerbation. Oral steroids have been used successfully to treat acute exacerbations. They improve symptoms and lung function in this circumstance. Oral corticosteroids are generally not recommended for long-term use because of their potential side effects.    
**Antibiotics**

Antibiotics eliminate organisms but to treat acute exacerbations in people with COPD, chronic infection of the lower airways is common. This therapy is most beneficial for people whose exacerbations are characterized by at least 2 of the following (ie, Winnipeg criteria): increased shortness of breath, increased sputum production, and increased sputum purulence. First-line treatment choices include [amoxicillin](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102046), [cefaclor](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102412), or trimethoprim/sulfamethoxazole. Second-line treatment choices include [azithromycin](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102195), [clarithromycin](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102274), and fluoroquinolones.

**Mucolytic agents**

Mucolytic agents not only reduce sputum viscosity ([resistance](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11958) to its flow) but also improve sputum clearance.

**Oxygen therapy**

COPD is commonly associated with worsening [oxygenation](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11807) of the blood (hypoxemia). Many people with COPD who are not hypoxemic at rest have worsening of their blood oxygen level during exertion. Even though studies to determine the long-term benefit of oxygen solely for exercise have not yet been conducted, home supplemental oxygen is commonly recommended for people whose blood oxygen level falls with exercise. Oxygen supplementation during exercise can prevent increases in [pulmonary artery](http://www.emedicinehealth.com/script/main/art.asp?articlekey=24368) pressure, reduce shortness of breath, and improve exercise tolerance. Oxygen therapy for people with COPD may be needed during air travel because of low airplane cabin pressure. If flying, you should arrange supplemental oxygen prior to the flight directly through the airline or through an airline agent (at an extra expense). Supplemental oxygen may also be needed for people with COPD whose sleep is disturbed by its symptoms. Oxygen therapy is generally safe. [Toxicity](http://www.emedicinehealth.com/script/main/art.asp?articlekey=34093) from high concentrations of oxygen is well recognized, but little is known about the long-term effects of low concentrations of supplemental oxygen. Because providing oxygen reduces the death rate of people with advanced COPD, the increased survival and quality of life benefits of long-term oxygen therapy outweigh the possible risks. The major physical hazards of oxygen therapy are fires or explosions. People with COPD, their family members, and their caregivers are warned not to smoke when supplemental oxygen is in use. Overall, major accidents are rare and can be avoided by proper training.

**Oxygen delivery systems**

Long-term oxygen therapy (LTOT) is typically delivered by continuous flow nasal cannula. This method is the standard means of oxygen delivery because it is simple, reliable, and generally well tolerated. At home, a machine called an oxygen concentrator is the usual means through which oxygen is delivered. Portable tanks provide the opportunity for people with COPD to continue their oxygen therapy while away from home. Oxygen-conserving devices enable the use of smaller, lighter, and more portable oxygen tanks. Oxygen-conserving devices function by delivering all of the supplemental oxygen during early inhalation (breathing in). In addition, they may reduce overall costs. Three oxygen-conserving devices exist: [reservoir](http://www.emedicinehealth.com/script/main/art.asp?articlekey=25479) cannulas, demand pulse delivery devices, and transtracheal oxygen delivery. Transtracheal oxygen delivery is invasive and requires special training by you, your health care provider, and your caregiver.

**Assisted** [**ventilation**](http://www.emedicinehealth.com/script/main/art.asp?articlekey=10705)

Progressive airflow obstruction may impair oxygenation and/or ventilation to the point where you may require assisted ventilation.     
General guidelines that are used in determining the ideal time to begin ventilatory support are as follows:

* There is a progressive worsening of respiratory acidosis and/or an altered mental state.
* There is significant hypoxemia despite supplemental oxygen.

**Surgery**

Over the past 50-75 years, various surgical approaches have been tried to improve symptoms and to restore lung function in people with emphysema. Only giant bullectomy and, possibly, [lung volume reduction surgery](http://www.emedicinehealth.com/script/main/art.asp?articlekey=38454) have proven useful.

* **Bullectomy**  
  Bullectomy is the removal of giant [bullae](http://www.emedicinehealth.com/script/main/art.asp?articlekey=14077), which are air-filled spaces affected by emphysema located in the lung [periphery](http://www.emedicinehealth.com/script/main/art.asp?articlekey=22763). Bullectomy has been a standard approach for many years. The bullae in patients with emphysema generally range in size from 1-4 cm in diameter; however, bullae can occupy more than 33% of the [hemithorax](http://www.emedicinehealth.com/script/main/art.asp?articlekey=25403) (eg, giant bullae). The hemithorax is one side of the chest. Giant bullae may compress adjacent lung tissue, reducing blood flow and ventilation to healthy tissue. Removal of these bullae can result in the expansion of compressed lungs and improved function.
* **Lung volume reduction surgery**

Lung volume reduction surgery was first performed nearly 40 years ago. Surgeons generally remove 20-30% from the upper part of each lung, the area typically most damaged by [tobacco smoking](http://www.emedicinehealth.com/script/main/art.asp?articlekey=13296). The theory is that the removal of a portion of the diseased lung increases the airway diameter in the remaining lung and thereby improving lung function and airflow, which, in turn, reduces the symptoms. This procedure has a death rate of 0-8%, and several complications can occur. The criteria in determining who should undergo lung volume reduction surgery have recently been defined. Generally speaking, those who do undergo this surgery have symptoms due to severe emphysema, marked hyperinflation (enlargement of airways and air spaces indicative of emphysema), and evidence of emphysema as seen on an HRCT scan. A large multicenter [prospective study](http://www.emedicinehealth.com/script/main/art.asp?articlekey=24050) has just been completed and has shown that patients with upper [lobe](http://www.emedicinehealth.com/script/main/art.asp?articlekey=12161) disease and low exercise tolerance benefit the most from this procedure.

* **Lung transplantation**

Lung transplantation is a relatively new surgical therapy for people with advanced lung disease.

Those with COPD are the largest single category of people who undergo this process. The timing of [transplant](http://www.emedicinehealth.com/script/main/art.asp?articlekey=6290) is difficult to determine, but those selected to receive a transplant should have a life expectancy without transplant of 2 years or less due to COPD.

**Pulmonary rehabilitation programs** are first conducted in an outpatient setting and can be continued at home. With pulmonary rehabilitation, improvements can occur in your quality of life, well being, and health status. These improvements include a reduction in respiratory symptoms and an increase in tolerance for functional activities (eg, walking, less anxiety and depression, increased feelings of control, self-esteem). Pulmonary rehabilitation also results in substantial savings in health care costs by reducing the use of hospital and medical resources. A successful pulmonary rehabilitation program requires a team approach. Health care professionals who have experience in treating COPD provide individual program components. This multidisciplinary approach emphasizes education for you and your family, smoking cessation, medical management (eg, oxygen, [immunization](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3909)), respiratory and chest physiotherapy, [physical therapy](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11885) with bronchopulmonary hygiene, exercise, vocational rehabilitation, and psychosocial support. Education is key to comprehensive pulmonary rehabilitation because it prepares you and your family to be actively involved in your care. This reliance on you to assume charge of your care is known as collaborative self-management. Exercise training is a mandatory component of pulmonary rehabilitation. People with COPD should regularly perform [aerobic](http://www.emedicinehealth.com/script/main/art.asp?articlekey=21696) exercises for the lower extremities (eg, legs) to enhance performance of daily activities and to reduce dyspnea. Exercise training on the upper extremities (eg, [arms](http://www.emedicinehealth.com/script/main/art.asp?articlekey=26231)) improves dyspnea and allows increased activities of daily living. Breathing retraining techniques (eg, diaphragmatic, pursed lip breathing) may improve your breathing pattern and prevent airway [compression](http://www.emedicinehealth.com/script/main/art.asp?articlekey=39885).

**Patient Education About Prevention**

COPD cannot be cured but it can be prevented. To prevent COPD:

* Do not smoke, and, if you do smoke, quit.
* Eliminate your exposure to smoke by not allowing people to smoke in your home and by sitting in designated nonsmoking areas when out in public. You should also avoid wood smoke and cooking smoke.
* Limit air pollutants in your home.
* Try to avoid getting respiratory infections during [cold](http://www.emedicinehealth.com/script/main/art.asp?articlekey=7808) and [flu](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3482) season. You should also frequently wash your hands because [viruses](http://www.emedicinehealth.com/script/main/art.asp?articlekey=6000) can be passed through hand-to-mouth contact.
* Fight for clean air to prevent those cases of COPD due to air pollution.

**Outlook for COPD**

* For people with mild COPD, the prognosis is favorable. More severe cases of COPD suggest a worse prognosis. Of those people who are admitted to the ICU with an acute exacerbation, the death rate is 24%. This rate doubles for people aged 65 years or older. The predictors of death due to COPD are as follows:
  + [Aging](http://www.emedicinehealth.com/script/main/art.asp?articlekey=13403)
  + Continued smoking
  + Accelerated decline in FEV1
  + Moderate-to-severe airflow obstruction
  + Poor bronchodilator response
  + Severe hypoxemia
  + Presence of [hypercapnia](http://www.emedicinehealth.com/script/main/art.asp?articlekey=38432) (increased arterial carbon dioxide tension)
  + Development of [cor pulmonale](http://www.emedicinehealth.com/script/main/art.asp?articlekey=10670) (right-sided [heart failure](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3672))
  + Overall poor functional capacity

**Key Points for COPD**

* COPD, or chronic obstructive pulmonary disease, is a progressive disease that makes it hard to breathe. "Progressive" means the disease gets worse over time.
* COPD can cause coughing that produces large amounts of mucus (a slimy substance), wheezing, shortness of breath, chest tightness, and other symptoms.
* Cigarette smoking is the leading cause of COPD. Most people who have COPD smoke or used to smoke. Long-term exposure to other lung irritants, such as air pollution, chemical fumes, or dust, also may contribute to COPD.
* In the United States, the term "COPD" includes two main conditions—[emphysema](http://www.nlm.nih.gov/medlineplus/emphysema.html) and chronic obstructive bronchitis. Most people who have COPD have both conditions. Thus, the general term "COPD " is more accurate.
* COPD is a major cause of disability, and it's the fourth leading cause of death in the United States.
* COPD develops slowly. Symptoms often worsen over time and can limit the ability to do routine activities. Severe COPD may prevent you from doing even basic activities like walking, cooking, or taking care of theself.
* The doctor will diagnose COPD based on the signs and symptoms, the medical and family histories, and test results.
* COPD has no cure yet. However, treatments and lifestyle changes can help you feel better, stay more active, and slow the progress of the disease.
* Quitting smoking is the most important step you can take to treat COPD. Other treatments include medicines, vaccines, pulmonary rehabilitation, oxygen therapy, surgery, and managing complications.
* You can take steps to prevent COPD before it starts. The best way to prevent COPD is to not start smoking or to quit smoking before you develop the disease. Also, try to avoid other lung irritants that can contribute to COPD.
* If you have COPD, you can take steps to manage the symptoms and slow the progress of the disease. Quit smoking and try to avoid other lung irritants. Also, get ongoing care, manage the disease and its symptoms, and prepare for emergencies.

**RESPIRATORY MEDICATIONS**

This table includes many of the medications used in respiratory disorders. Please note that this is a general overview. You must reference your most common medication books and/or your hospital formulary before administering any medications. Adapted Compiled from <http://www.tingmo.com/respiratory-medications-dose-side-effects-contraindications-considerations>, <http://www.globalrph.com/respiratory.htm>

**Rescue Meds –taken after an attack Controller Meds - to prevent an attack**

| **Drug Classification** | **Drug**  **Generic and Trade** | **How the Drug Works – Key Points** |
| --- | --- | --- |
| α, β1, AND β2AGONIST | epinephrine (Primatene Mist®) | Bronchodilator to help with wheezing associated with asthma and emphysema. |
| β1 AND β2 AGONIST | isoproterenol (Isuprel®) |  |
| β2-AGONISTS Short Acting | albuterol  (Proventil ®)  bitolterol (Tornalate ®)  isoetharine  levalbuterol  (Xopenex ®)  pirbuterol  (Maxair ®)  metaproterenol  (Alupent ®)  terbutaline (Brethine®, Bricanyl®) | The most commonly used rescue meds. Inhaled short-acting beta-agonists work rapidly, within minutes, to open the breathing passages, and the effects usually last four hours  Relief and prevention of bronchospasm.  Albuterol – prophylaxis of exercise-induced asthma  Raise intracellular levels of cAMP, which in turn produces smooth muscle relaxation and dilates the constricted bronchi and bronchioles |
| β2-AGONISTS Long Acting | formoterol  (Foradil ®)  salmeterol  (Serevent ®) | This class of drugs is chemically related to [adrenaline](http://www.emedicinehealth.com/script/main/art.asp?articlekey=2155), a [hormone](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3783) produced by the adrenal glands. Inhaled long-acting beta-agonists work to keep breathing passages open for 12 hours or longer. They relax the muscles of the breathing passages, [dilating](http://www.emedicinehealth.com/script/main/art.asp?articlekey=3002) the passages and decreasing the resistance to exhaled airflow, making it easier to breathe. They may also help to reduce inflammation, but they have no effect on the underlying cause of the asthma attack. Side effects include rapid heartbeat and shakiness. Asthma maintenance therapy, prevention of exercise-induced bronchospasm (EIB) Raise intracellular levels of cAMP, which in turn produces smooth muscle relaxation and dilates the constricted bronchi and bronchioles |
| Adrenergics | Albuterol (Ventolin®) | COPD and bronchodilator. It binds to beta2 adrenergic receptors which eventually decrease the intracellular calcium to relax smooth muscles. |
| Adrenergics | Epinephrine | Asthma Staticus, rapid relieve of hypersensitivity reactions and mucosal congestions. It stimulates beta adrenergic receptors to produce smooth muscle relaxation. |
| Adrenergic | Racemic Epinehprine | Used for moderate to severe croup and respiratory syncytial virus. Has an alpha-adrenergic effect. Causes mucosal vasoconstriction which decreases subglottic edema. There is a rapid response (within 10 minutes) with croup. |
| Anti IGE Monoclonal Antibody | omalizumab (Xolair®) | A newer class of agents that works with the body's immune system. In people with asthma who have an elevated level of Immunoglobulin E (Ig E), an allergy antibody, this drug given by injection may be helpful with symptoms that are more difficult to control. This agent inhibits IgE binding to cells that release chemicals that worsen asthma symptoms. This binding prevents release of these mediators, thereby helping in controlling the disease. |
| anti- tuberculosis | Generic: Rifampin | TB and elimination of meningococcal carriers. |
| anti- tuberculosis | pyrazinamide (PZA®) | TB. It is converted to pyrazinoic acid which lowers the pH of the mycobaterium environment and produce bacteriostatic action. |
| Anti - Tuberculosis | Insoniazid (INH) ( Nydrazid®) | TB, first line therapy for active TB. It inhibits the cell wall synthesis of mycobacterium and interferes with metabolism. |
| Anti- tuberculosis antibiotic | ethambutol (Myabutol®) | TB. It prevents the growth of tuberculosis bacteria along with other drugs. |
| Anticholinergics | ipratropium (Atrovent ®)  tiotropium (Spiriva ®): | A class of drugs useful as rescue medications during asthma attacks. Inhaled anticholinergic drugs open the breathing passages, similar to the action of the beta-agonists. Inhaled anticholinergics take slightly longer than beta-agonists to achieve their effect, but they last longer than the beta-agonists. An anticholinergic drug is often used together with a beta-agonist drug to produce a greater effect than either drug can achieve by itself  COPD, bronchitis, emphysyma and symptomatic relief of rhinorrhea.  Blocks the action of acetylcholine at parasympathetic sites in bronchial smooth muscle causing bronchodilation. It also decrease the secretion by nasal glands. |
| Anti-infectives | First Line - [amoxicillin](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102046), [cefaclor](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102412), or trimethoprim/sulfamethoxazole  Second Line - [azithromycin](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102195), [clarithromycin](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102274), and fluoroquinolones.  Severe infections – streptomycin, genatamicin | Antibiotics eliminate organisms but to treat acute exacerbations in people with COPD, chronic infection of the lower airways is common. This therapy is most beneficial for people whose exacerbations are characterized by at least 2 of the following (ie, Winnipeg criteria): increased shortness of breath, increased sputum production, and increased sputum purulence. First-line treatment choices include [amoxicillin](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102046), [cefaclor](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102412), or trimethoprim/sulfamethoxazole. Second-line treatment choices include [azithromycin](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102195), [clarithromycin](http://www.emedicinehealth.com/script/main/art.asp?articlekey=102274), and fluoroquinolones. |
| Antimuscarinic Agents | ipratropium (Atrovent®)  tiotropium (Spiriva HandiHaler®) | Causes bronchodilation and dries respiratory tract secretions. Used in bronchial asthma and reversible bronchospasm associated with chronic bronchitis and emphysema. |
| [Antitussives](http://commons.wikimedia.org/wiki/Category:Antitussives) | Codeine, Dextromethorphan  Vicodin | These agents suppress cough primarily through central nervous system mechanisms. |
| Combination β2-AGONIST + anticholinergic | Combivent ® albuterol + ipratropium | Combivent is used to prevent bronchospasm in people with chronic obstructive pulmonary disease (COPD) who are also using other medicines to control their condition |
| Combination β2-AGONIST + Corticosteroid | Advair ® fluticasone + salmeterol  Symbicort ® budesonide + formoterol | |  | | --- | |  | |  | |  |   The combination of fluticasone and salmeterol is used to prevent wheezing, shortness of breath, and breathing difficulties caused by asthma and chronic obstructive pulmonary disease (COPD) |
| Corticosteroid. | Prednisone (Meticorten®, Deltasone®, Sterapred®) | Corticosteroids are used for people who do not improve sufficiently after trying other drugs or who develop an exacerbation. Oral steroids have been used successfully to treat acute exacerbations. They improve symptoms and lung function in this circumstance. Oral corticosteroids are generally not recommended for long-term use because of their potential side effects.  COPD, asthma, and allergic disorders. Prednisone is a corticosteroid that inhibits accumulation of leukocytes at the site of inflammation and increases capillary permeability; thus reduces swelling and pain associated with the injury. Decrease in leukocytes and lymphatic system activity also suppresses immune response due to allergic reaction. |
| Corticosteroids, Inhaled | beclomethasone (Vanceril ® Beclovent ®)  beclomethasone dipropionate HFA (QVAR)  budesonide (Pulmicort ®)  flunisolide (Aerobid ®)  fluticasone  (Flovent ®  mometasone furoate  (Asmanex ®)  triamcinolone  (Azmacort ®) | the main class of medications in this group. The inhaled steroids act locally by concentrating their effects directly within the breathing passages, with very few side effects outside of the lungs.  COPD-Asthma, immunosuppressant and anti-inflammatory.  . |
| Expectorants | guaifenesin (Mucinex®, Robitussin®) | COPD and cough associated with viral upper respiratory infection. It loosens the viscosity of the phlegm and increase the mobilization of respiratory fluid. |
| Histamine Antagonists  Sedating | azatadine (Optimine®)  brompheniramine (Dimetane®)  cetirizine (Zyrtec®)  Chlorpheniramine (Chlor-Trimeton®)  clemastine fumarate (Tavist®)  cyproheptadine (Periactin®)  diphenhydramine (Benadryl®, Benylin®)  hydroxyzine (Atarax®, Vistaril®) | These drugs block histamine receptors and have some sedative effects. Can be helpful for anaphylaxis and allergic reactions. |
| Histamine Antagonists  Nonsedating | desloratadine (Clarinex®, Aerius®)  fexofenadine (Allegra®)  loratadine (Alavert®, Claritin®) | Used to relieve the allergy symptoms of seasonal allergic rhinitis ('hay fever'), including runny nose; sneezing; red, itchy, or watery eyes; or itching of the nose, throat, or roof of the mouth in adults and children 2 years of age and older. It is also used to relieve symptoms of urticaria (hives; red, itchy raised areas of the skin), including itching and rash in adults and children 6 months of age and older. |
| Leukotrine inhibitors | montelukast (Singulair ®)  zafirlukast  (Accolate ®)  zileuton  (Zyflo ®) | These are powerful chemical substances that promote the [inflammatory response](http://www.emedicinehealth.com/script/main/art.asp?articlekey=19510) seen during an acute asthma attack. By blocking these chemicals, leukotriene inhibitors reduce inflammation. The leukotriene inhibitors are considered a second line of defense against asthma and usually are used for asthma that is not severe enough to require oral corticosteroids.COPD-Asthma and management of seasonal allergy rhinitis. Singulair inhibits leukotrines that are released when our body experiences allergens, which causes tightening of lungs and airway passages. Modify or inhibit the activity of the leukotriens, which decreases arachidonic acid-induced inflammation and allergen-induced bronchoconstriction |
| Mast Cell Stabilizers | cromolyn sodium (Intal ®)  nedocromil  (Tilade ®) | Prevent the release of chemicals that cause asthma-related inflammation. This drug is especially useful for people who develop asthma attacks in response to certain types of allergic exposures. When taken regularly prior to an exposure, cromolyn sodium can prevent the development of an asthma attack. However, this medicine is of no use once an asthma attack has begun.  Stabilize the cell membranes in which the antigen-antibody reactions take place (the mast cell), thereby preventing the release of substances such as histamine that cause constriction |
| Mucolytic | acetylcysteine (Mucomyst ®, Acetadote ®) | Mucolytic agents not only reduce sputum viscosity ([resistance](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11958) to its flow) but also improve sputum clearance. Patients should receive bronchodilator 15 minutes prior to dose. |
| water soluble vitamins | Vitamin B6  pyridoxine | TB and neuropathy from isoniazid, penicillamine, or hydrolazine therapy. Also for synthesis of neurotransmitters serotonin and norepinephrine and for myelin formation. |
| Xanthine derivatives | Aminophylline  Dyphylline ( Dilor®, Lufyllin®)  oxtriphylline  theophylline ( Bronkodyl®, Elixophyllin®, Theolair® , Theo-dur®) | Useful in the treatment of asthma. This group of medications is chemically related to [caffeine](http://www.emedicinehealth.com/script/main/art.asp?articlekey=11068). Xanthines work as long-acting bronchodilators. At one time, methylxanthines were commonly used to treat asthma. Today, because of significant caffeine-like side effects, they are being used less frequently in the routine management of asthma. COPD, chronic asthma and bronchitis.  It relaxes smooth muscles as well as suppresses the responsiveness of the airways to the histamine and allergen stimuli. |

**Respiratory Dictionary**

Adapted from <http://noairtogo.tripod.com/gloss.htm>

**Acidemia** - abnormally high level of acid in the blood, low pH (< 7.35)

**Acidosis** - condition resulting from accumulation of acid in the blood and tissues

**Acute Interstitial Pneumonia** (AIP) - a rare respiratory condition characterized by  hyaline membrane formation in the lungs.

**Adult Respiratory Distress Syndrome** (ARDS) - respiratory failure of sudden onset characterized by leakage of plasma into the lungs via damaged capillaries, resulting in fluid accumulation which deprives the lungs of their ability to expand.  ARDS is a medical emergency.

**Air** **trapping** - the air caught behind collapsed bronchial branches during [expiration](http://noairtogo.tripod.com/gloss.htm#expiration#expiration).

**Airway** - a passageway for air into or out of the lungs.

**Airway Collapse** - Actual collapse or closure of branches of the [bronchial tree](http://noairtogo.tripod.com/gloss.htm#tree#tree), caused by weakened bronchial walls secondary to disease.

**All Trans Retinoic Acid** (ATRA) - Vitamin A derivative being investigated for possible tissue regeneration in patients with mild to moderate emphysema.  ATRA is known to be toxic when used systemically, but its use in treating acute promyelocytic leukemia (APL) has shown promising results (see [ATRA Syndrome](http://noairtogo.tripod.com/gloss.htm#syndrome#syndrome))

**Alkalemia** - a blood pH above normal (> 7.45).

**Alpha1 Antitrypsin Deficiency** (A1AD) - an inherited recessive disorder resulting in low or no production of Alpha1 Antitrypsin. Lack of this protein leads to organ damage, mainly to the liver and lung.

**Alveolar Macrophage** (AM) - a cell in the lungs which engulfs bacteria and foreign material and produces enzymes to protect the lung.

**Alveoli** (pl) (singular: alveolus) - tiny air sacs at the end of the [bronchioles](http://noairtogo.tripod.com/gloss.htm#bronchioles#bronchioles) where oxygen crosses capillaries into the bloodstream, exchanging it for carbon dioxide crossing from the bloodstream into the alveoli to be exhaled.  Adults have roughly 300 million microscopic alveoli in their lungs

**Antibiotic** - medication that interferes with the growth of [bacteria](http://noairtogo.tripod.com/gloss.htm#bacteria#bacteria) and may stop an infection.

**Anticholinergic** - Short- and long-lasting class of drugs that reduce mucus and relax airway muscles.

**Apnea** - the absence of spontaneous [respiration](http://noairtogo.tripod.com/gloss.htm#respiration#respiration)

**Arterial Blood Gases** (ABG) - a lab test of arterial blood (usually taken from the wrist) which measures carbon dioxide and oxygen levels as well as acid-base status. Normal ABG values:

pH 7.35 to 7.45  
PO2 80 to 98 mmHg  
PCO2 35 to 45 mmHg  
SaO2 96 to 98%

SaO2 of  90% or above is considered adequate to support tissues and body functions. At less than 90% tissues and organs begin to suffer and supplemental oxygen may be prescribed.

**Asthma** - a chronic inflammatory airway disease characterized by airway narrowing, [bronchospasm](http://noairtogo.tripod.com/gloss.htm#bronchospasm#bronchospasm)  and [wheezing](http://noairtogo.tripod.com/gloss.htm#Wheezing#Wheezing); asthma is considered a reversible condition.  Asthma is often called a [reactive airway disease](http://noairtogo.tripod.com/gloss.htm#RAD#RAD) when it's expected to be of short duration, ie 'outgrown' as a child ages.

**Asthmatic Bronchitis** - Coexistence of [wheezing](http://noairtogo.tripod.com/gloss.htm#wheezing#wheezing) and [chronic bronchitis](http://noairtogo.tripod.com/gloss.htm#bronchitis#bronchitis).

**Atelectasis** - incomplete expansion of the lung

**ATRA** **Syndrome** -  a life-threatening complication that can occur during the treatment of acute promyelocytic leukemia (APL) by ATRA. Main clinical signs are respiratory distress, fever, pulmonary infiltrates, weight gain, pleural effusion, renal failure, pericardial effusion, cardiac failure and hypotension. [[more info](http://www.bloodjournal.org/cgi/content/abstract/92/8/2712)]

**Barrel chest** - the shape of the chest in some patients with [COPD](http://noairtogo.tripod.com/gloss.htm#COPD#COPD) when air trapping causes overinflated lungs.

**Beta Agonist** - Short- or long-lasting class of drugs that relax the muscles in the airway. 

**BiPAP**® - Bi-Level Positive Airway Pressure - a machine which administers air under pressure via a nose mask to keep [airways](http://noairtogo.tripod.com/gloss.htm#airway#airway) open and unobstructed.  BiPAP® units track the patient's breathing and lower the pressure during exhalation.

**Blebs** - Air-filled cysts near or on the surface of the lung.  Blebs are less than 1cm in diameter.  Compare to [bullae](http://noairtogo.tripod.com/gloss.htm#bullae#bullae)

**Blebs Disease** - see [Spontaneous Pneumonothorax](http://noairtogo.tripod.com/gloss.htm#SP#SP)

**Blue Bloater** - term for the [COPD](http://noairtogo.tripod.com/gloss.htm#COPD#COPD) patient whose symptoms include [hypoxemia](http://noairtogo.tripod.com/gloss.htm#hypoxemia#hypoxemia), secondary [polycythemia](http://noairtogo.tripod.com/gloss.htm#polycythemia#polycythemia), [CO2](http://noairtogo.tripod.com/gloss.htm#CO2#CO2) retention, [pulmonary hypertension](http://noairtogo.tripod.com/gloss.htm#PH#PH) and [cor pulmonale](http://noairtogo.tripod.com/gloss.htm#cor#cor). Term is rarely used anymore.

**Bradypnea** - decreased breathing rate, usually under ten breaths per minute.   Bradypnea is often caused by the administration of narcotic analgesics such as morphine.

**Bronchi** (pl) (singular: bronchus) - branches of the bronchial tree

**Bronchial** **tree** - term used to describe the ductwork of the respiratory system which branch like a tree, the terminal 'branches' leading to the [alveoli](http://noairtogo.tripod.com/gloss.htm#alveoli#alveoli).

**Bronchiectasis** - a [chronic](http://noairtogo.tripod.com/gloss.htm#chronic#chronic) inflammatory or degenerative condition of bronchi or bronchioles marked by dilation and loss of elasticity of the walls.

**Bronchioles** - tiniest branches of the bronchial tree, they lead into the [alveoli](http://noairtogo.tripod.com/gloss.htm#alveoli#alveoli)

**Bronchiolitis Obliterans** (BO) - an obstructive process involving small [airways](http://noairtogo.tripod.com/gloss.htm#airway#airway) in the lung periphery. It may occur following a bout of pneumonia or lung transplantation.

**Bronchiolitis Obliterans Organizing Pneumonia** (BOOP) - obstructive condition characterized by granulation tissue plugs within the small [airways](http://noairtogo.tripod.com/gloss.htm#airway#airway). This abnormal tissue extends into alveolar ducts and [alveoli](http://noairtogo.tripod.com/gloss.htm#alveoli#alveoli).

**Bronchitis** - [acute](http://noairtogo.tripod.com/gloss.htm#acute#acute) or [chronic](http://noairtogo.tripod.com/gloss.htm#chronic#chronic) inflammation of the bronchial airways or any part of them.

**Acute Bronchitis** - [inflammation](http://noairtogo.tripod.com/gloss.htm#inflammation#inflammation) of cells lining the [bronchi](http://noairtogo.tripod.com/gloss.htm#bronchi#bronchi) causes production of yellow or gray [mucus](http://noairtogo.tripod.com/gloss.htm#mucus#mucus) which clogs airways resulting in shortness of breath, [wheezing](http://noairtogo.tripod.com/gloss.htm#wheezing#wheezing) and pain in upper chest, especially when coughing.

**Chronic Bronchitis** - to be considered chronic, there must be a [productive cough](http://noairtogo.tripod.com/gloss.htm#productive#productive) on most days for at least three months of the year, for at least two consecutive years.

**Bronchoalveolar Lavage (****BAL)** - during [bronchoscopy](http://noairtogo.tripod.com/gloss.htm#bronchoscopy#bronchoscopy), a small amount of saline is injected into the distal (far) portions of the lung, then aspirated back through the bronchoscope, washing out the [alveoli](http://noairtogo.tripod.com/gloss.htm#alveoli#alveoli). The material recovered is then analyzed for cell count, differential or foreign bodies.

**Bronchodilator** - a drug that relaxes the smooth muscles in the constricted airway.

**Bronchoscopy** - a procedure where a lighted bronchoscope is inserted through the nose or throat to allow visual examination of the trachea, bronchi and select bronchioles.

**Broncopulmonary Dysplasia** (BPD) - abnormal development of the lung that results from [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) toxicity in premature infants who receive prolonged respiratory assistance for hyaline membrane disease. Also called Chronic Lung Disease (CLD).

**Bronchospasm** - constriction of air passages of the lung by spasmodic contraction of the bronchial muscles, obstructing the flow of air.

**Bullae** (pl) (singular: bulla) - large air spaces within the lung, >1-2 cm in diameter, formed by ruptured [alveoli](http://noairtogo.tripod.com/gloss.htm#alveoli#alveoli). Compare to [blebs](http://noairtogo.tripod.com/gloss.htm#blebs#blebs).

**Bullous Disease** - See [Vanishing Lung](http://noairtogo.tripod.com/gloss.htm#vv#vv) - also known as type 1 bullous disease and primary bullous disease of the lung

**Carbon Dioxide** (CO2) - a colorless, odorless, nonflammable gas produced in r[espiration](http://noairtogo.tripod.com/gloss.htm#respiration#respiration), and given off by the tissues to the blood, to be exhaled by the lungs in exchange for oxygen.

**Cardiopulmonary** (C/P) - pertaining to both heart and lungs

**Chest X-Ray** (CXR) - images of the chest cavity can be used to assess lung disease. Dense structures of the body, like bone, will appear white; air will be indicated by areas in black ('air' is a void which can't be photographed).  All other structures will appear as shades of gray.

**Chronic** - refers to a disease or disorder that shows little change in symptoms from day to day, but implies a continuing disease process with progressive deterioration.

**Chronic Lung Disease** (CLD) - a general term for long-term respiratory problems in premature babies. It is also known as bronchopulmonary dysplasia (see [BPD](http://noairtogo.tripod.com/gloss.htm#BPD#BPD)).

**Chronic Obstructive Pulmonary Disease** (COPD) - a disease state characterized by reduced maximal expiratory flow and slow forced emptying of the lungs. This airflow limitation is only minimally reversible with bronchodilators. The two diseases covered by the 'umbrella term' COPD are emphysema and chronic bronchitis.

**Cilia** (pl) - tiny hairlike cells that line the airways and  beat constantly toward the pharynx to assist in removal of [mucus](http://noairtogo.tripod.com/gloss.htm#mucus#mucus) and dust particles.

**Clubbing -** refers to a condition where tips of the fingers enlarge and the nails become curved from front to back as a result of  chronic low blood-oxygen levels. *Clubbing has 'reversed' in patients who underwent lung transplantation!*

**Compliance** (Patient compliance) - in medical language, the practice of following medical direction fully and correctly.

**Continuous Positive Airway Pressure** (CPAP) - a machine which administers a continuous flow of air under pressure via a nose mask to keep [airways](http://noairtogo.tripod.com/gloss.htm#airway#airway) open and unobstructed.

**Cor Pulmonale** - enlargement of the right ventricle resulting from [pulmonary hypertension](http://noairtogo.tripod.com/gloss.htm#PH#PH) secondary to lung disorders

**Corticosteroid** - natural or synthetic hormones like those produced by the body's adrenal glands which are used to reduce swelling and [inflammation](http://noairtogo.tripod.com/gloss.htm#inflammation#inflammation)

**CPAP Titration** (Test) - see [Oximetry](http://noairtogo.tripod.com/gloss.htm#oximetry#oximetry)

**Cyanosis** - dusky bluish or purplish tinge to the skin caused by insufficient blood oxygen

**Cystic Fibrosis** (CF) - a disease of the [mucus](http://noairtogo.tripod.com/gloss.htm#mucus#mucus) and sweat glands which causes disorders of the lungs and pancreas.

CF is the leading cause of chronic lung disease in children and young adults, and the most common fatal hereditary disorder affecting Caucasians in the US.

**Demand Positive Airway Pressure** (DPAP) - This machine monitors breathing.  If spontaneous respiration doesn't occur within eight seconds,  DPAP will provide the patient a 'breath' at whatever pressure flow necessary to move air into the lungs. Indications for DPAP usage is intolerable use of CPAP.

**Desquamative Interstitial Pneumonia** (DIP) - More than 90% of the individuals who have DIP are smokers or former smokers, yet this interstitial condition has a 50% cure rate. The survival rate is 90% at 5 years and 70% at 10 years

**Diaphragm** - a dome shaped muscle above the abdomen and below the lungs. When it contracts it creates negative pressure within the chest allowing air to be drawn into the lungs.

**Diffusion** - movement of [oxygen](http://noairtogo.tripod.com/gloss.htm#O2#O2) or [carbon dioxide](http://noairtogo.tripod.com/gloss.htm#CO2#CO2) across the membrane of the [alveoli](http://noairtogo.tripod.com/gloss.htm#alveoli#alveoli)

**Dyspnea** - difficult or labored breathing; air hunger

**Elastic** **recoil** - ability of the lung to 'snap back' at the end of [inspiration](http://noairtogo.tripod.com/gloss.htm#inspiration#inspiration).

**Embolism** - the sudden blocking of an artery by an embolus carried to the site by the blood flow.

**Embolus** - clot, or foreign material (such as a fat globule)

**Emphysema** - a chronic obstructive pulmonary disease characterized by dilation and destruction of [alveoli](http://noairtogo.tripod.com/gloss.htm#alveoli#alveoli) leading to large air spaces, decreased [elastic recoil](http://noairtogo.tripod.com/gloss.htm#recoil#recoil) and [air trapping](http://noairtogo.tripod.com/gloss.htm#trapping#trapping).  Emphysema is one of two conditions which present as a singular disease called [COPD](http://noairtogo.tripod.com/gloss.htm#COPD#COPD); the other is [chronic bronchitis](http://noairtogo.tripod.com/gloss.htm#bronchitis#bronchitis).

**Endotracheal Tube** (ET) - a tube which by which a patient is connected to a respirator, it's inserted through the patient's mouth or nose, passes through the throat (and vocal cords), and into the air passages. The patient will be unable to speak while the  tube is in place.

**End-stage Emphysema** - End-stage refers to the patient for whom the damage to their lungs has reached a stage where symptoms severely affect their quality of life and may have begun to affect other organs, such as the heart.  Drugs, progressive exercise programs, oxygen, lung reduction surgery, and ultimately lung transplants are considered in a step-wise fashion to maximize the oxygen delivery from what lung tissue remains.

**End-stage Organ Disease** - a disease that ultimately leads to functional organ failure. Examples: [emphysema](http://noairtogo.tripod.com/gloss.htm#emphysema#emphysema) (lungs), cardiomyopathy (heart), and polycystic kidney disease (kidneys).

**Etiology** - the cause or origin of a disease or disorder.

**Eupnea** - normal [respiration](http://noairtogo.tripod.com/gloss.htm#respiration#respiration); implies normal tidal volume, with respiratory rate (adults) about 14-18

**Exacerbation** - a temporary period when a disease or medical condition worsens.  For patients with lung disease, this may cause an increase in mucus production or shortness of breath, for example.

**Expiration** - breathing out; exhaling

**Expiratory Reserve Volume** (ERV) - maximal amount of air that can be expired starting at [Functional Residual Capacity](http://noairtogo.tripod.com/gloss.htm#FRC#FRC) (FRC).

**Extracorporeal Membrane Oxygenator** (ECMO) - a device that acts as an artificial lung, oxygenating the blood that passes through it from the patient's blood vessels.

**Exudate** - the material composed of serum, fibrin and white blood cells in variable amounts that escapes from blood vessls into a superficial lesion

**Fibrosis** - a condition marked by relative increase in formation of [interstitial](http://noairtogo.tripod.com/gloss.htm#interstitial#interstitial) fibrous tissue in any organ or region of the body. Fibrosis is often called scar tissue.

**Forced Expiratory Flow** (FEF) - a flow rate measurement of how much air can be expired from the lungs

**Forced Expiratory Volume** (FEV1) - the amount of air expelled the first second following maximal inspiration during the test for [vital capacity](http://noairtogo.tripod.com/gloss.htm#VC#VC)

**Forced Vital Capacity** (FVC) - the maximum volume of air that can be expired forcefully after a maximal inspiration.

**Functional Residual Capacity** (FRC) - lung volume at the end of normal [expiration](http://noairtogo.tripod.com/gloss.htm#expiration#expiration). At FRC, the tendency of the lungs to collapse is exactly balanced by the tendency of the chest wall to expand.

**Gunk** - slang term for [mucus](http://noairtogo.tripod.com/gloss.htm#mucus#mucus).

**Hypercapnia** - abnormally high [carbon dioxide](http://noairtogo.tripod.com/gloss.htm#CO2#CO2) level in the blood, pCO2>45 mmHg

Symptoms:  
   »  increased respiratory rate  
   »  headache  
   »  confusion  
   »  nausea and/or vomiting  
   »  lethargy

**Hyperventilate** - to breathe abnormally fast and deep, resulting in excessive amounts of [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) in the lungs and reduced [carbon dioxide](http://noairtogo.tripod.com/gloss.htm#carbon#carbon) levels in the blood.

**Hypocapnia** - abnormally low blood levels of carbon dioxide.

**Hypoxemia** - deficient oxygenation of the blood (PaO2 <55 mmHg or Sa02 <85%)

Symptoms:   
   »  tachycardia is primary response  
   »  anxiety  
   »  agitation / mood changes   
   »  forgetfulness  
   »  inability to concentrate  
   »  altered levels of consciousness  
   »  pallor - skin may feel cool and clammy  
   »  cyanosis is a late sign of hypoxemia

**Hypoxia** - deficiency of [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) reaching tissues of the body

**Idiopathic Pulmonary Fibrosis** (IPF)- a specific form of chronic fibrosing interstitial pneumonia of unknown origin, associated with the histologic appearance of Usual Interstitial Pneumonia (UIP) on surgical biopsy. IPF is synonymous with Cryptogenic Fibrosing Alveolitis (CFA), a term used in European countries

**Immotile Cilia Syndrome** (ICS) - Immotile Cilia Syndrome occurs when cilia in the body are unable to move.

**Immune System** - a complex network of specialized cells and organs that protects the body against attack by "foreign invaders." When functioning properly it produces antibodies to fight off infections from [bacteria](http://noairtogo.tripod.com/gloss.htm#bacteria#bacteria), [virus](http://noairtogo.tripod.com/gloss.htm#virus#virus), fungi and other parasites.

**Inflammation** - redness, warmth and swelling in tissue following infection or injury; the [immune system's](http://noairtogo.tripod.com/gloss.htm#immune#immune) protective reaction to an irritant. Chronic inflammation usually involves formation of new connective tissue. In [COPD](http://noairtogo.tripod.com/gloss.htm#COPD#COPD) it can lead to airway obstruction; with [ILD](http://noairtogo.tripod.com/gloss.htm#ILD#ILD) this can cause a reduction in lung capacity.

**Inhaler** - the dispenser for metered-dose, and dry powder medications. See [Suggested Sequence for Use of Multipe Inhalers](http://tinyurl.com/oxch8)

**Inspiration** - breathing in

**Inspiratory Capacity** (IC) - the maximal volume that can be inspired after a normal (non forced) expiration

**Inspiratory Muscle Trainer** (IMT) - a small device used to exercise and strengthen respiratory muscle endurance

**Inspiratory Reserve Volume** (IRV) - additional volume that can be inspired with maximum effort after a normal inspiration.

**Inspiratory Vital Capacity** (IVC) - The volume change of the lung between a maximal expiration to residual volume and a full inspiration to total lung capacity.

**Interstitial** - refers to tissue between [alveoli](http://noairtogo.tripod.com/gloss.htm#alveoli#alveoli) of the lungs (called interstitium). Outside the vascular system interstitial refers to the space in the tissues between cells

**Interstitial Lung Disease** (ILD) - term which includes more than 200 lung disorders characterized by fibrosing (scarring) in the lungs. A common link between various types of ILD is they all begin with an inflammation of known or unknown origin.

* Inflammation involving the [bronchioles](http://noairtogo.tripod.com/gloss.htm#bronchioles#bronchioles) is called bronchiolitis
* Inflammation involving the alveoli (air sacs) is called alveolitis

When the cause of ILD is unknown, it's called "idiopathic"  See [pulmonary fibrosis](http://noairtogo.tripod.com/gloss.htm#fibrosis#fibrosis) for a partial list of terms which refer to interstitial lung disease

**Interstitial Pulmonary Fibrosis** (IPF) - the result of many types of severe or sustained lung inflammation.  See [pulmonary fibrosis](http://noairtogo.tripod.com/gloss.htm#PF#PF).

**Kartagener's Syndrome** (KS) - a condition where the heart is located on the right side of the body in patients with [Immotile Cilia Syndrome](http://noairtogo.tripod.com/gloss.htm#ICS#ICS)

**Lung** - one of a pair of breathing organs located within the chest which remove [carbon dioxide](http://noairtogo.tripod.com/gloss.htm#carbon#carbon) from and bring [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) to the blood.

**Lung Transplant** (TX or XP) - surgery to replace one or both diseased lungs with healthy ones from a human donor.   [[transplant links](http://noairtogo.tripod.com/links.htm#transplantation)]

**Lung Volume Reduction Surgery** (LVRS) -  Reduction Pneumoplasty is performed on patients with [emphysema](http://noairtogo.tripod.com/gloss.htm#emphysema#emphysema). Varied surgical procedures allow the compressed lung to expand, thus establishing improved respiratory function. LVRS is also referred to as lung shaving, lung contouring, thoracoscopic bullectomy or simply lung reduction.

**Lymphangioleiomyomatosis** (LAM) - rare lung disease that primarily affects women only. Abnormal muscle cells  invade the lung and airways, as well as blood and lymph vessels, causing obstruction. [[LAM Foundation](http://lam.uc.edu/)]

**Lymphocytic Interstitial Pneumonia** (LIP) - is a syndrome of fever, cough and dyspnea, with bibasilar pulmonary infiltrates consisting of dense interstitial accumulations of lymphocytes and plasma cells

**Metabolic Equivalent** (MET) - the amount of [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) required while sitting very quietly at rest (approximately 3.5 milliliters of oxygen per kilogram of body weight).

**Metered Dose Inhaler** (MDI) - device which dispenses a specific amount of medication in aerosol or powdered form

**Minute Ventilation –** formula is respiratory rate X tidal volume. Normal range is 5 – 8 L per minute.

**Mucus** - slippery secretions that serve to moisten and protect the mucous membranes by special cells within the [bronchial tree](http://noairtogo.tripod.com/gloss.htm#tree#tree),  usually as a result of irritation, [inflammation](http://noairtogo.tripod.com/gloss.htm#inflammation#inflammation) or infection of the [airways](http://noairtogo.tripod.com/gloss.htm#airway#airway).  (synonymous with [phlegm](http://noairtogo.tripod.com/gloss.htm#phlegm#phlegm))

**Nasal Cannula** (NC)  - a rubber or vinyl tube which extends around the user's face with curved prongs that fit into the nostrils for delivery of [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) at low flow rates.  Also referred to as "nose hose" (slang)

**Nebulizer** - an atomizer device that sprays liquid medication in aerosol form into the air a patient breathes

**Nonspecific Interstitial Pneumonia** (NIP / NSIP) - characterized by infiltrate and three patterns of fibrosis: 1) little or none, 2) moderate, or 3) dense fibrosis. The majority of patients will show a favorable response to corticosteroid therapy for the first and second pattern.

**Nose Hose** - aka Nasal Cannula (NC)

**Nuclear Scan** (also called Ventilation Perfusion (VQ) Scan) - test using small amounts of radioactive material to compare left and right lung functions (blood flow and gas exchange)

**Obstructive Sleep Apnea** (OSA) - a common respiratory sleep disorder characterized by snoring and episodes of breathing cessation that causes blood [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) levels to fall below acceptable levels.

**Open Lung Biopsy** (OLB) - a small piece of lung tissue is obtained for examination by surgical incision of the chest wall (thoracotomy) performed under general anesthesia by a Thoracic Surgeon.

**Organic Dust Toxic Syndrome** (ODTS) - a febrile (feverish) illness occurring after heavy organic dust exposure; symptoms resemble those of acute farmer's lung.

**Oximeter** - a noninvasive device for measuring continuously the estimated degree of [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) saturation of the circulating blood. The oximeter clips to a finger, toe, nose or ear lobe and is painless to use.

**Oximetry** - noninvasive measurement of the estimated level of arterial oxygenation in circulating blood; report usually includes baseline functional O2 saturation and heart rate, as well as lowest functional O2 saturation and heart rate during monitored activity (ie exercise, [oxygen therapy](http://noairtogo.tripod.com/gloss.htm#therapy#therapy))

**Oxygen** (O2) - colorless, odorless gas essential for all life processes; the most important component of air.  See [Hypoxemia](http://noairtogo.tripod.com/gloss.htm#hypoxemia#hypoxemia) for symptoms of insufficient oxygenation

**Oxygen** **Conserver** - device designed to maintain adequate oxygenation with a reduction in flow rate.

**Oxygen debt** - cumulative deficiency of [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) that develops in the body during periods of intense activity and must be made good when the body activity returns to a normal level. In patients with severe pulmonary insufficiency, climbing even a step or two can be 'intense activity'

**Oxygen** **Therapy** - use of supplemental oxygen to assure the body receives an amount suffcient to provide for its needs. (SaO2 of 90 or greater)

**Oxygen Titration Test** - see [Oximetry](http://noairtogo.tripod.com/gloss.htm#oximetry#oximetry)

**Pack Years** - a  measure of cigarette smoking over someone's lifetime, figured as the number of packs per day times the number of years a person has smoked. Ten pack-years could refer to a smoking history of two packs a day for five years, one pack/day for 10 years, or half a pack a day for 20 years.  One "pack year" means 7300 cigarettes, or 1460 cigars, or 7.3kg of pipe tobacco.

**Palliative** - a therapy that relieves symptoms, such as pain, but does not alter the course of disease. Its primary purpose is to improve the quality of life (QOL).

**Peak Expiratory Flow Rate (****PEFR)** - the fastest speed a person can expel air from the lungs after taking in as big a breath as possible

**Peak Flow Meter** (PFM) - small device used to measure a person's peak expiratory flow rate.

**Perfusion** - passage of blood through the lungs

**Perfusion Scan** - test to determine the status of blood flow to an organ.

**Phlegm** - thick, gluey, stringy mucus secreted in the respiratory passages usually as a result of inflammation, irritation or infection of the airways, and discharged through the mouth.  (synonymous with [mucus](http://noairtogo.tripod.com/gloss.htm#mucus#mucus), this word is no longer widely used)

**Pink Puffer** - term describing the [COPD](http://noairtogo.tripod.com/gloss.htm#COPD#COPD) or emphysematic patient whose symptoms are breathlessness, hyperinflation, mild [hypoxemia](http://noairtogo.tripod.com/gloss.htm#hypoxemia#hypoxemia) and a low [PCO2](http://noairtogo.tripod.com/gloss.htm#PCO2#PCO2). Compare with [Blue Bloater](http://noairtogo.tripod.com/gloss.htm#blue#blue).  Term is rarely used anymore.

**Pleura** - either of a pair of two-walled sacs of serous membrane that covers and protect the lung.

**Pleural** **Cavity** - the space between the two layers of pleura; the chest cavity

**Pleural Space** - the fluid-filled "space" between the two pleural walls (visceral and parietal pleura).

**Pleurisy** - [inflammation](http://noairtogo.tripod.com/gloss.htm#inflammation#inflammation) of the [pleura](http://noairtogo.tripod.com/gloss.htm#pleura#pleura) with or without [diffusion](http://noairtogo.tripod.com/gloss.htm#diffusion#diffusion) of an [exudate](http://noairtogo.tripod.com/gloss.htm#exudate#exudate) into the pleural cavity

**Plethysmography** or Body Box - an airtight chamber with clear doors where one sits to have lung volumes measured. Breathing is accomplished through a mouthpiece.

**Pneumothorax** (PTX)- presence of air in the pleural cavity, caused by by rupture of the plural membrane or by trauma through the chest wall; often referred to as a collapsed lung.

**Pneumonoultramicroscopicsilicovolcanoconiosis** - a lung disease caused by the inhalation of very fine silicate or quartz dust and occurring especially in miners. (45 letters with no acronym of it's own!!! )

**Polycythemia** - Too many red blood cells. The condition exists when the hemoglobin, red blood cell (RBC) count, and total RBC volume are all above normal.

**Positive Airway Pressure** (PAP) - these units are used to mobilize secretions and treat conditions such as atelectasis, or to keep airways open and unobstructed in patients with sleep apnea. They include continuous positive airway pressure ([CPAP](http://noairtogo.tripod.com/gloss.htm#CPAP#CPAP)), positive expiratory pressure (PEP),  expiratory positive airway pressure (EPAP). and bilevel positive airway pressure ([BiPAP](http://noairtogo.tripod.com/gloss.htm#BiPAP#BiPAP))

**Positive End Expiratory Pressure** (PEEP) - a method of mechanical [ventilation](http://noairtogo.tripod.com/gloss.htm#ventilation#ventilation) in which pressure is maintained to increase the volume of gas remaining in the lung at the end of expiration, thus keeping [alveoli](http://noairtogo.tripod.com/gloss.htm#alveoli#alveoli) open and improving gas exchange.

**Positive Pressure Ventilation** (PPV) - process of forcing gases down a patient's trachea using either a manual control technique or using an automatic ventilator.  PPV can be done using a manual resuscitator or the rebreathing bag on the anesthesia machine; for long term use an automatic [ventilator](http://noairtogo.tripod.com/gloss.htm#ventilator#ventilator) is usually prescribed.

**Post Nasal Discharge** (PND) - the sensation of mucus accumulation in the throat or a feeling that mucus is dripping downward from the back of the nose into the throat. Also called Post Nasal Drip.

**Primary Ciliary Dyskinesia** (PCD) - condition where cilia in the body fail to beat effectively causing mucus to become trapped in various parts of the respiratory system. PCD, Immotile Cilia Syndrome (ICS) and Kartagener's Syndrome (KS) refer to the same condition, with the exception that in KS the heart is located on the right side of the body.

**Primary Immunodeficiency** (PIDS) - Primary immune deficiency diseases are inherited disorders in which part of the body's immune system is missing or fails to function properly.  Often presenting as 'common' infections or conditions (such as asthma or sinusitus),  PIDs can go undetected for many years resulting in permanent damage to organs, or death. [[Jeffrey Modell Foundation](http://www.jmfworld.com/)]

Ten warning signs of PIDS —  
  » Eight or more new ear infections within one year  
  » Two or more serious sinus infections within one year.  
  » Two or more months on antibiotics with little effect.  
  » Two or more pneumonias within one year.  
  » Failure of an infant to thrive (gain weight or normal growth).  
  » Recurrent deep skin or organ abscesses.  
  » Persistent thrush in mouth or elsewhere on skin, after age one.  
      - Need for intravenous antibiotics to clear infections.  
      - Two or more deep-seated infections such as osteomyelitis, cellulitis, or sepsis.  
  » A family history of primary immune deficiency.

**Primary Pulmonary Hypertension** (PPH) - see [Pulmonary Hypertension](http://noairtogo.tripod.com/gloss.htm#PH#PH)

**Productive Cough** - a cough in which [mucus](http://noairtogo.tripod.com/gloss.htm#mucus#mucus) is dislodged, enabling a person to clear the lungs.

**Puffers** - slang term for aerosol metered dose inhalers

**Pulmonary** - pertaining to the lungs

**Pulmonary Alveolar** **Proteinosis** (PAP) -a rare condition characterized by a disturbance in surfactant turnover which causes the alveoli to fill with eosinophilic, proteinaceous material closely resembling surfactant. Treatment consists of bronchoalveolar lavages.

**Pulmonary Artery** (PA) - blood vessel that delivers oxygen-poor blood from the right ventricle to the lungs

**Pulmonary Edema** (PE) - condition (usually acute, but sometimes chronic) that occurs when too much fluid accumulates in the lungs, blocking transport of [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) into the blood.

**Pulmonary** **Embolism** (PE) - the closure or narrowing of the [pulmonary artery](http://noairtogo.tripod.com/gloss.htm#PA#PA), or one of its branches, by an embolus.

**Pulmonary Fibrosis** (PF) - condition characterized by deposition of scar tissue in the lung.

Other terms that refer to pulmonary fibrosis, or conditions that cause it:  
Chronic diffuse fibrosing  
Chronic diffuse sclerosing of the lung   
Chronic interstitial pneumonia  
Cryptogenic fibrosing alveolitis  
Diffuse idiopathic interstitial fibrosis  
Diffuse idiopathic pulmonary fibrosis  
Diffuse infiltrative pulmonary disease   
Desquamative interstitial pneumonitis   
Fibrosing alveolitis  
Honeycomb lung  
Honey lung  
Idiopathic fibrosing alveolitis  
Idiopathic interstitial fibrosis of lung syndrome  
Shrinking Lung   
Stiff Lung   
Usual interstitial pneumonitis   
Velcro lung

**Pulmonary Function Tests** (PFT) - set of tests (spirometry, [ABG](http://noairtogo.tripod.com/gloss.htm#ABG#ABG), [DLCO](http://noairtogo.tripod.com/gloss.htm#diffusing#diffusing)) to evaluate the mechanical properties of the lung by studying lung volumes and capacities.  Related terms: [TLC](http://noairtogo.tripod.com/gloss.htm#TLC#TLC), [RV](http://noairtogo.tripod.com/gloss.htm#RV#RV), [VT](http://noairtogo.tripod.com/gloss.htm#VT#VT), [FRC](http://noairtogo.tripod.com/gloss.htm#FRC#FRC), [VC](http://noairtogo.tripod.com/gloss.htm#VC#VC), [FEF](http://noairtogo.tripod.com/gloss.htm#FEF#FEF), [FVC](http://noairtogo.tripod.com/gloss.htm#FVC#FVC), [FEV1](http://noairtogo.tripod.com/gloss.htm#FEV1#FEV1))

**Pulmonary (Arterial) Hypertension** (PH or PAH) - occurs when [blood pressure](http://noairtogo.tripod.com/gloss.htm#BP#BP) in the [pulmonary artery](http://noairtogo.tripod.com/gloss.htm#PA#PA) is too high. Increased pressure within the lung causes the right ventricle of the heart to become enlarged and may result in shortness of breath, syncope (fainting), dizzy spells and heart failure. PPH or PPAH, or primary pulmonary hypertension, exists when its cause is unknown.  This condition is extremely rare. PH, pulmonary hypertension, occurs as a result of other medical conditions, including [COPD](http://noairtogo.tripod.com/gloss.htm#COPD#COPD).  PH is sometimes referred to as SPH (secondary PH)

**Pulmonary Insufficiency** (PI) - Chronic impairment of gas exchange due to clinically documented pulmonary disease .

**Pulmonary** **Rehabilitation** (PR) - a personalized program which incorporates therapy, support and education in attempting to assist the patient achieve the maximum obtainable functional capacity allowed by his handicap.

**Pursed Lip Breathing** (PLB) - technique used to slow breathing to maintain even lung pressure and control shortness of breath

**Quality of Life** (QOL) - the physical, social and emotional aspects of a patient's well-being that are relevant and important to the individual.

**Rating of Perceived Exertion** (RPE) - a self-assessment scale to rate breathlessness and fatigue during exercise.

**Reactive Airway Disease** (RAD) - condition caused by reaction to a trigger (i.e. allergen, odor or hypersensitivity).  [Asthma](http://noairtogo.tripod.com/gloss.htm#asthma#asthma) and Hypersensitivity Pneumonitis are examples of RAD.

**Rescue Medication** - short-acting medication designed to relieve [symptoms](http://noairtogo.tripod.com/gloss.htm#SX#SX) quickly

**Residual Volume** (RV) - amount of air left behind after a maximum expiratory effort; lowest voluntary volume obtainable

**Respiration** - Respiration has two meanings in physiology. Along with breathing, respiration includes all chemical processes that occur in the body converting [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) and food to water, energy and [carbon dioxide](http://noairtogo.tripod.com/gloss.htm#CO2#CO2).

**Respiratory Distress Syndrome** (RDS) - breathing complications experienced by newborns when immature lungs lack enough surfactant to keep air spaces open.  Also called hyaline membrane disease.

**Respiratory System** - entire system of organs and tissues involved in breathing; these include the nose, throat, larynx, trachea, bronchi and lungs

**SaO2** - percent saturation of hemoglobin with [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) in the arterial blood;   in the venous blood - SVO2

**Shock Lung** - clinical terminology for [Adult Respiratory Distress Syndrome](http://noairtogo.tripod.com/gloss.htm#ARDS#ARDS) (ARDS)

**Signs**  - objective findings discovered by a physician, i.e. heart murmur.  See [symptoms](http://noairtogo.tripod.com/gloss.htm#SX#SX)

**Spacer** - device designed to hold an aerosol metered-dose inhaler (MDI) for optimum delivery of the drug into the lungs; ie Aerochamber® .

**Spirometer** - an instrument for measuring volume of air entering and leaving the lungs

**Spirometry** - best pulmonary function test available in primary care for early detection of many lung disorders, this procedure provides following key parameters:

Forced Vital Capacity (FVC)  
Forced Expiratory Volume in 1st second (FEV1)  
Forced Expiratory Ratio in 1st second (FEV1/FVC%)  
Peak Expiratory Flow Rate (PEFR)

**Spontaneous Pneumothorax** (SP) - an inherited condition characterized by weak areas in the pleural lining of the lung. Small air-filled blisters, called [blebs](http://noairtogo.tripod.com/gloss.htm#blebs#blebs), may form which occasionally rupture causing air to leak from the lung into the chest cavity. Also called Blebs Disease.

**Sputum** - [mucus](http://noairtogo.tripod.com/gloss.htm#mucus#mucus), [phlegm](http://noairtogo.tripod.com/gloss.htm#phlegm#phlegm) or other substances coughed up from the respiratory tract

**Symptoms** (SX) - subjective indications experienced by the patient, i.e. chest pain (see [signs](http://noairtogo.tripod.com/gloss.htm#signs#signs))

**Tachypnea** - increased rate of [respiration](http://noairtogo.tripod.com/gloss.htm#respiration#respiration)

**Thoracoscope** - instrument used to directly visualize the [pleura](http://noairtogo.tripod.com/gloss.htm#pleura#pleura) and lung surfaces; introduced into the thorax under general anesthesia, it facilitates the collection of tissue samples (see [Open Lung Biopsy](http://noairtogo.tripod.com/gloss.htm#Open Lung#Open Lung))

**Thoracoscopy** (VATS) -  a minimally invasive "keyhole" surgical procedure which allows the surgeon to directly examine the chest cavity without a big incision.  Often referred to as VATS (Video Assisted Thoracic Surgery)

**Thoracotomy** - surgical incision of the chest wall

**Tidal Volume** (TV or  VT) -  volume of a normal [i](http://noairtogo.tripod.com/gloss.htm#inspiration#inspiration)nspiration or expiration during relaxed (normal) breathing

**Total Lung Capacity** (TLC) - volume of the lungs after a maximum voluntary inspiration

**Transplant** (TX)  - surgery to replace a diseased organ or organs with healthy ones from a human donor.

**Transtracheal oxygen** (TTO2) -  delivery of [oxygen](http://noairtogo.tripod.com/gloss.htm#oxygen#oxygen) by insertion of a thin catheter directly into the trachea.

**Upper Respiratory Infection** (URI) - affecting any, or a combination, of the five parts comprising the upper respiratory tract: nose, sinuses, pharynx, larynx, trachea

**Usual Interstitial Pneumonitis** (UIP) - see [IPF](http://noairtogo.tripod.com/gloss.htm#idio#idio)

**Vanishing Lung Syndrome** - a progressive disorder characterized by presence of large upper lobe [bullae](http://noairtogo.tripod.com/gloss.htm#bullae#bullae) occupying at least one-third of the hemithorax, and compressing surrounding normal lung.  Also called "type 1 bullous disease" and "primary bullous disease of the lung.

**Ventilation** - the movement of gas in and out of the lungs to facilitate blood oxygenation and [carbon dioxide](http://noairtogo.tripod.com/gloss.htm#CO2#CO2) removal

**Ventilation Perfusion Scan** (VQ)- a test that compares right and left lung function (blood flow and gas exchange)  through the use of a small amount of radioactive material.

**Ventilators** - machines used in operating rooms (OR) and intensive care units (ICU) for respiratory support of patients who cannot breathe on their own. Also called respirators. They measure five main parameters:

1. Tidal Volume (eg. 700 ml) [Volume of gas injected into trachea with each breath]  
2. Respiratory Rate (eg. 12 breaths/minute)  
3. FIO2 (Fraction of Inspired Oxygen) (eg. 0.6 or 60% oxygen)  
4. PEEP (Positive End Expiratory Pressure) (eg. 5 cm H2O)   
5. I:E ratio (eg. 1:3)  Time for inspiration in relation to time for expiration

**Video Assisted Thoracoscopic Surgery** (VATS) - a minimally invasive 'keyhole'  surgical procedure which allows the surgeon to directly examine the chest cavity without a big incision.]

**Vital Capacity** (VC) - the maximum volume of air that can be exhaled following a complete lung inflation. The difference between [Total Lung Capacity](http://noairtogo.tripod.com/gloss.htm#TLC#TLC) (TLC) and [Residual Volume](http://noairtogo.tripod.com/gloss.htm#RV#RV) (RV).

**Wheezing** - the sound made by air moving through partially obstructed [airways](http://noairtogo.tripod.com/gloss.htm#airway#airway).

**X-Ray** - a form of electromagnetic radiation which can penetrate a body to produce an image on film.

***Respiratory Abbreviations and Descriptions***

| Abbrev. | Description |
| --- | --- |
| [A1AD](http://noairtogo.tripod.com/gloss.htm#A1AD#A1AD)AAT [ABG](http://noairtogo.tripod.com/gloss.htm#ABG#ABG) ABPA AECB AFB AHI AHR AHRF AIP AIR ALI  [AM](http://noairtogo.tripod.com/gloss.htm#AM#AM)  AO AOD APAH APB APE API [ARDS](http://noairtogo.tripod.com/gloss.htm#ARDS#ARDS) AREA  ARTI AS- AS+ ASM [ATRA](http://noairtogo.tripod.com/gloss.htm#ATRA#ATRA) AVM | Alpha1 Antitrypsin Deficiency Emphysema Alpha1 Antitrypsin protein Arterial Blood Gases Allergic Bronchopulmonary Aspergillosis Acute Exacerbation of Chronic Bronchitis Autofluorescence Bronchoscopy Apnea Hypopnea Index Airway Hyperresponsiveness Acute Hypercapnic Respiratory Failure Acute Interstitial Pneumonia Alpha1 International Registry Acute Lung Injury  Alveolar Macrophage Airway/Airflow Obstruction Airway Obstructive Disease Associated Pulmonary Arterial Hypertension Acute Pulmonary Blastomycosis Acute Pulmonary Edema Alpha 1-Proteinase Inhibitor Adult Respiratory Distress Syndrome Aspergillus Related Endobronchial Abnormalities Acute Respiratory Tract Infection Asthma Symptoms Negative Asthma Symptoms Positive Airway Smooth Muscle All-Trans Retinoic Acid Arteriovenous Malformation |
| BA BAC BAE [BAL](http://noairtogo.tripod.com/gloss.htm#BAL#BAL) BALF BAS BD BF BFL BHR [BiPAP](http://noairtogo.tripod.com/gloss.htm#BiPAP#BiPAP) BLT BLVR  [BO](http://noairtogo.tripod.com/gloss.htm#BO#BO) BODE  [BOOP](http://noairtogo.tripod.com/gloss.htm#BOOP#BOOP) BOS [BPD](http://noairtogo.tripod.com/gloss.htm#BPD#BPD) BPT BW Bx | Bronchial Anastomosis Bronchioloalveolar Carcinoma Bronchial Artery Embolization Bronchoalveolar Lavage Bronchoalveolar Lavage Fluid Bronchial Aspirate  Bronchodilator Breathing Frequency Bird Fancier' Lung Bronchial Hyperreactivity Bi-Level Positive Airway Pressure Bilateral Lung Transplantation Biologic Lung Volume Reduction Bronchiolitis Obliterans Body mass, Obstruction, Dyspnea,  Exercise tolerance Bronchiolitis Obliterans Organizing Pneumonia Bronchiolitis Obliterans Syndrome BronchoPulmonary Dysplasia Bronchial Provocation Test Bronchial Washing Biopsy |
| CAD CAO CAP CARTI  CDA [CAT](http://noairtogo.tripod.com/gloss.htm#CT#CT)  [CB](http://noairtogo.tripod.com/gloss.htm#Chron#Chron) CBF  CCS  Cdyn [CF](http://noairtogo.tripod.com/gloss.htm#CF#CF) CFA [CHF](http://noairtogo.tripod.com/gloss.htm#CHF#CHF) CIP [CLD](http://noairtogo.tripod.com/gloss.htm#CLD#CLD) CLRD CMV CO CO2 COAD COLD CONT COP [COPD](http://noairtogo.tripod.com/gloss.htm#COPD#COPD)  CORD COT [C/P](http://noairtogo.tripod.com/gloss.htm#C/P#C/P) [CPAP](http://noairtogo.tripod.com/gloss.htm#CPAP#CPAP) CPFT CPR CPT CRF CRT CSA CSB CSE  CSS CSS Cst CT CTD CVA CVD CVD-IP  CVID  CWD  CWP CXR | Coronary Artery Disease Chronic Airway Obstruction Community Acquired Pneumonia Community Acquired Respiratory Tract Infection Currently Diagnosed Asthma Computerized Axial Tomography Chronic Bronchitis Ciliary Beat Frequency Corticosteroids Dynamic Compliance of the Resp Syst Cystic Fibrosis Cryptogenic Fibrosing Alveolitis  Congestive Heart Failure Chronic Interstitial Pneumonia Chronic Lung Disease Chronic Lower Respiratory Disease Cytomegalovirus Carbon Monoxide Carbon Dioxide Chronic Obstructive Airways Disease Chronic Obstructive Lung Disease Continuous Oxygen Flow Therapy Cryptogenic Organizing Pneumonia Chronic Obstructive Pulmonary Disease  Chronic Obstructive Respiratory Disease Continuous Oxygen Therapy Cardiopulmonary Continuous Positive Airway Pressure Certified Pulmonary Function Technician Cardiopulmonary Resuscitation Chest Physical Therapy Chronic Respiratory Failure Certified Respiratory Therapist Central Sleep Apnea Cheyne-Stokes Breathing Chronic Sputum Expectoration  Churg-Strauss Syndrome Closed Suction System Static Compliance of the Respiratory System Computerized Axial Tomography Close To Death Cough Variant Asthma Cardiovascular Disease Interstitial Pneumonia associated with Collagen Vascular Diseases Common Variable Immunodeficiency Chest Wall Deformity Coal Workers' Pneumoconiosis Chest X-Ray |
| DAD DAH [DIP](http://noairtogo.tripod.com/gloss.htm#DIP#DIP) DLCO DNI DNR DODS DOE DOT [DPAP](http://noairtogo.tripod.com/gloss.htm#DPAP#DPAP) DPI DPO Dx Dz | Diffuse Alveolar Damage Diffuse Alveolar Hemorrhage Desquamative Interstitial Pneumonia Diffusing Capacity of Carbon Monoxide Do Not Intubate Do Not Resuscitate Demand Oxygen Delivery System Dyspnea On Exertion Directly Observed Therapy Demand Positive Airway Pressure Dry Powder Inhaler Dendriform Pulmonary Ossification Diagnosis Disease |
| EA EB EBB EBC EBUS ECG ECHO ECMO EEG EELV EFL EIB EKG ELF EMG EMT  eNO ENT EP EPAP ERS ERV ESPB ESS ET ETS EUS EVLW | Esophageal Atresia Eosinophilic Bronchitis Electrobronchial Biopsy Exhaled Breath Condensate Endobronchial Ultrasonography Electrocardiogram Echocardiogram Extracorporeal Membrane Oxygenator Electroencephalogram End Expiratory Lung Volume Expiratory Flow Limitation Exercise Induced Bronchoconstriction Electrocardiogram Epithelial Lining Fluid Electromyogram Emergency Medical Technician  exhaled Nitric Oxide Ear, Nose & Throat Eosinophilic Pneumonia Expiratory Positive Airway Pressure European Respiratory Society Expiratory Reserve Volume Endoluminal Stenosis of Proximal Bronchi Epworth Sleepiness Score Endotracheal Tube Environmental Tobacco Smoke Endoscopic Ultrasonography Extravascular Lung Water |
| FB FEES FEF FEFMAX FET FEV1 (3,5)  FIF FiO2 FIVC FOB  FOX FP FPF FRC FVC | Flexible Bronchoscopy Fiberoptic Endoscopic Evaluation of Swallowing Forced Expiratory Flow Forced Expiratory Flow at Maximum Effort Forced Expiratory Time (in seconds) Forced Expiratory Volume in the first (3,5) second following maximum inhalation  Forced Inspiratory Flow Fraction of Inspired Oxygen Forced Inspiratory Vital Capacity Fiberoptic Bronchoscopy Finger (Pulse) Oximetry Fluticasone Propionate Familial Pulmonary Fibrosis Functional Residual Capacity Forced Vital Capacity |
| GERD GGOGI GOLD GORD GSH GV | Gastroesophageal Reflux Disease Ground Glass Opacity GastroIntestinal Global Initiative for Chronic Obstructive Lung Disease Gastro-oesophageal Reflux Disease (UK) Glutathione Gas Ventilation |
| HAPE HAPH HCVR HEENT HEPA HL HLA HLT HMO HOT HP HPLC HPS HR HRCT HRQOL HRV HSCT HSP | High Altitude Pulmonary Edema High Altitude Pulmonary Hypertension Hypercapnic Ventilatory Response Head, Eyes, Ears, Nose, Throat High Efficiency Particulate Air (filter or mask) Hilar Lymphadenopathy Human Leukocyte Antigen Heart Lung Transplantation Health Maintenance Organization Home Oxygen Therapy Hypersensitivity Pneumonia (or Pneumonitis) High Performance Liquid Chromatography Hantavirus Pulmonary Syndrome Heart Rate High Resolution CT Scan Health Related Quality of Life Heart Rate Variability Haemopoietic Stem Cell Transplantation Hypersensitivity Pneumonia (or Pneumonitis) |
| IADL IC [IC](http://noairtogo.tripod.com/gloss.htm#IC#IC) ICC [ICS](http://noairtogo.tripod.com/gloss.htm#ICS#ICS) ICS ICU IEI IIP [IMT](http://noairtogo.tripod.com/gloss.htm#IMT#IMT) [ILD](http://noairtogo.tripod.com/gloss.htm#ILD#ILD) IP IPAH IPD [IPF](http://noairtogo.tripod.com/gloss.htm#IPF#IPF) IPH IPV [IRV](http://noairtogo.tripod.com/gloss.htm#IRV#IRV) ISABA ISP ITBC ITGV [IVC](http://noairtogo.tripod.com/gloss.htm#IVC#IVC) | Instrumental Activities of Daily Living Immunocompromised Inspiratory Capacity Idiopathic Chronic Cough Immotile Cilia Syndrome Inhaled Corticosteroids Intensive Care Unit Idiopathic Environmental Intolerance Idiopathic Interstitial Pneumonia Inspiratory Muscle Trainer Interstitial Lung Disease Interventional Pulmonology / Pulmonologist Idiopathic Pulmonary Arterial Hypertension Intrapulmonary Deposition Idiopathic Pulmonary Fibrosis Idiopathic Pulmonary Hemosiderosis Intrapulmonary Percussive Ventilation Inspiratory Reserve Volume Inhaled Short-Acting ß-Agonists Idiopathic Spontaneous Pneumothorax Intraluminal Typical Bronchial Carcinoid Intrathoracic Gas Volume  Inspiratory Vital Capacity |
| Kco [KS](http://noairtogo.tripod.com/gloss.htm#KS#KS) | lung carbon monoxide transfer coefficient Kartagener's Syndrome |
| LAAC LABA [LAM](http://noairtogo.tripod.com/gloss.htm#LAM#LAM) LAR LCI [LIP](http://noairtogo.tripod.com/gloss.htm#LIP#LIP) LIS LLL LOX LPM LPS LRCP LRI LRTI LUL LTGCT LTRAs LTX [LVRS](http://noairtogo.tripod.com/gloss.htm#LVRS#LVRS) | Long Acting Anticholinergics Long Acting Beta Agonists Lymphangioleiomyomatosis Laryngeal Adductor Reflex Lung Clearance Index Lymphocytic Interstitial Pneumonia Lung Injury Score Left Lower Lobe Liquid Oxygen Liters Per Minute (O2 flow rate) Laryngopharyngeal Sensitivity Licensed Respiratory Care Practitioner Lower Respiratory Tract Infection Lower Respiratory Tract Infection Left Upper Lobe Long-Term Glucocorticoid Treatment Leukotriene Receptor Antagonists Lung Transplantation Lung Volume Reduction Surgery |
| MAC MAC MAP MBW MCS MDI MDR TB MEF MEF50 MET M/H MIP/MEP MLD MMEFR MNIPPV or M/NIPPV  MPAP MPE MRI MRSA MT MTB MVMVV | Major Airway Collapse Mycobacterium avium complex Mean systemic Arterial Pressure Multiple Breath inert gas Washout Multiple Chemical Sensitivity Metered Dose Inhaler Multi Drug Resistant Tuberculosis Mid Expiratory Flow Maximal Expiratory Flow at 50% of FVC Metabolic equivalents Medical history Maximal Inspiratory / Expiratory Pressure Mean Lung Density Maximum Mid Expiratory Flow Rate Mouth/Nasal Intermittent Positive Pressure Ventilation  Mean Pulmonary Artery Pressure Malignant Pleural Effusion  Magnetic Resonance Imaging Methicillin-Resistant Staphylococcus aureus Medical Thoracoscopy Mycobacterium tuberculosis Mechanical Ventilation Maximal Voluntary Ventilation |
| NAC NAR NBL NBS NC or nc NCPAP NEP NETT NFR [NIP](http://noairtogo.tripod.com/gloss.htm#NSIP#NSIP) NIV NO NOS NOT NPAE NPPV NRT NS NSAID NSCLC [NSIP](http://noairtogo.tripod.com/gloss.htm#NSIP#NSIP) NSW NT | N-acetylcysteine Nasal Airflow Resistance Non-directed Bronchial Lavage Normal Breath Sounds Nasal Cannula Nasal Continuous Positive Airway Pressure Negative Expiratory Pressure National Emphysema Treatment Trial Not For Resuscitation Nonspecific Interstitial Pneumonia Non Invasive Ventilation Nitric Oxide Not Otherwise Specified Nocturnal Oxygen Therapy Non Pneumonic Acute Exacerbation Noninvasive Positive Pressure Ventilation Nicotene Replacement Therapy Not Significant Non-Steroidal Anti-Inflammatory Drug Non Small Lung Cell Cancer Nonspecific Interstitial Pneumonia Night Sweats Nasotracheal |
| O2OA OB OCD ODI [ODTS](http://noairtogo.tripod.com/gloss.htm#ODTS#ODTS) OEP OI [OLB](http://noairtogo.tripod.com/gloss.htm#OLB#OLB) OLD OLT OR [OSA](http://noairtogo.tripod.com/gloss.htm#OSA#OSA) OSAHS OSAS OSS OTC | Oxygen Occupational Asthma Obliterative Bronchiolitis Oxygen Conservation Device Oxygen Desaturation Index Organic Dust Toxic Syndrome Optoelectronic Plethysmography Oxygenation Index Open Lung Biopsy Occupational Lung Disease Orthotopic Lung Transplantation Odds Ratio Obstructive Sleep Apnea Obstructive Sleep Apnea-Hypopnea Syndrome Obstructive Sleep Apnea Syndrome Open Suction System Over-The-Counter (no prescription required) |
| PA PAH PaO2 [PAP](http://noairtogo.tripod.com/gloss.htm#PAP#PAP) PAP PAP PB PBD PBEC  [PCD](http://noairtogo.tripod.com/gloss.htm#PCD#PCD) PCO2 PCP PCR PCT PCV PCVID PD20  PDM PDOD  PE [PE](http://noairtogo.tripod.com/gloss.htm#PE#PE) [PE](http://noairtogo.tripod.com/gloss.htm#embolism#embolism) PEAP [PEEP](http://noairtogo.tripod.com/gloss.htm#PEEP#PEEP) PEEPt | Pulmonary Artery Pulmonary Arterial Hypertension Arterial Oxygen Pressure Positive Airway Pressure Pulmonary Alveolar Proteinosis Pulmonary Artery Pressure Periodic Breathing Pigeon Breeders' Disease Primary Bronchial Epithelial Cell  Primary Ciliary Dyskinesia Partial Pressure of Carbon Dioxide in Blood Pneumocystis carinii pneumonia Polymerase Chain Reaction Percutaneous Tracheostomy Pressure Controlled Ventilation Partial Common Variable Immununodeficiency Provocative dose of methacholine required to produce a 20% fall in FEV1 Pharyngeal Dilator Muscles Pulsed Dose Oxygen Delivery  Physical Examination Pulmonary Edema Pulmonary Embolism (or Embolus) Positive End Airway Pressure Positive End Expiratory Pressure Total PEEP |
| [PEFR](http://noairtogo.tripod.com/gloss.htm#PEFR#PEFR) PEFT Pelast PEP PET  [PF](http://noairtogo.tripod.com/gloss.htm#PF#PF) PF [PFM](http://noairtogo.tripod.com/gloss.htm#PFM#PFM) PFR [PFT](http://noairtogo.tripod.com/gloss.htm#PFT#PFT) [PH](http://noairtogo.tripod.com/gloss.htm#PH#PH) pH  PI [PI](http://noairtogo.tripod.com/gloss.htm#PI#PI) [PID](http://noairtogo.tripod.com/gloss.htm#PIDS#PIDS) PIIA PIP PITS [PLB](http://noairtogo.tripod.com/gloss.htm#PLB#PLB) PLCH PLE PLV pMDI Pmean PMF PMV | Peak Expiratory Flow Rate Peak Expiratory Flow Time Elastic component of airway pressure Positive Expiratory Pressure Positron Emission Tomography Pulmonary Fibrosis Pulmonary Function Peak Flow Meter Pulmonary Flow Redistribution Pulmonary Function Tests Pulmonary Hypertension (secondary) Measurement of blood alkalinity or acidity  Protease Inhibitor Pulmonary Insufficiency Primary ImmunoDeficiency Post Inspiration Inspiratory Activity Peak Inspiratory Pressure Post Intubation Stenosis Pursed Lip Breathing Pulmonary Langerhans Cell Histiocytosis Panlobular or panacinar emphysema Partial Liquid Ventilation Pressurized Metered Dose Inhaler Mean airway pressure Progressive Massive Fibrosis Prolonged Mechanical Ventilation |
| PNAE PND PND PO2 POC POD Ppause Ppeak  [PPH](http://noairtogo.tripod.com/gloss.htm#PH#PH) [PPV](http://noairtogo.tripod.com/gloss.htm#PPV#PPV) [PR](http://noairtogo.tripod.com/gloss.htm#PR#PR) PRA Presist PS PSI PSP PSV  PT PTLD PTO Ptr [PTX](http://noairtogo.tripod.com/gloss.htm#PTX#PTX) PVPVD PVR PVR PVR PY | Pneumonic Acute Exacerbations Paroxysmal Nocturnal Dyspnea Post Nasal Drip (or Discharge) Oxygen tension in arterial blood Portable Oxygen Concentrator Post Operative Day Inspiratory pause pressure Peak airway pressure Primary Pulmonary Hypertension Positive Pressure Ventilation Pulmonary Rehabilitation Panel Reactive Antibody Resistive component of airway pressure Pulmonary Valvular Stenosis Pneumonia Severity Index Primary Spontaneous Pneumothorax Pressure Support Ventilation  Physical or Pulmonary Therapy (or Therapist) Post Transplant Lymphoproliferative Disorder Periodic Trachael Occlusion Tracheal Pressure Pneumothorax Pulmonary Valve Pulmonary Vascular Disease Peripheral Vascular Resistance Pulmonary Vascular Resistance Pulmonary Valve Repair or Replacement Pack Years smoked |
| QOL QOL-MV | Quality Of Life Quality of Life after Mechanical Ventilation in the Aged |
| [RAD](http://noairtogo.tripod.com/gloss.htm#RAD#RAD) RB RB-ILD RCP RDI [RDS](http://noairtogo.tripod.com/gloss.htm#RDS#RDS) RER RF RFA Rint  RLL RML RMLS  [RPE](http://noairtogo.tripod.com/gloss.htm#RPE#RPE) RPFT RR RR RRT RSB RSV RT RUL [RV](http://noairtogo.tripod.com/gloss.htm#RV#RV) RVH RVSP Rx | Reactive Airway Disease or Dysfunction Rapid Breathing Respiratory Bronchiolitis-Interstitial Lung Disease Respiratory Care Practitioner Respiratory Disturbance Index Respiratory Distress Syndrome Respiratory Exchange Ratio Respiratory Frequency Radio Frequency Ablation Airway resistance measured by interrupter  technique Right Lower Lobe Right Middle Lobe Right Middle Lobe Syndrome  Rating of Perceived Exertion Registered Pulmonary Function Technician Relative Risk Respiratory Rate Registered Respiratory Therapist Rapid Shallow Breathing Respiratory Syncytial Virus Respiratory Therapy (or Therapist) Right Upper Lobe Residual Volume Right Ventricle Hypertrophy Right Ventricular Systolic Pressure Treatment or Therapy (prescription) |
| SABA SAD SAHS SaO2 SARS SCBA SCD SCLC SDB SEMAS SFD SGRQ SGT SHS SIRS  SLB SLT SLTA SMI SMOIL SOB SOFA [SP](http://noairtogo.tripod.com/gloss.htm#SP#SP) SPH SpO2 SUARS SVC SvO2 [Sx](http://noairtogo.tripod.com/gloss.htm#SX#SX) | Short-Acting ß-agonists Small Airways Disease Sleep Apnea Hypopnea Syndrome Arterial blood-oxygen saturation Severe Acute Respiratory Syndrome Self Contained Breathing Apparatus Secondary Ciliary Dyskinesia Small Cell Lung Cancer Sleep Disordered Breathing Self Expandable Metallic Airway Stents Symptom-Free Day St George’s Respiratory Questionnaire Surgical Tracheostomy Second Hand Smoke Systemic Inflammatory Response Syndrome  Surgical Lung Biopsy Single Lung Transplantation Severe Life-Threatening Asthma Soft Mist Inhaler Smoke from burning oil wells Short Of Breath Sequential Organ Failure Assessment Spontaneous Pneumothorax Secondary Pulmonary Hypertension Pulse oxygen saturation Silent Upper Airway Resistance Syndrome Slow Vital Capacity Venous blood-oxygen saturation Symptoms |
| TBTBATBB TBLB TBM TBNA TDI Te TEF TGI THCTi TIA [TLC](http://noairtogo.tripod.com/gloss.htm#TLC#TLC) TLCO TLV TM TNF TOBI TP TPR TS TT TTI [TTO2](http://noairtogo.tripod.com/gloss.htm#TTO2#TTO2) [TX](http://noairtogo.tripod.com/gloss.htm#TX#TX) Tx | Tuberculosis Tracheobronchial Amyloidosis Transbronchial Biopsy Transbronchial Lung Biopsy Tracheobronchomalacia Transbronchal Needle Aspiration Transitional Dyspnea Index Expiratory Time Tracheoesophageal Fistula Trachael Gas Insufflation Thoracic Gas Compression Inspiratory Time Transient Ischemic Attack Total Lung Capacity Carbon Monoxide Lung Transfer Factor Total Liquid Ventilation Tracheomalacia Tumor Necrosis Factor Tobramycin Solution for Inhalation  Talc Poudrage  Temperature, Pulse, Respiration Thoracostomy and Talc Slurry Transtracheal Thoracoscopy with Talc Insufflation Transtracheal Oxygen Transplant  Treatment |
| UAUAO UARS [UIP](http://noairtogo.tripod.com/gloss.htm#idio#idio) UNOS [URI](http://noairtogo.tripod.com/gloss.htm#URI#URI) US UST | Upper Airway Upper Airway Obstruction Upper Airway Resistance Syndrome Usual Interstitial Pneumonia  United Network for Organ Sharing Upper Respiratory Tract Infection Ultrasound Ultrasound guided Thoracentesis |
| VALI VALR VAP [VATS](http://noairtogo.tripod.com/gloss.htm#VATS#VATS) VBG [VC](http://noairtogo.tripod.com/gloss.htm#VC#VC) VCV VD/VT Ve VSD VSM [VT](http://noairtogo.tripod.com/gloss.htm#VT#VT) VTT [VQ](http://noairtogo.tripod.com/gloss.htm#VQ#VQ) Vua | Ventilator Associated Lung Injury Vacuum Assisted Lung Reduction Ventilator Associated Pneumonia Video Assisted Thoracoscopic Surgery Venous Blood Gas Vital Capacity Volume Controlled Ventilation Physiologic Dead Space Minute Volume Ventricular Septal Defect Vascular Smooth Muscle Tidal Volume  Voice Tracheostomy Tube Ventilation/Perfusion Scan Airflow through the upper airway |
| WLB WOB | White Light Bronchoscopy Work of Breathing |
| XP  6MW 6MWD | Transplant (slang)  6-Minute Walk  6-Minute Walk Distance |
|  |  |