A HOME CARE GUIDE TO KEEP YOUR LUNGS HEALTHY

Dr. Mahmoud Sous

Bhoomika Pathak & Priyanka Yadav

A HOME CARE GUIDE TO KEEP YOUR LUNGS HEALTHY

Dr. Mahmoud Sous

Bhoomika Pathak & Priyanka Yadav

Website: www.drsous.ca
Email: mahmoudsous@yahoo.com

ABOUT THE AUTHORS

Dr. Mahmoud Sous – Ph.D.

During the period of 1995-1999, I went to the medical school in Poland to research about the various methods of back pain treatment. After finishing my PhD, I took variety of courses including naturopath, acupuncture, and manual techniques. This gave me an idea that exercises, and massage could be helpful in treatment of chronic pain. But my findings didn't stop me here, I also worked as a naturopath practitioner in Canada where I got familiar about treatments with Chinese medicines, osteopath techniques and some other manual therapies which helps in pain management.

Fixing injuries requires an understanding of anatomy and biomechanics. That is why my research and treatment belong to the holistic approach of using different techniques and remedies for the treatment of back pain. In 1990, I realize that there are some complex spinal aspects and issues which leads to of back pain. So, from my case studies I formulated a guideline which is clear and easy to understand and will fix your issues.

My goal is to help people visualize how the body functions and what happens inside when you experience pain. Healing requires to focus on one's action because pain results due to faulty actions and movements. This thought motivated me to work on a book which will include all home remedies where people can treat themselves to fix their pain. I have included knowledge based on my clinical research using manual massage therapy, food habits, nutrition facts, heat, sauna, hydrotherapy, cold water treatments which overall helps in pain management. It gives me pleasure to introduce this book to the community where I have shared all my experienced treatment plans.

Priyanka Yadav (Physiotherapist)

I started my career in 2011, since then I have worked as a Physiotherapist in several clinics and hospitals in India. Working mostly in the Outpatient department made me realize that Physio's role is extremely crucial in the rehabilitation and recovery process of a patient. My desire to reach out to more people motivated me to work for this book. Have worked with Dr. Mahmoud on several research books on self-pain management. We have been constantly working on curating the best suited protocol for various Musculoskeletal conditions. Additionally, we have also included approaches with alternative medicine.

Bhoomika Pathak (Physiotherapist)

After graduating in 2014, I have been working with various clinical conditions like sports injury, musculoskeletal injury, and neurological disorders for more than 5 years. Along with Dr. Mahmoud & colleagues I have worked on treatment and pain management for various musculoskeletal injuries and pain population. With all the successful outcomes till now, we have designed this book with stagewise guide to treat your knee pain.

This book aims to help improve the function of the respiratory muscles through specific exercises, positions and breathing. It is helpful in improving respiratory functions of people with any chronic conditions like COPD, asthma or in athletes and healthy individuals as well to promote enhanced functioning. Because the respiratory muscles are also essential for postural control and core stability, with this course one can also improve conditions like back pain and reduce falls risk. An understanding of this technique can, therefore, enhance the practice of physiotherapists from a range of backgrounds and the general population. This course aims to provide you with an understanding of the emergence, advancement and techniques behind chest physiotherapy. At the end of this book, you will be able to, design or self-treat the respiratory condition in variety of patients ranging from athletes to chronic conditions, identify the mechanism behind each condition, rationale in between different conditions, list the indications – contraindications and precautions while doing the exercise.

Apart from the basic medical knowledge, there will also emphasize on the effects of herbs and many natural techniques, which will fasten the process of recovery. There are variety of recipes for inhalation and massage included in this course. All treatment options will be explained under one roof.

Dr. Sous's Team who have contributedwith theiw approaches in this book.

* Priyanka Yadav - Physiotherapist
* Bhoomika Pathak - Physiotherapist
* Liming Nang - Acupuncturist
* Navjot Kaur - Physiotherapist
* Payal Vaghani - Physiotherapist
* Revathi Kandaswamy - Massage Therapist
* Mandeep Kaur - Physiotherapist
* Donaliza Mendoza - Massage Therapist
* Haitham Ajoury - layout and design

Contents

CHAPTER 1: HISTORY AND ADVANCES IN CHEST PHYSIOTHERAPY

Chest physiotherapy aims at improving patient pulmonary function and has a significant role in respiratory medicine. Common techniques involved in respiratory physiotherapy include percussion, vibration, postural drainage and breathing exercises. Chest physical therapy is the term for a group of treatments designed to improve respiratory efficiency, promote expansion of the lungs, strengthen respiratory muscles, and eliminate secretions from the respiratory system.

With chest physical therapy (CPT), the person gets in different positions to use gravity to drain mucus (postural drainage) from the five lobes of the lungs. Each position is designed so that a major part of the lung is facing downward. When combined with percussion, it may be known as postural drainage and percussion (PD&P).

History:

The use of postural drainage was first mentioned by **S. H. Quincke** in 1898. He recommended "intermittent" use of postural drainage to treat patients with thick secretions. Yet this technique wasn't adapted by the medical community until William Ewart recommended CPT with postural drainage in 1901.

Ewart worked with children with bronchiectasis, and he recommended "continuous postural drainage" as opposed to "intermittent" to these children to promote the removal of thick tenacious secretions. By continuous he meant that it should be done frequently, as opposed to just once a day. Generally, the treatment was prescribed 3-4 times a day for up to 10 minutes, and this is still how it's ordered today for the same reasons.

While Ewart may have spearheaded the idea of CPT and postural drainage for bronchiectasis and eventually cystic fibrosis patients, the use of these techniques was ultimately found to be useful to prevent and treat complications that result from performing surgeries. Physicians noted many of their post-operative patients were developing respiratory complications not related to the surgery itself, and they sought to understand and find a solution. This concept of using CPT to prevent and treat post-operative respiratory complications was first described in 1915 by MacMahon in an article about how to treat post-operative trauma patients. In fact, not only did he recommend the use of CPT, but he also recognized the importance of exercising as soon as possible after a surgery to get the lungs back to normal, or their pre-operative status.

Most of the patients **MacMahon** treated were soldiers injured in battle. He recommended CPT with exercise, and forced exhalation, and reported that the results were "remarkable," particularly within one week. By 1919 there was an increasing body of evidence to suggest that where there is "serious lung collapse and chest deformity following wounds or illness, breathing and physical exercises should, in certain cases, be given as accessories to medical and surgical treatment, if the best possible recovery is to be assured."

Kigin explained that Loius Pasteur first recognized atelectasis in 1908 after "temporary inhibition of muscular activity." In the 1930s studies showed a link between post-operative respiratory distress and hypoxemia (low oxygen in the blood). In 1952 atelectasis was recognized by R.N.V. Palmer and BA Sellick as the most common cause of post-operative complications.

Palmer and Sellick described that some of the best results in treating these complications are by using percussion, postural drainage, and treatments with isoprenaline. They were among the first to recognize the value of using beta adrenergic to treat and prevent post-operative complications. The idea was that anesthesia causes "reflex bronchospasm", and this results in the retention of secretions. They concluded that Isoprenaline given before and during anesthesia treated this perceived problem by dilating airways and enhancing secretion clearance in that way.

Till 1960s "gold standard" for preventing post-operative pulmonary complications was chest physiotherapy, then other methods, such as the incentive spirometer, were discovered to also benefit such patients. There were also some mechanical percussors available, yet there was never any conclusive evidence they did any better of a job than CPT. Whether to use cupped hands or a mechanical device was generally left to the institution or therapist.

In 1970 the **incentive spirometer (IS) was invented**. It was believed to be more effective than any of the other methods used to promote airway clearance because it could be done by the patient alone. Seeing this device on the bedside table acted as a reminder or

an incentive to take deep breaths. Likewise, being able to see how high they could make the bellow or balls move up acted as positive feedback. The patient and the physician could also monitor progress.

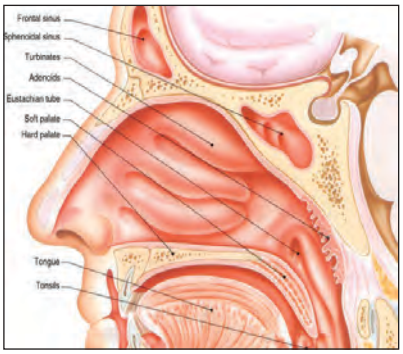
During the 1970s many studies were done to determine the effects of both the incentive spirometer and CPT. A 1974 article in the **British Journal of Surgery** studied a group of post-operative patients that were treated with CPT and another group treated with IS therapy. The CPT was done only twice a day, and the IS every hour. Those in the group receiving CPT had a 63 percent chance of developing post-operative complications, and those in the IS group had only a 37% chance of developing complications. The researchers decided CPT may have been less effective because deep breathing exercises weren't encouraged.

During the early 1990s the **flutter device** was introduced to the market as an alternative to CPT to help with mucus clearance. It's a handheld device that the patient blows into. This causes ball bearings inside it to "oscillate at a high frequency, resulting in vibrations of the airways and intermittent positive expiration facilitate mucus expectoration." While studies show CPT is a better method of helping patients with cystic fibrosis remove secretions and improve lung volumes, other studies showed that use of a flutter device was even more effective. Studies also showed that CF patients coughed up three times as much with the flutter as compared to CPT.

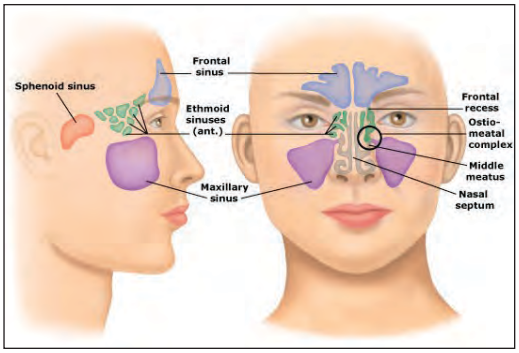
Yet regardless of all the technology, CPT continues to be the gold standard method of helping patients promote airway clearance. Regardless of what studies say, just having a respiratory therapist in the room moving the patient from side to side assures the physician the patient will be assessed and moved on a regular basis. This alone may all that most patients need for a speedy recovery.

CHAPTER 2: ANATOMY OF RESPIRATORY TRACT

Anatomy of upper respiratory tract: Upper airway structures consist of the nose, sinuses and nasal passages, pharynx, tonsils and adenoids, larynx, and trachea.

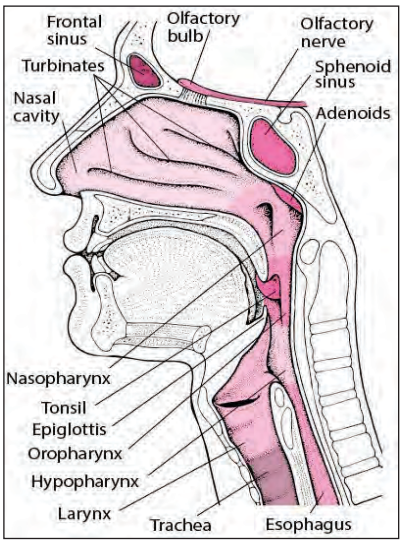


Nose: The nose is composed of an external and an internal portion. The external portion protrudes from the face and is supported by the nasal bones and cartilage. The anterior nares (nostrils) are the external openings of the nasal cavities. The internal portion of the nose is a hollow cavity separated into the right and left nasal cavities by a narrow vertical divider, the septum. Each nasal cavity is divided into three passageways by the projection of the turbinates' (also called conchae) from the lateral walls. The nasal cavities are lined with highly vascular ciliated mucous membranes called the nasal mucosa. Mucus, secreted continuously by goblet cells, covers the surface of the nasal mucosa, and is moved back to the nasopharynx by the action of the cilia (fine hairs). The nose serves as a passageway for air to pass (to and from) the lungs. It filters impurities and humidifies and warms the air as it is inhaled. It is responsible for olfaction (smell) because the olfactory receptors are in the nasal mucosa. This function diminishes with age.



Paranasal Sinuses: The paranasal sinuses include four pairs of bony cavities that are lined with nasal mucosa and ciliated pseudostratified columnar epithelium. These air spaces are connected by a series of ducts that drain into the nasal cavity. The sinuses are named by their location: frontal, ethmoidal, sphenoidal, and maxillary. A prominent function of the sinuses is to serve as a resonating chamber in speech. The sinuses are a common site of infection. Turbinate Bones (also known as Conchae the name suggested by their shell-like appearance). Because of their curves, these bones increase the mucous membrane surface of the nasal passages and slightly obstruct the air flowing through them.

Air entering the nostrils is deflected upward to the roof of the nose, and it follows a circuitous route before it reaches the nasopharynx. It meets a large surface of moist, warm mucous membrane that catches practically all the dust and organisms in the inhaled air. The air is moistened, warmed to body temperature, and brought into contact with sensitive nerves. Some of these nerves detect odors; others provoke sneezing to expel irritating dust.

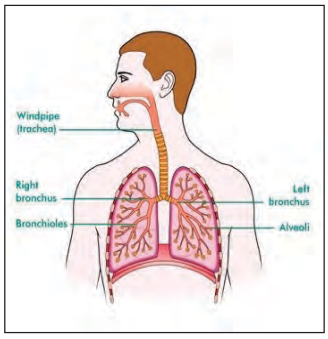


Pharynx, Tonsils, and Adenoids: The pharynx, or throat, is a tube-like structure that connects the nasal and oral cavities to the larynx. It is divided into three regions: nasal, oral, and laryngeal. The nasopharynx is located posterior to the nose and above the soft palate. The oropharynx houses the faucial, or palatine, tonsils. The laryngopharynx extends from the hyoid bone to the cricoid cartilage. The epiglottis forms the entrance of the larynx. The adenoids, or pharyngeal tonsils, are in the roof of the nasopharynx. The tonsils, the adenoids, and other lymphoid tissue encircle the throat. These structures are important links in the chain of lymph nodes guarding the body from invasion by organisms entering the nose and the throat. The pharynx functions as a passageway for the respiratory and digestive tracts.

Larynx: The larynx, or voice organ, is a cartilaginous epithelium lined structure that connects the pharynx and the trachea (fig. 4). The major function of the larynx is vocalization. It also protects the lower airway from foreign substances and facilitates coughing. It is referred to as the voice box and consists of the following:

- Epiglottis: a valve flap of cartilage that covers the opening to the larynx during swallowing.
- Glottis: the opening between the vocal cords in the larynx.

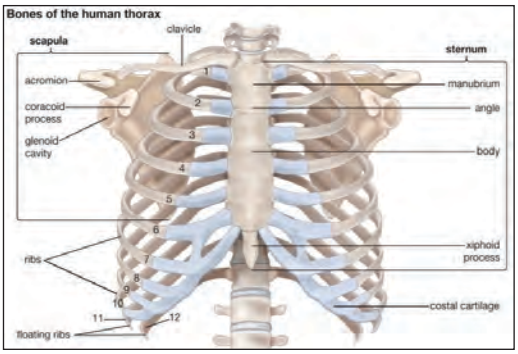
- Cricoid cartilage: the only complete cartilaginous ring in the larynx (located below the thyroid cartilage).
- Arytenoid cartilages: used in vocal cord movement with the thyroid cartilage.
- Vocal cords: ligaments controlled by muscular movements that produce sounds; located in the lumen of the larynx.



Trachea: The trachea, or windpipe, is composed of smooth muscle with C-shaped rings of cartilage at regular intervals. The cartilaginous rings are incomplete on the posterior surface and give firmness to the wall of the trachea, preventing it from collapsing. The trachea serves as the passage between the larynx and the bronchi.

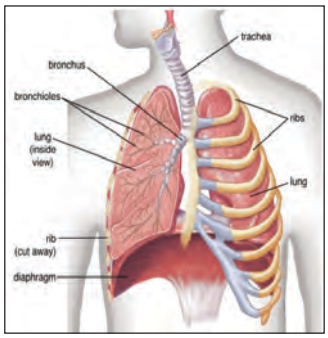
Anatomy of lower respiratory tract:

Thoracic cavity, also called **chest cavity**, the second largest hollow space of the body. It is enclosed by the ribs, the vertebral column, and the sternum, or breast-bone, and is separated from the abdominal cavity (the body's largest hollow space) by a muscular and membranous partition, the diaphragm. It contains the lungs, the middle and lower airways—the tracheobronchial tree—the heart, the vessels transporting blood between the heart and the lungs, the great arteries bringing blood from the heart out into general circulation, and the major veins into which the blood is collected for transport back to the heart. The heart is covered by a fibrous membrane sac called the pericardium that blends with the trunks of the vessels running to and from the heart. The thoracic cavity also contains the esophagus, the channel through which food is passed from the throat to the stomach.



The chest cavity is lined with a serous membrane, which exudes a thin fluid. That portion of the chest membrane is called the parietal pleura. The membrane continues over the lung, where it is called the visceral pleura, and over part of the esophagus, the heart, and the great vessels, as the mediastinal pleura, the mediastinum being the space and the tissues and structures between the two lungs. Because the atmospheric pressure between the parietal pleura and the visceral pleura is less than that of the outer atmosphere, the two surfaces tend to touch, friction between the two during the respiratory movements of the lung being eliminated by the lubricating actions of the serous fluid. The pleural cavity is the space, when it occurs, between the parietal and the visceral pleura.

Lungs: The lower respiratory tract consists of the lungs, which contain the bronchial and alveolar structures needed for gas exchange. The lungs, which is the organ for respiration is a paired cone shaped organs lying in the thoracic cavity separated from each other by the heart and other structures in the mediastinum. Each lung has a base resting on the diaphragm and an apex extending superiorly to a point approximately 2.5 cm superior to the clavicle. It also has a medial surface and with three borders- anterior, posterior, and inferior. The broad coastal surface of the lungs is pressed against the rib cage, while the smaller mediastinal surface faces medially. The lungs receive the bronchus, blood vessels, lymphatic vessels, and nerves through a slit in the mediastinal surface called the helium, and the structures entering the helium constitutes the lungs root.



The right lung is larger and weighs more than the left lung. Since the heart tilts to the left, the left lung is smaller than the right and has an indentation called the cardiac impression to accommodate the heart. This indentation shapes the inferior and anterior parts of the superior lobe into a thin tongue-like process called the lingual.

Ventilation requires movement of the walls of the thoracic cage and of its floor, the diaphragm. The effect of these movements is al-

ternately to increase and decrease the capacity of the chest. When the capacity of the chest is increased, air enters through the trachea (inspiration) because of the lowered pressure within and inflates the lungs. When the chest wall and diaphragm return to their previous positions (expiration), the lungs recoil and force the air out through the bronchi and trachea. The inspiratory phase of respiration normally requires energy; the expiratory phase is normally passive.

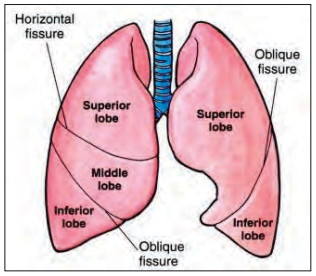
Pleura: The lungs and wall of the thorax are lined with a serous membrane called the pleura (fig. 5). The visceral pleura covers the lungs; the parietal pleura lines the thorax. The visceral and parietal pleura and the small amount of pleural fluid between these two membranes serve to lubricate the thorax and lungs and permit smooth motion of the lungs within the thoracic cavity with each breath.

Mediastinum: The mediastinum is in the middle of the thorax, between the pleural sacs that contain the two lungs. It extends from the sternum to the vertebral column and contains all the thoracic tissue outside the lungs.

Lobes and Fissures of the Lung:

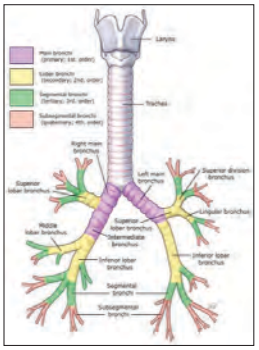
Each lung is divided into lobes by fissures.

- Both lungs have oblique fissure, and the right is further divided by a transverse fissure. The oblique fissure in the left lung separates the superior and the inferior lobe. The oblique and horizontal fissure divides the lungs into superior, middle, and inferior lobes. Thus, the right lung has three lobes while the left has two.
- Each lobe is supplied by a lobar bronchus. The lobes are subdivided by bronchopulmonary segments which are supplied by the segmental bronchi.



Tracheobronchial Tree:

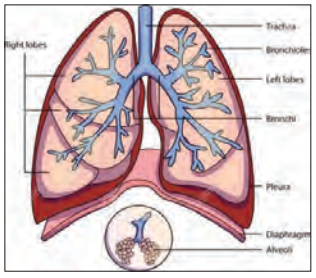
All the respiratory passages from the trachea to the respiratory bronchioles are called the tracheobronchial tree. The trachea divides at the sternal angle into right and left primary bronchus which goes into the right and left lungs. Each bronchus enters the lung at a notch called the hilum. Blood vessels and nerves also connect with the lungs here and together with the bronchus forms a region called the root of the lungs.



The right main bronchus is larger in diameter and more vertical making it directly in line with the trachea than the left main bronchus. Thus, swallowed objects that accidentally enter the lower respiratory tract are most likely to become lodged in the right main bronchus.

The main bronchi divide into lobar or secondary bronchi within each lung. Two lobar bronchi exist in the left lung, and three exist in the right lung. The lobar bronchi, in turn give rise to segmental or tertiary bronchi. The tertiary bronchi supply the bronchopulmonary segments.

Bronchi and Bronchioles: There are several divisions of the bronchi within each lobe of the lung. First are the lobar bronchi (three in the right lung and two in the left lung). Lobar bronchi divide into segmental bronchi (10 on the right and 8 on the left), which are the structures identified when choosing the most effective postural drainage position for a given patient. Segmental bronchi then divide into subsegmental bronchi. These bronchi are surrounded by connective tissue that contains arteries, lymphatics, and nerves. The subsegmental bronchi then branch into bronchioles, which have no cartilage in their walls. Their patency depends entirely on the elastic recoil of the surrounding smooth muscle and on the alveolar pressure.



The bronchioles contain submucosal glands, which produce mucus that covers the inside lining of the airways. The bronchi and bronchioles are lined also with cells that have surfaces covered with cilia. These cilia create a constant whipping motion that propels

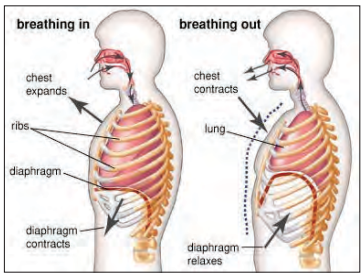
mucus and foreign substances away from the lung toward the larynx. The bronchioles then branch into terminal bronchioles, which do not have mucous glands or cilia. Terminal bronchioles then become respiratory bronchioles, which are the transitional passageways between the conducting airways and the gas exchange airways. Up to this point, the conducting airways contain about 150 mL of air in the tracheobronchial tree that does not participate in gas exchange. This is known as physiologic dead space. The respiratory bronchioles then lead into alveolar ducts and alveolar sacs and then alveoli. Oxygen and carbon dioxide exchange takes place in the alveoli.

Alveoli: The lung is made up of about 300 million alveoli, which are arranged in clusters of 15 to 20. These alveoli are so numerous that if their surfaces were united to form one sheet, it would cover 70 square meters—the size of a tennis court. There are three types of alveolar cells. Type I alveolar cells are epithelial cells that form the alveolar walls. Type II alveolar cells are metabolically active. These cells secrete surfactant, a phospholipid that lines the inner surface and prevents alveolar collapse. Type III alveolar cell macrophages are large phagocytic cells that ingest foreign matter (e.g., mucus, bacteria) and act as an important defense mechanism.

CHAPTER 3: PHYSIOLOGY OF RESPIRATION

Process of Respiration

Respiration is divided into two components, inhalation, and exhalation.

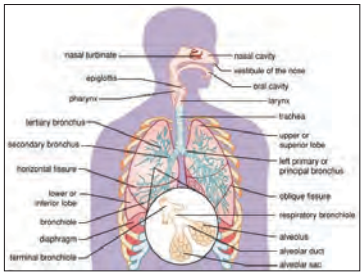


Inhalation is active because it requires muscle contraction. The major muscle of respiration is a sheet-like dome shaped muscle called the diaphragm that is located below the lungs. The diaphragm separates the chest and abdominal cavities. As the diaphragm contracts, it flattens out, moving toward the abdominal cavity. This action causes an increase in the size of the chest cavity, thus creating a vacuum. Air is then sucked in through the mouth or nose. When physical activity increases dramatically, or with some lung conditions, other muscles like those of the neck and those between the ribs also assist in the increase in size of the chest cavity. These muscles are referred to as accessory muscles of respiration.

Exhalation is passive because it does not require muscle contraction. During this phase, the expanded lung acts like a stretched rubber band and simply contracts to its resting position. This contraction forces air out of the lungs and through the mouth.

Structures involved in the respiratory system

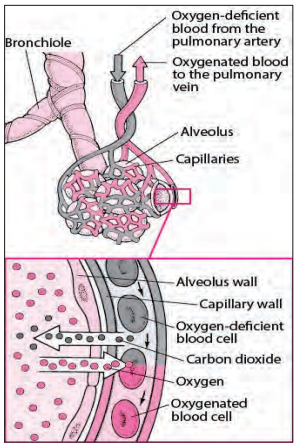
Air enters the body via the nose (preferably) or the mouth. The air enters the main windpipe, called the trachea, and continues en route to each lung via either the right or left bronchus (plural=bronchi). The lungs are separated into sections called lobes, two on the left and three on the right. The air passages continue to divide into ever smaller tubes, which finally connect with tiny air sacs called alveoli. This gradually branching array of tubes is referred to as the tracheobronchial "tree" because of the remarkable similarity to the branching pattern of a tree.



The other half of the respiratory system involves blood circulation. Venous blood from the body is returned to the right side of the heart and then pumped out via the pulmonary artery. This artery splits in two for the left and right lungs and then continues to branch much like the tracheobronchial tree. These vessels branch into a fine network of very tiny tubes called capillaries. The capillaries are situated adjacent to the alveoli and are so small that only one red blood cell at a time can pass through their openings. It is during this passage that gases are exchanged between the blood and the air in the nearby alveoli. After passing the alveoli, capillaries then join to begin forming the pulmonary veins, which carry the blood back to the left side of the heart.

Oxygen and Carbon Dioxide exchange:

The primary function of the respiratory system is to take in oxygen and eliminate carbon dioxide. Inhaled oxygen enters the lungs and reaches the alveoli. The layers of cells lining the alveoli and the surrounding capillaries are each only one cell thick and are in very close contact with each other. This barrier between air and blood averages about 1 micron (1/10,000 of a centimeter, or 0.000039 inch) in thickness. Oxygen passes quickly through this air-blood barrier into the blood in the capillaries. Similarly, carbon dioxide passes from the blood into the alveoli and is then exhaled.



Oxygenated blood travels from the lungs through the pulmonary veins and into the left side of the heart, which pumps the blood to the rest of the body. Oxygen-deficient, carbon dioxide-rich blood returns to the right side of the heart through two large veins, the superior vena cava, and the inferior vena cava. Then the blood is pumped through the pulmonary artery to the lungs, where it picks up oxygen and

releases carbon dioxide.

To support the absorption of oxygen and release of carbon dioxide, about 5 to 8 liters (about 1.3 to 2.1 gallons) of air per minute are brought in and out of the lungs, and about three tenths of a liter (about three tenths of a quart) of oxygen is transferred from the alveoli to the blood each minute, even when the person is at rest. At the same time, a similar volume of carbon dioxide moves from the blood to the alveoli and is exhaled.

Three processes are essential for the transfer of oxygen from the outside air to the blood flowing through the lungs: ventilation, diffusion, and perfusion.

- **Ventilation:** During inspiration, air flows from the environment into the trachea, bronchi, bronchioles, and alveoli. During expiration, alveolar gas travels the same route in reverse. Physical factors that govern air flow in and out of the lungs are collectively referred to as the mechanics of ventilation and include air pressure variances, resistance to air flow, and lung compliance.
- **Diffusion:** is the process by which oxygen and carbon dioxide are exchanged at the air–blood interface. The alveolar–capillary membrane is ideal for diffusion because of its large surface area and thin membrane. In the normal healthy adult, oxygen, and carbon dioxide travel across the alveolar–capillary membrane without difficulty because of differences in gas concentrations in the alveoli and capillaries.
- **Perfusion:** is the actual blood flow through the pulmonary circulation. The blood is pumped into the lungs by the right ventricle through the pulmonary artery. The pulmonary artery divides into the right and left branches to supply both lungs. These two branches divide further to supply all parts of each lung.

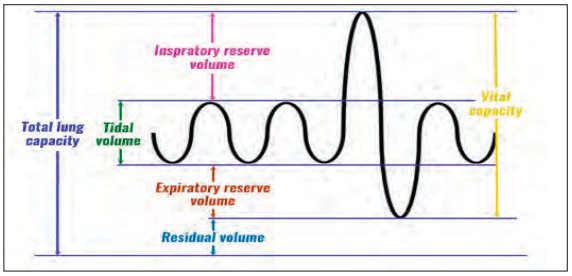
The body's circulation is an essential link between the atmosphere, which contains oxygen, and the cells of the body, which consume oxygen.

Normal Lung Volumes and Capacities:

Lung function, which reflects the mechanics of ventilation, is viewed in terms of lung volumes and lung capacities. Lung volumes are categorized as tidal volume, inspiratory reserve volume, expiratory reserve volume, and residual volume. Lung capacity is evaluated in terms of vital capacity, inspiratory capacity, functional residual capacity, and total lung capacity.

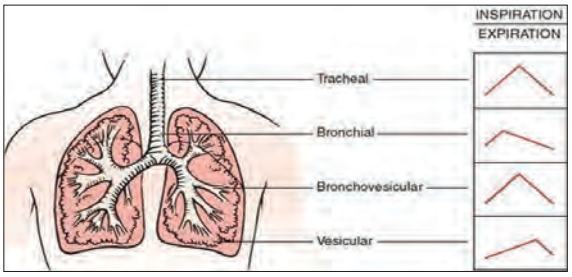
Measurement of lung volumes provides a tool for understanding normal function of the lungs as well as disease states. The breathing cycle is initiated by expansion of the chest. Contraction of the diaphragm causes it to flatten downward. If chest muscles are used, the ribs expand outward. The resulting increase in chest volume creates a negative pressure that draws air in through the nose and mouth. Normal exhalation is passive, resulting from "recoil" of the chest wall, diaphragm, and lung tissue. In normal breathing at rest, approximately one-tenth of the total lung capacity is used. Greater amounts are used as needed (i.e., with exercise). The following terms are used to describe lung volumes

- Tidal Volume (TV): The volume of air breathed in and out without conscious effort.
- Inspiratory Reserve Volume (IRV): The additional volume of air that can be inhaled with maximum effort after a normal inspiration.
- Expiratory Reserve Volume (ERV): The additional volume of air that can be forcibly exhaled after normal exhalation.
- Vital Capacity (VC): The total volume of air that can be exhaled after a maximum inhalation: VC = TV + IRV + ERV
- Residual Volume (RV): The volume of air remaining in the lungs after maximum exhalation (the lungs can never be completely emptied)
- Total Lung Capacity (TLC): = VC + RV
- Minute Ventilation: The volume of air breathed in 1 minute: (TV) (breaths/minute)

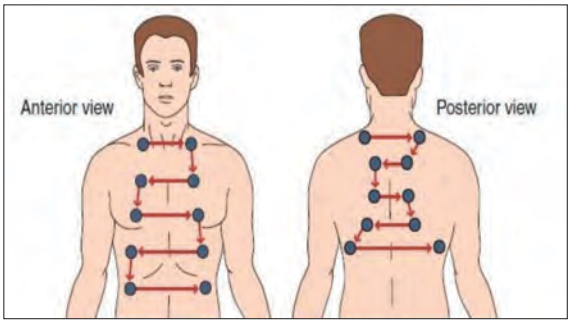


Physiological breath sounds

- **Vesicular:** Soft and low pitched, through inspiration and part of expiration. Heard over both lungs.
- **Broncho-vesicular:** Intermediate intensity and pitch, through both inspiration and expiration. Heard over 1st & 2nd intercostal space.
- **Bronchial:** Loud and high pitched, through part of inspiration and all of expiration. Heard over the sternum.
- **Tracheal:** Very loud and high pitched, through both inspiration and expiration. Heard over the neck.



Auscultation of breath sounds:



CHAPTER 4: RESPIRATORY TRACT DISEASES

Classification of Respiratory Diseases

Lung pathology is any problem in the lungs that prevents the lungs from working properly. It is broadly divided into three forms:

1. **Airway diseases** -- These diseases affect the tubes (airways) that carry oxygen and other gases into and out of the lungs. They usually cause a narrowing or blockage of the airways. Airway diseases include Asthma, COPD and Bronchiectasis. People with airway diseases often say they feel as if they're "trying to breathe out through a straw."
2. **Lung tissue diseases** -- These diseases affect the structure of the lung tissue. Scarring or inflammation of the tissue makes the lungs unable to expand fully (restrictive lung disease). This makes it hard for the lungs to take in oxygen and release carbon dioxide. People with this type of lung disorder often say they feel as if they are "wearing a too-tight sweater or vest." As a result, they can't breathe deeply. Pulmonary fibrosis and Sarcoidosis are examples of lung tissue disease. As the scarring spreads, it makes your lungs more rigid, so they're unable to expand and contract as easily as they once did. Symptoms include:

- a dry cough.
- shortness of breath.
- difficulty breathing.

3. **Lung circulation diseases** -- These diseases affect the blood vessels in the lungs. They are caused by clotting, scarring, or inflammation of the blood vessels. They affect the ability of the lungs to take up oxygen and release carbon dioxide. These diseases may also affect heart function. An example of a lung circulation disease is pulmonary hypertension. People with these conditions often feel very short of breath when they exert themselves.

This is the risk of infection screener which helps you to determine if you have any respiratory pathologies,

1. During past week, how much time did you feel short of breath?
2. Do you ever cough up any stuff like "mucus" or "phlegm"?
3. Is your physical activity reduced because of breathing difficulties?
4. Have you smoke at least 100 cigarettes in your life?
5. Is your age above 50 years?

If you answered YES to the above questions your breathing problem is due to any respiratory pathologies. Usually, mild respiratory pathologies are treated at home with proper care and guidance. Many lung diseases involve a combination of these three types.

CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Chronic obstructive pulmonary disease, or COPD, is an inflammatory chronic lung disease that leads to obstructed airflow. People with obstructive lung disease have shortness of breath due to difficulty exhaling all the air from the lungs. Because of damage to the lungs or narrowing of the airways inside the lungs, exhaled air comes out more slowly than normal. At the end of a full exhalation, an abnormally high amount of air may still linger in the lungs. It typically develops slowly, but it's progressive, meaning its symptoms worsen over time. It can cause coughing and difficulty breathing.

Two of the most common types of COPD are chronic bronchitis and emphysema. Chronic bronchitis refers to the effects on the bronchi, or large airways. Emphysema refers to the changes in the alveoli, or air sacs. Both are common with COPD, and both contribute to airflow obstruction and symptoms.

Causes of COPD: The main cause of COPD is tobacco smoking. Breathing in smoke and its chemicals can injure the airways and air sacs. This leaves you vulnerable to COPD. Exposure to secondhand smoke, environmental chemicals, and even fumes from gas burned

for cooking in poorly ventilated buildings can also lead to COPD.

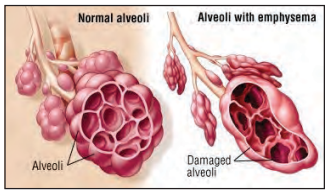
Symptoms: At first, you might not have any symptoms. But as the disease gets worse, you might notice these common signs of COPD:

- A cough that doesn't go away.
- Coughing up lots of mucus.
- Shortness of breath, especially when you're physically active.
- Wheezing or squeaking when you breathe.
- Tightness in your chest.
- Frequent colds or flu.
- Blue fingernails.
- Low energy.
- Losing weight without trying (in later stages).
- Swollen ankles, feet, or legs.

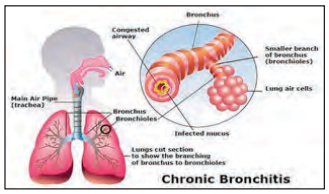
Types of COPD: COPD is an umbrella term used when you have one or more of these conditions:

- Emphysema.
- chronic bronchitis.

Emphysema damages the tiny alveoli (air sacs) at the tips of your lungs. Normally these air sacs stretch like balloons as you breathe in and out. Emphysema makes these air sacs stiff. Because they cannot stretch, air gets trapped inside them. This makes it difficult for you to breathe in and makes you feel tired.



Chronic bronchitis makes your airways red, swollen, and irritated. Glands in your airways make extra mucus (phlegm), which blocks some air from passing through. This makes you cough, cough up mucus and feel short of breath. Many people with COPD have both diseases.



Diagnosis: Doctors make a preliminary diagnosis of COPD in a person with chronic obstructive pulmonary disease symptoms by noting

- Breathing pattern.
- History of tobacco smoking or exposure to secondhand smoke.
- Exposure to air pollutants, and/or a history of lung disease (for example, pneumonia).

Other tests to diagnose COPD include:

- **Pulse oximetry** to measure the oxygen in your blood.
- **Spirometry** to see how well your lungs work.
- **Arterial blood gases (ABGs)** to check your oxygen and carbon dioxide levels.
- **Electrocardiogram (ECG or EKG)** to check heart function and rule out heart disease as a cause of shortness of breath.
- **Chest X-ray or chest CT scan** to look for lung changes that are caused by COPD.
- **Exercise testing** to determine if the oxygen level in your blood drops when you exercise.

Treatment: The best way to slow COPD is to quit smoking. This is the most important thing you can do. Quitting smoking can help stop the damage to your lungs. Your doctor can prescribe treatments that may help you manage your symptoms and feel better.

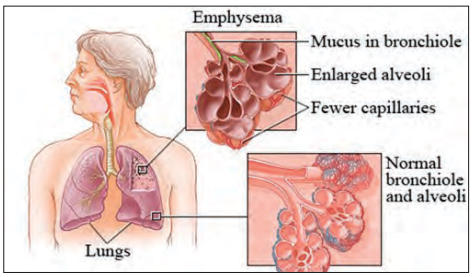
- **Medication** - Several kinds of medications are used to treat the symptoms and complications of COPD. You may take some medications on a regular basis and others as needed.
- **Bronchodilators** - Bronchodilators are medications that usually come in inhalers they relax the muscles around your airways.

This can help relieve coughing and shortness of breath and make breathing easier.

- **Inhaled steroids** - Inhaled corticosteroid medications can reduce airway inflammation and help prevent exacerbations.
- **Combination inhalers** - Some medications combine bronchodilators and inhaled steroids.
- **Oral steroids** - For people who experience periods when their COPD becomes more severe, called moderate or severe acute exacerbation, short courses of oral corticosteroids may prevent further worsening of COPD.
- **Antibiotics** - Respiratory infections, such as acute bronchitis, pneumonia, and influenza, can aggravate COPD symptoms. Antibiotics help treat episodes of worsening COPD, but they aren't generally recommended for prevention.
- **Lung therapies** - Doctors often use these additional therapies for people with moderate or severe COPD:
- **Oxygen therapy.** If there isn't enough oxygen in your blood, you may need supplemental oxygen.
- **Pulmonary rehabilitation program.** These programs generally combine education, exercise training, nutrition advice and counseling.
- **Surgery** - In severe cases of COPD, your doctor may suggest: Bullectomy: Removes bullae, large air spaces that form when air sacs collapse, Lung volume reduction surgery. Removes diseased lung tissue, Lung transplant. Replaces a diseased lung with a healthy one

EMPHYSEMA

Emphysema is a type of chronic obstructive pulmonary disease (COPD). In this condition, the air sacs in the lungs become damaged and stretched. This results in a chronic cough and difficulty breathing. Emphysema is a condition that involves damage to the walls of the air sacs (alveoli) of the lung. Alveoli are small, thin walled, very fragile air sacs located in clusters at the end of the bronchial tubes deep inside the lungs. There are about 300 million alveoli in normal lungs. As you breathe in air, the alveoli stretch, drawing oxygen in and transporting it to the blood. When you exhale, the alveoli shrink, forcing carbon dioxide out of the body.



When emphysema develops, the alveoli and lung tissue are destroyed. With this damage, the alveoli cannot support the bronchial tubes. The tubes collapse and cause an "obstruction" (a blockage), which traps air inside the lungs. Too much air trapped in the lungs can give some patients a barrel-chested appearance. Also, because there are fewer alveoli, less oxygen will be able to move into the bloodstream.

Symptoms: The key symptoms of emphysema include:

- shortness of breath, or dyspnea.
- a chronic cough that produces mucus.
- wheezing and a whistling or squeaky sound when breathing.
- tightness in the chest.

At first, a person may notice these symptoms during physical exertion. However, as the condition progresses, they can also start to happen during rest. Emphysema and COPD develop over several years.

In the later stages, a person may have:

- frequent lung infections and flare-ups.
- worsening symptoms, including shortness of breath, mucus production, and wheezing.
- weight loss and reduced appetite.
- fatigue and a loss of energy.
- blue-tinged lips or fingernail beds, or cyanosis, due to a lack of oxygen.
- anxiety and depression.

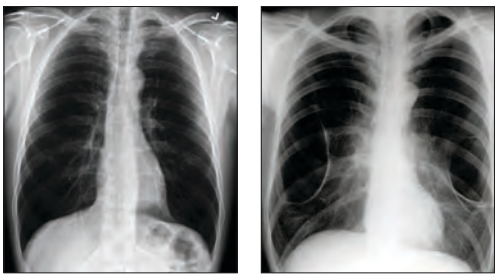
Causes: The main cause of emphysema is long-term exposure to airborne irritants, including:

- Tobacco smoke.
- Marijuana smoke.
- Air pollution.
- Chemical fumes and dust.

Rarely, emphysema is caused by an inherited deficiency of a protein that protects the elastic structures in the lungs. It's called alpha-1-antitrypsin deficiency emphysema.

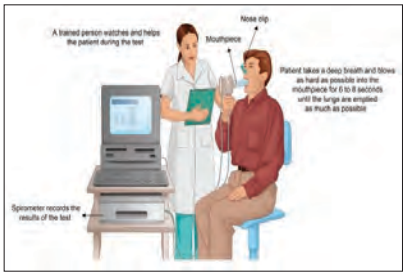
How is emphysema diagnosed?

The diagnosis of emphysema cannot be made solely on symptoms. Several tests are used to make the diagnosis. One simple test is to tap on your chest and listen with a stethoscope for a hollow sound. This means that air is being trapped in your lungs. Other tests include:



X-rays: X-rays are generally not useful for detecting early stages of emphysema. However, X-rays can help diagnose moderate or severe cases. Either a plain chest X-ray or a CAT (computer-aided tomography) scan can be used. Once the test is completed, the readings are compared to X-rays of healthy or normal lungs

Pulse oximetry: This test is also known as an oxygen saturation test. Pulse oximetry is used to measure the oxygen content of the blood. This is done by attaching the monitor to a person's finger, forehead, or earlobe.



Spirometry and pulmonary function tests (PFT): This are one of the most useful tests to determine airway blockage. A spirometry or PFT tests the lungs' volume by measuring airflow while a patient inhales and exhales. This test is done by taking a deep breath and then blowing into a tube that is hooked up to a specialized machine. These tests are compared to normal results from people of similar gender, age, height, weight, and ethnic background.

Arterial blood gas: This test measures the amount of oxygen and carbon dioxide in blood from an artery. It is a test often used as emphysema worsens. It is especially helpful in determining if a patient needs extra oxygen.

Electrocardiogram (ECG): ECGs check heart function and are used to rule out heart disease as a cause of shortness of breath.

Treatments: Treatment cannot cure emphysema, but it can help slow the progress of the condition, manage the symptoms, prevent complications, boost a person's overall health and well-being

- **Supportive therapy** includes oxygen therapy and help with quitting smoking.
- **Pulmonary rehabilitation.** A pulmonary rehabilitation program can teach you breathing exercises and techniques that may help reduce your breathlessness and improve your ability to exercise.
- **Nutrition therapy.** You'll also receive advice about proper nutrition. In the early stages of emphysema, many people need to lose weight, while people with late-stage emphysema often need to gain weight.
- **Supplemental oxygen.** If you have severe emphysema with low blood oxygen levels, using oxygen regularly at home and when you exercise may provide some relief. Many people use oxygen 24 hours a day. It's usually administered via narrow tubing that fits into your nostrils.
- **Drug therapies:** The main medications for emphysema are inhaled bronchodilators, which can help relieve symptoms. They relax and open the airways, making it easier for a person to breathe. The inhaler delivers the following bronchodilators: Beta-agonists, which relax bronchial smooth muscle and help clear mucus, Anticholinergics, or anti-muscarinic, such as albuterol (Ventolin), which relax bronchial smooth muscle, Inhaled steroids, such as fluticasone, which help reduce inflammation.
- **Lifestyle therapies:** People can take steps to manage their symptoms, improve their quality of life, and slow the progression

of emphysema. The sooner a person takes these steps, the more helpful they will be.

Some things to try including:

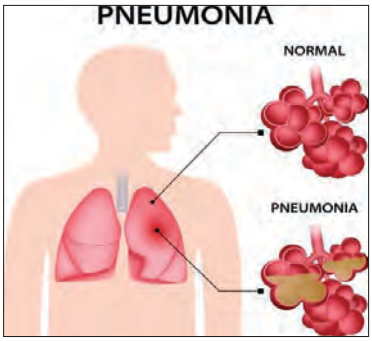
- quitting or avoiding smoking.
- avoiding places where there are air pollutants, if possible.
- following or developing an exercise program.
- consuming a healthful diet.
- drinking plenty of water, to loosen mucus and help keep the airways open.
- breathing through the nose in cold weather or using a face covering to keep out cold air.
- practicing diaphragmatic breathing, pursed-lip breathing, and deep breathing.

PNEUMONIA:

It is an infection that inflames the air sacs in one or both lungs. The air sacs may fill with fluid or pus (purulent material), causing cough with phlegm or pus, fever, chills, and difficulty breathing. A variety of organisms, including bacteria, viruses, and fungi, can cause pneumonia.

Pneumonia can range in seriousness from mild to life-threatening. It is most serious for infants and young children, people older than age 65, and people with health problems or weakened immune systems.

What causes pneumonia? There are more than 30 different causes of pneumonia, and they're grouped by the cause. The main types of pneumonia are:



- **Bacterial pneumonia.** This type is caused by various bacteria. The most common is Streptococcus pneumoniae. It usually occurs when the body is weakened in some way, such as by illness, poor nutrition, old age, or impaired immunity, and the bacteria can work their way into the lungs. Bacterial pneumonia can affect all ages, but you are at greater risk if you abuse alcohol, smoke cigarettes, are debilitated, have recently had surgery, had a respiratory disease or viral infection, or had a weakened immune system.
- **Viral pneumonia.** This type is caused by various viruses, including the flu (influenza), and is responsible for about one-third of all pneumonia cases. You may be more likely to get bacterial pneumonia if you have viral pneumonia.
- **Mycoplasma pneumonia.** This type has somewhat different symptoms and physical signs and is referred to as atypical pneumonia. It is caused by the bacterium Mycoplasma pneumoniae. It generally causes a mild, widespread pneumonia that affects all age groups.
- **Other pneumonias.** There are other less common pneumonias that may be caused by other infections including fungi.

Signs and symptoms of pneumonia: The symptoms of bacterial pneumonia include:

- Bluish color to lips and fingernails.
- Confused mental state or delirium, especially in older people.
- Cough that produces green, yellow, or bloody mucus.
- Fever.
- Heavy sweating.
- Loss of appetite.
- Low energy and extreme tiredness.
- Rapid breathing.
- Rapid pulse.
- Shaking chills.

- Sharp or stabbing chest pain that's worse with deep breathing or coughing.
- Shortness of breath that gets worse with activity.

Early symptoms of viral pneumonia are the same as those of bacterial pneumonia, which may be followed by:

- Headache.
- Increasing shortness of breath.
- Muscle pain.
- Weakness.
- Worsening of the cough.

How is pneumonia diagnosed? Your doctor will listen to your lungs with a stethoscope. If you have pneumonia, your lungs may make crackling, bubbling, and rumbling sounds when you inhale.

Diagnostic Tests: If your doctor suspects you may have pneumonia, they will probably recommend some tests to confirm the diagnosis and learn more about your infection. These may include,

Blood tests to confirm the infection and to try to identify the germ that is causing your illness.

Chest X-ray to look for the location and extent of inflammation in your lungs.

Pulse oximetry to measure the oxygen level in your blood. Pneumonia can prevent your lungs from moving enough oxygen into your bloodstream.

Sputum test on a sample of mucus (sputum) taken after a deep cough, to look for the source of the infection.

If you are considered a high-risk patient because of your age and overall health, or if you are hospitalized, the doctors may want to do some additional tests, including:

CT scan of the chest to get a better view of the lungs and look for abscesses or other complications.

Arterial blood gas test, to measure the amount of oxygen in a blood sample taken from an artery, usually in your wrist. This is more accurate than the simpler pulse oximetry.

Pleural fluid culture, which removes a small amount of fluid from around tissues that surround the lung, to analyze and identify bacteria causing the pneumonia.

Bronchoscopy, a procedure used to investigate the lungs' airways. If you are hospitalized and your treatment is not working well, doctors may want to see whether something else is affecting your airways, such as a blockage. They may also take fluid samples or a biopsy of lung tissue.

Treatment: How pneumonia is treated depends on the germs that cause it.

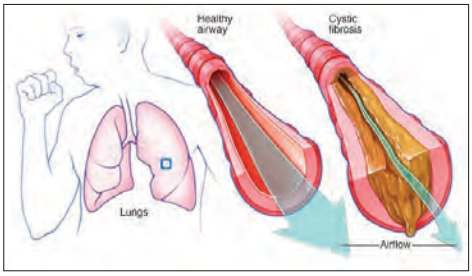
- **Bacterial pneumonia:** Bacterial pneumonia is usually treated with antibiotics. The specific antibiotic choice depends on such factors as your general health, other health conditions you may have, the type of medications you are currently taking (if any), & your recent use of antibiotics. Medicines to relieve pain and lower fever may also be helpful. It's important to be able to cough to clear your lungs.

- **Viral pneumonia:** Antibiotics are not used to fight viruses. (In some cases, antibiotics may be given to fight a bacterial infection that is also present.) There are no treatments for most viral causes of pneumonia. However, if the flu virus is thought to be the cause, antiviral drugs might be prescribed, such to decrease the length and severity of the illness. Over-the-counter medicines to relieve pain and lower fever are usually recommended. Other medicines and therapies such as breathing treatments and exercises to loosen mucus may be prescribed by your doctor.
- **Fungal pneumonia:** Antifungal medication is prescribed if a fungus is the cause of your pneumonia.

Physiotherapy Management:

- Poor gas exchange in affected regions - deep breathing, positioning.
- Pain, due to coughing or pleuritis - relaxation, supported cough.
- Retained secretions can be present. Need to assess carefully - airway clearance techniques such as coughing, huffing, and active cycle breathing techniques, increase mobility to tolerance.
- Decreased mobility - bed exercises; gradually increase mobility to tolerance and as their condition permits; position upright as soon as possible.
- Exercise to improve swallowing in patients with dysphagia - A suprahyoid muscle strengthening exercise program is effective in restoring oral feeding in some patients with swallowing difficulties due to abnormal upper esophageal sphincter opening. Perform these exercises in the supine position:
    - Perform 3 sustained head raisings for 1 minute and follow by a 1-minute rest period.
    - Perform 30 consecutive repetitions of head raising.
- The head should be raised high and forward enough that the you could see your toes without lifting the shoulders off the bed. Respiratory physiotherapy is an adjunct commonly used in the treatment of pneumonia. However, these techniques are commonly used to aid airway clearance and improve the rate of breathing.

CYSTIC FIBROSIS:



Cystic fibrosis (CF) is an inherited disorder that causes severe damage to the lungs, digestive system, and other organs in the body. cystic fibrosis affects the cells that produce mucus, sweat and digestive juices. These secreted fluids are normally thin and slippery. But in people with CF, a defective gene causes the secretions to become sticky and thick. This abnormal mucus can clog the airways, leading to severe problems with breathing and bacterial infections in the lungs. These infections cause chronic coughing, wheezing, and inflammation. Over time, mucus buildup and infections result in permanent lung damage, including the formation of scar tissue (fibrosis) and cysts in the lungs.

Causes: In cystic fibrosis, a defect (mutation) in a gene the cystic fibrosis transmembrane conductance regulator (CFTR) gene changes a protein that regulates the movement of salt in and out of cells. The result is thick, sticky mucus in the respiratory, digestive, and reproductive systems, as well as increased salt in sweat. Many different defects can occur in the gene. The type of gene mutation is associated with the severity of the condition. Children need to inherit one copy of the gene from each parent to have the disease. If children inherit only one copy, they won't develop cystic fibrosis. However, they will be carriers and could pass the gene to their own children.

Signs and Symptoms: The signs and symptoms of cystic fibrosis (CF) vary from person to person and over time. Sometimes the kid will have few symptoms. Other times, symptoms may become more severe. One of the first signs of CF that parents may notice is that their baby's skin tastes salty when kissed, or the baby doesn't pass stool when first born. Most of the other signs and symptoms of CF happen later. They're related to how CF affects the respiratory, digestive, or reproductive systems of the body.

Respiratory signs and symptoms: The thick and sticky mucus associated with cystic fibrosis clogs the tubes that carry air in and out of your lungs. This can cause signs and symptoms such as:

- A persistent cough that produces thick mucus (sputum).
- Wheezing.
- Exercise intolerance.
- Repeated lung infections.
- Inflamed nasal passages or a stuffy nose.
- Recurrent sinusitis.

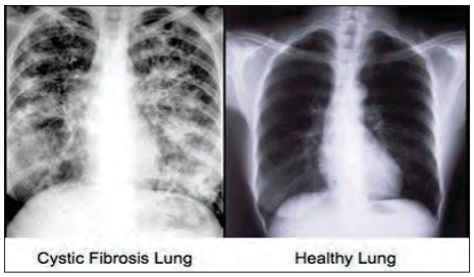
Digestive signs and symptoms: The thick mucus can also block tubes that carry digestive enzymes from your pancreas to your small intestine. Without these digestive enzymes, your intestines can't completely absorb the nutrients in the food you eat. The result is often:

- Foul-smelling, greasy stools.
- Poor weight gain and growth.
- Intestinal blockage, particularly in newborns (meconium ileus).
- Chronic or severe constipation, which may include frequent straining while trying to pass stool, eventually causing part of the rectum to protrude outside the anus (rectal prolapse)

Diagnosis: Newborn screening tests catch most cases of CF. If the screening test is positive, or if a child has cystic fibrosis symptoms, doctors do a painless sweat test. They collect sweat from an area of skin (usually the forearm) to see how much chloride is in it. People with CF have higher levels of chloride. Most children with CF are diagnosed by the time they're 2 years old. But someone with a mild form may not be diagnosed until they are a teen.

Other Tests: If you or your child has CF, your doctor may recommend other tests, such as:

- Genetic tests to find out what type of CFTR defect is causing your CF.
- A chest x ray. This test creates pictures of the structures in your chest, such as your heart, lungs, and blood vessels. A chest x ray can show whether your lungs are inflamed or scarred, or whether they trap air.
- A sinus x ray. This test may show signs of sinusitis, a complication of CF.
- Lung function tests. These tests measure how much air you can breathe in and out, how fast you can breathe air out, and how well your lungs deliver oxygen to your blood.
- A sputum culture. For this test, your doctor will take a sample of your sputum (spit) to see whether bacteria are growing in it. If you have bacteria called mucoid Pseudomonas, you may have more advanced CF that needs aggressive treatment.



Treatment: Although there's no cure for cystic fibrosis, there are various treatments available that may help relieve symptoms and reduce the risk of complications.

Medications

- Antibiotics may be prescribed to get rid of a lung infection and to prevent another infection from occurring in the future. They're usually given as liquids, tablets, or capsules. In more severe cases, injections or infusions of antibiotics can be given intravenously (through a vein).
- Mucus-thinning medications make the mucus thinner and less sticky. They also help you to cough up the mucus, so it leaves the lungs. This significantly improves lung function.
- Nonsteroidal anti-inflammatory drugs (NSAIDs) have a limited role as an agent to reduce airway inflammation.
- Bronchodilators relax the muscles around the tubes that carry air to the lungs, which helps increase airflow. You can take this medication through an inhaler or a nebulizer.
- Cystic fibrosis transmembrane conductance regulator (CFTR) modulators are a class of drugs that act by improving the

function of the defective CFTR gene.

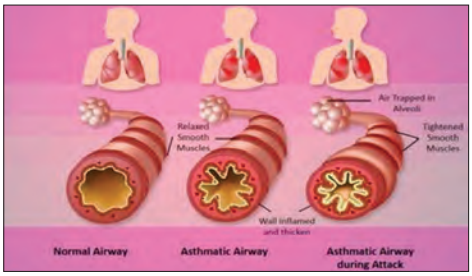
Physiotherapy Management:

- Poor gas exchange in affected regions - deep breathing with inspiratory hold, positioning, ensure to use oxygen adequately.
- Pain, if atelectasis is due to surgery or trauma - coordinate treatment with pain medication if indicated; support painful area with pillows; and positioning during deep breathing and coughing
- Decreased mobility - bed exercises; gradually increase mobility to tolerance.
- Retained secretions can be present - airway clearance techniques such as coughing, huffing, active cycle breathing techniques , increase mobility to tolerance as soon as able.

ASTHMA

Asthma is a condition in which your airways narrow and swell and may produce extra mucus. This can make breathing difficult and trigger coughing, a whistling sound (wheezing) when you breathe out and shortness of breath.

What's an asthma attack? When you breathe normally, muscles around your airways are relaxed, letting air move easily. During an asthma attack, three things can happen:



- Bronchospasm: The muscles around the airways constrict (tighten). When they tighten, it makes the airways narrow. Air cannot flow freely through constricted airways.
- Inflammation: The airway linings become swollen. Swollen airways don't let as much air in or out of the lungs.
- Mucus production: During the attack, your body creates more mucus. This thick mucus clogs airways.

Causes: It isn't clear why some people get asthma and others don't, but it's probably due to a combination of environmental and inherited (genetic) factors.

Asthma triggers: Exposure to various irritants and substances that trigger allergies (allergens) can trigger signs and symptoms of asthma. Asthma triggers are different from person to person and can include:

- Airborne allergens, such as pollen, dust mites, mold spores, pet dander or particles of cockroach waste.
- Respiratory infections, such as the common cold.
- Physical activity.
- Cold air.
- Air pollutants and irritants, such as smoke.
- Certain medications, including beta blockers, aspirin, and nonsteroidal anti-inflammatory drugs, such as ibuprofen (Advil, Motrin IB, others) and naproxen sodium (Aleve).
- Strong emotions and stress.
- Sulfites and preservatives added to some types of foods and beverages, including shrimp, dried fruit, processed potatoes, beer, and wine.
- Gastroesophageal reflux disease (GERD), a condition in which stomach acids back up into your throat.

Asthma symptoms: People with asthma usually have obvious symptoms. These symptoms resemble many respiratory infections:

- Chest tightness, pain, or pressure.
- Coughing (especially at night).
- Shortness of breath.
- Wheezing.

With asthma, you may not have all these symptoms. You may have different signs at different times. And symptoms can change between asthma attacks.

Physical exam: Your doctor will perform a physical exam to rule out other possible conditions, such as a respiratory infection or chronic obstructive pulmonary disease (COPD).

Tests to measure lung function: You may be given lung function tests to determine how much air moves in and out as you breathe. These tests may include:

- **Spirometry.** This test estimates the narrowing of your bronchial tubes by checking how much air you can exhale after a deep breath and how fast you can breathe out.
- **Peak flow.** A peak flow meter is a simple device that measures how hard you can breathe out. Lower than usual peak flow readings are a sign that your lungs may not be working as well and that your asthma may be getting worse.

Additional tests: Other tests to diagnose asthma include:

- **Methacholine challenge:** Methacholine is a known asthma trigger. When inhaled, it will cause your airways to narrow slightly. If you react to the methacholine, you likely have asthma. This test may be used even if your initial lung function test is normal.
- **Imaging tests.** A chest X-ray can help identify any structural abnormalities or diseases (such as infection) that can cause or aggravate breathing problems.
- **Allergy testing.** Allergy tests can be performed by a skin test or blood test. They tell you if you're allergic to pets, dust, mold, or pollen.
- **Nitric oxide test.** This test measures the amount of the gas nitric oxide in your breath. When your airways are inflamed a sign of asthma you may have higher than normal nitric oxide levels.
- **Sputum eosinophils.** This test looks for certain white blood cells (eosinophils) in the mixture of saliva and mucus (sputum) you discharge during coughing.
- **Provocative testing for exercise and cold-induced asthma.** In these tests, your doctor measures your airway obstruction before and after you perform vigorous physical activity or take several breaths of cold air.

Treatment: Prevention and long-term control are key to stopping asthma attacks before it starts. Treatment usually involves learning to recognize your triggers, taking steps to avoid triggers, and tracking your breathing to make sure your medications are keeping symptoms under control.

Medications

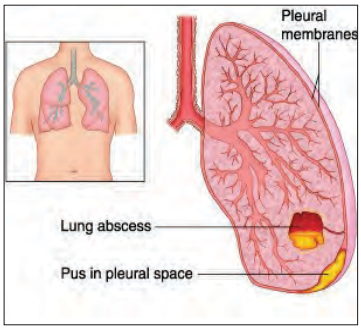
- **Anti-inflammatory medicines:** These medicines reduce swelling and mucus production in your airways. They make it easier for air to enter and exit your lungs
- **Bronchodilators:** These medicines relax the muscles around your airways. The relaxed muscles let the airways move air. They also let mucus move more easily through the airways. These medicines relieve your symptoms when they happen.
  You can take asthma medicines in several different ways. You may breathe in the medicines using a metered-dose inhaler, nebulizer, or other inhaler.
- **Allergy shots (immunotherapy):** Over time, allergy shots gradually reduce your immune system reaction to specific allergens. You generally receive shots once a week for a few months, then once a month for a period of three to five years.

Alternative medicine

- Certain alternative treatments may help with asthma symptoms. **Breathing exercises.** These exercises may reduce the amount of medication you need to keep your asthma symptoms under control.
- **Herbal and natural remedies.** A few herbal and natural remedies that may help improve asthma symptoms include black seed, caffeine, choline and pycnogenol.

- Many people think they can skip their asthma preventer medications when they don't feel any symptoms that's not true. Asthma is a chronic (long-term) disease. If you have asthma, you have it all the time, even when you don't feel symptoms. You must manage your asthma every day, not just on days when you feel symptoms.

EMPYEMA



It is a condition that affects the space between the outermost layer of the lungs and the layer touching the chest wall, known as the pleural space. This space exists to help the lungs expand and contract.

The pleural space naturally contains a small amount of fluid. Empyema is a collection of pus caused by an infection that spreads from the lung and leads to an accumulation of pus in the pleural space, the infected fluid can build up to a quantity of a pint or more, which puts pressure on the lungs, causing shortness of breath and pain. Risk factors include recent lung conditions like bacterial pneumonia, lung abscess, thoracic surgery, trauma, or injury to the chest.

Causes: You can get empyema through bacterial or fungal infections.

- Bacterial infections: You can get empyema by being exposed to various types of bacteria, such as Streptococcus aureus and Pseu domonas, which are particularly common if you get an infection at the hospital. The bacteria cause inflammation, which causes more fluid to be produced in the pleural cavity. As time goes on, bacteria and other microorganisms create an empyema by taking over the fluid. After the infection goes away, your lung tissue may stiffen and become hard in a process known as fibrosis. This will make it more difficult for your lungs to work properly. That's why empyema needs to be diagnosed and treated as soon as possible.
- Fungal infections. Fungal empyema is rare and associated with higher mortality. The most common type of fungus associated with this kind of infection is the Candida species.

Symptoms: Symptoms of empyema may include:

- having a case of pneumonia that does not improve.
- a fever.
- chest pain.
- a cough.
- pus in mucus.
- difficulty breathing.
- a crackling sound from the chest.
- decreased breathing sounds.
- dullness when tapping chest.
- fluid in the lungs (visible with a chest X-ray).

Empyema can progress through three stages if a person does not receive treatment.

Stage 1: Simple (the exudative phase) The first stage of empyema is called simple empyema. It occurs when extra fluid begins to build up in the pleural cavity. This fluid can become infected and may contain pus.

Stage 2: Complicated (the fibrinopurulent phase) In complicated empyema, the fluid in the pleural cavity begins to thicken and form "pockets."

Stage 3: Frank (the organizing phase) Finally, the infected fluid causes scarring to the inner layers that line the pleural cavity in the lungs. This causes difficulty breathing as it stops the lungs from inflating properly.

Diagnosis

- **Chest CT scan** uses a combination of X-rays and computer technology to produce horizontal, or axial, images of any part of the body, including the bones, muscles, fat, and organs.
- **Chest X-ray** uses invisible radiation energy beams to produce images of internal tissues, bones, and organs on film or digital media.
- **Thoracentesis,** where a needle is inserted through the back of the ribcage into the pleural space to remove fluid or air.
- **Pleural fluid analysis** examines the fluid under a microscope to look for bacteria, protein, and cancer cells.
- **Ultrasound** uses sound waves to tell where the fluid is located.

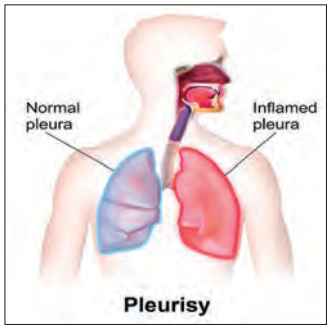
Treatment

The goal of treating empyema is to remove the infection from the lung and cure the infection. Your doctor will prescribe antibiotics to get rid of the infection and use a chest tube to drain the pus.

- **Minimally Invasive Surgery**
  - Percutaneous thoracentesis can be used if the empyema is very early with just thin fluid. A needle is inserted into the pleural space to drain fluid.
  - Thoracostomy: After providing your sedation and injecting a local anesthetic into your ribcage where the fluid is located, your physician will insert a plastic tube into your chest between two ribs, connect the tube to a suction device and remove the fluid. Special medicines can be injected to help the fluid drain.
  - Video-assisted thoracic surgery (VATS), a minimally invasive procedure that involves the insertion of a thoracoscope (a tiny camera) and surgical instruments into three small incisions without any spreading of the ribs. This operation is performed under anesthesia in the operating room. The surgeon can remove restricting tissue around the lung, insert a drainage tube or apply medicine to reduce fluid accumulation.
  - Open decortication: if required, is a surgical procedure to peel away the scar peel that formed on the lung so it can re-expand. This can prevent permanent disability.

PLEURISY (PLEURITIS)

Pleurisy describes the chest pain syndrome characterized by a sharp chest cavity pain that worsens with breathing. It is caused by inflammation of the linings around the lungs (the pleura), a condition also known as pleuritis. There are two layers of pleura: one covering the lung (termed the visceral pleura) and the other covering the inner wall of the chest (the parietal pleura). These two layers are lubricated by pleural fluid.



Pleurisy

Symptoms of pleurisy: The chief symptom associated with pleurisy is a sharp, stabbing pain when you breathe. This pain might go away when you hold your breath or put pressure on the painful area. However, the pain will often get worse when you sneeze, cough, or move. Fever, chills, and loss of appetite are also possible symptoms, depending on the condition that's causing the pleurisy.

Additional symptoms of pleurisy include:

- pain on one side of your chest.
- pain in your shoulders and back.
- shallow breathing to avoid feeling pain.
- headaches.
- joint pain.
- muscle aches.
- shortness of breath.

What causes pleurisy?

Viral infections are the most common cause of pleurisy. Viruses can cause infections in the lungs, which can lead to pleurisy. Other causes of pleurisy include:

- bacterial pneumonia.
- bronchitis.
- tuberculosis.
- chest wounds.
- rib fractures.
- blunt trauma to the chest wall.
- chest or lung tumors.
- blood clots in the arteries of your lung, also called pulmonary emboli.
- immune system disorders, such as systemic lupus and rheumatoid arthritis.
- sickle cell anemia.
- heart surgery complications.
- lung cancer.
- lymphoma.
- mesothelioma, which is a cancer caused by asbestos exposure.
- fungal or parasitic infections.

Diagnosis: Doctors use a medical history and several tests to evaluate for pleurisy. These tests include:

- Biopsy: In some cases, a doctor will take a small sample of lung tissue to determine whether cancer or tuberculosis is present.
- Blood test: Doctors use blood tests to look for signs of infection or autoimmune disorders such as lupus or rheumatoid arthritis.
- Electrocardiogram (EKG or ECG): This test uses small electrodes placed on the chest to measure the heart's electrical activity. It helps doctors rule out problems or defects of the heart.
- Imaging tests: Imaging tests such as X-rays, CT scans and ultrasounds allow your doctor to see abnormalities in the pleural space, including air, gas, or a blood clot.
- Physical exam: Listening to your lungs with a stethoscope allows your doctor to hear a rubbing sound in your lungs that may be a sign of pleurisy.
- Fluid extraction (thoracentesis): A doctor inserts a small needle into the pleural space and removes fluid to look for signs of infection or other causes of pleurisy.

Treatment:

To treat your pleurisy, the right way, your doctor needs to know what's causing it:

- If it is caused by a bacterium, antibiotics can make you better.
- If it's a fungus, they will give you an antifungal drug.
- If it's a virus, you'll get better on your own in a few days or weeks.

Some people with pleurisy have too much fluid built up between their two layers of pleura.

Thoracentesis: Draining the pleural space. Doctors remove air, blood, or fluid from the pleural space. Depending on how much of the substance needs to be drained, they use a needle and syringe or a chest tube to suction fluid out of the area.

Radiation treatment or chemotherapy: In some cases, doctors use cancer treatments to shrink tumors that cause pleurisy.

Complications: Some people with pleurisy experience complications. They include:

- Hemothorax: Blood builds up in the pleural space.
- Pleural effusion: Too much fluid collects in the pleural space. Pleural effusion can cause difficulty in breathing.

- Severe illness from not treating the infection or condition that caused pleurisy in the first place.

PLEURAL EFFUSION

Pleural effusion, sometimes referred to as "water on the lungs," is the build-up of excess fluid between the layers of the pleura outside the lungs. The pleura are thin membranes that line the lungs and the inside of the chest cavity and act to lubricate and facilitate breathing.

Causes pleural effusion: Depending on the cause, the excess fluid may be either protein-poor (transudative) or protein-rich (exudative). These two categories help physicians determine the cause of the pleural effusion.

The most common causes of transudative (watery fluid) pleural effusions include:

- Heart failure.
- Pulmonary embolism.
- Cirrhosis.
- Post open heart surgery.

Exudative (protein-rich fluid) pleural effusions are most caused by:

- Pneumonia.
- Cancer.
- Pulmonary embolism.
- Kidney disease.
- Inflammatory disease.

Other less common causes of pleural effusion include:

- Tuberculosis.
- Autoimmune disease.
- Bleeding (due to chest trauma).
- Chylothorax (due to trauma).
- Rare chest and abdominal infections.
- Asbestos.
- Pleural effusion (due to exposure to asbestos).
- Meigs's syndrome (due to a benign ovarian tumor).
- Ovarian hyperstimulation syndrome.

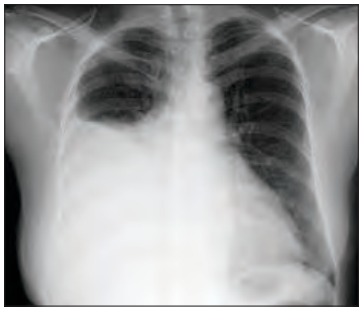
Symptoms of pleural effusion: Some patients with pleural effusion have no symptoms, with the condition discovered on a chest x-ray that is performed for another reason. The patient may have unrelated symptoms due to the disease or condition that has caused the effusion. Symptoms of pleural effusion include:

- Chest pain.
- Dry, non-productive cough.
- Dyspnea (shortness of breath, or difficult, labored breathing).
- Orthopnea (the inability to breathe easily unless the person is sitting up straight or standing erect).

Diagnosis: The tests most used to diagnose and evaluate pleural effusion include:

- **Chest x-ray:** Pleural effusions appear white on X-rays, while air space looks black. If a pleural effusion is likely, you may get more X-ray films while you lie on your side. These can show if the fluid flows freely within the pleural space.

- Computed tomography (CT) scan of the chest.
- Ultrasound of the chest.
- Thoracentesis (a needle is inserted between the ribs to remove a biopsy, or sample of fluid).
- Pleural fluid analysis (an examination of the fluid removed from the pleura space).

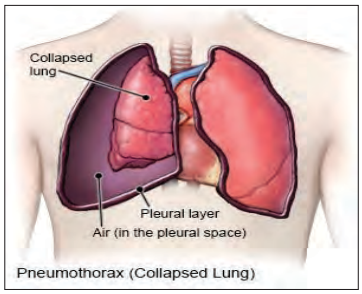


Treatment: Treatment of pleural effusion is based on the underlying condition and whether the effusion is causing severe respiratory symptoms, such as shortness of breath or difficulty breathing.

- **Medicines.** You would get antibiotics if the reason of your pleural effusion is pneumonia or some infection. You may also be given steroids or nonsteroidal anti-inflammatory drugs (NSAIDs) to relieve pain and reduce inflammation or swelling. Diuretics and other heart failure medications are used to treat pleural effusion caused by congestive heart failure or other medical causes.
- **Chemotherapy, Radiation therapy:** A malignant effusion may require chemotherapy or radiation therapy.
- **Draining the fluid.** Thoracentesis may be used to drain extra fluid around the lungs. Your doctor will insert a hollow needle between the ribs into the pleural cavity. The needle is used to remove the fluid. The fluid can also be drained through a chest tube called tube thoracostomy.
- **Surgery.** Surgery is often used to treat malignant pleural effusion. Pleurodesis may be done if the fluid builds up in the pleural cavity again after thoracentesis. It is often done using video-assisted thoracoscopic surgery (VATS), which uses a thoracoscope with a video camera. During pleurodesis, your surgeon places a tube into the pleural cavity to drain the extra fluid.

PNEUMOTHORAX

Pneumothorax is the medical term for a collapsed lung. Pneumothorax occurs when air enters the space around your lungs (the pleural space). Air can find its way into the pleural space when there's an open injury in your chest wall or a tear or rupture in your lung tissue, disrupting the pressure that keeps your lungs inflated. The pressure of this air causes the lung to collapse on itself. The lung may fully collapse, but most often only a part of it collapses. This collapse can also put pressure on the heart, causing further symptoms.



Pneumothorax (Collapsed Lung)

Pneumothorax Causes and Risk Factors: You can get pneumothorax several ways. Causes include,

- **Lung disease:** Tissue that's damaged is more likely to tear, allowing air to leak out. This is especially true with chronic obstructive pulmonary disease (COPD).
- **Injury:** A broken rib, knife wound, or gunshot wound can puncture your lung. In severe cases, the escaping air can build up pressure on your lung and heart, which might cause life-threatening problems such as loss of blood pressure.
- **Mechanical ventilation.** This machine that helps you breathe creates uneven pressure in your chest. As a result, your lung might collapse.
- **Air blisters.** Sacs full of air, called blebs, may form on the outside of your lung, and then burst, creating pressure. This happens most often with tall men who are younger than 40 and who smoke.
- **Your period.** It's rare, but cysts could form inside your chest. Within about 3 days before or after the start your period, the cysts release blood between the lung and chest.

Symptoms of a pneumothorax: The symptoms of a traumatic pneumothorax often appear at the time of chest trauma or injury, or shortly afterward. The onset of symptoms for a spontaneous pneumothorax normally occurs at rest. A sudden attack of chest pain is often the first symptom. Other symptoms may include:

- a steady ache in the chest.
- shortness of breath, or dyspnea.
- breaking out in a cold sweat.

- tightness in the chest.
- turning blue, or cyanosis.
- severe tachycardia, or a fast heart rate.

Types of Pneumothorax: There are several types of pneumothorax like you could have one or more at the same time: Simple, in which the tissues and organs between your lungs aren't moved around.

- **Primary spontaneous** when it happens without any clear cause.
- **Secondary spontaneous** or disease-related.
- **Tension,** when air continues to enter the space between your lung and your chest wall, raising pressure in your chest.
- **Traumatic** or injury-related.

Diagnosing pneumothorax: Diagnosis is based on the presence of air in the space around the lungs. A stethoscope may pick up changes in lungs sounds but detecting a small pneumothorax can be difficult. Some imaging tests may be hard to interpret due to the air's position between the chest wall and lung.

Imaging tests commonly used to diagnose pneumothorax include:

- an upright posteroanterior chest radiograph.
- a CT scans.
- a thoracic ultrasound.

Treatment: The goal in treating a pneumothorax is to relieve the pressure on your lung, allowing it to re-expand. The methods for achieving these goals depend on the severity of the lung collapse and sometimes on your overall health.

- **Observation** - If only a small portion of your lung is collapsed, your doctor may simply monitor your condition with a series of chest X-rays until the excess air is completely absorbed and your lung has re-expanded. This may take several weeks.
- **Needle aspiration** - If a larger area of your lung has collapsed, it's likely that a needle or chest tube will be used to remove the excess air. A hollow needle with a small flexible tube (catheter) is inserted between the ribs into the air-filled space that's pressing on the collapsed lung. Then the doctor removes the needle, attaches a syringe to the catheter and pulls out the excess air. The catheter may be left in for a few hours to ensure the lung is re-expanded and the pneumothorax does not recur.
- **Chest tube insertion.** A flexible chest tube is inserted into the air-filled space and may be attached to a one-way valve device that continuously removes air from the chest cavity until your lung is re-expanded and healed.
- **Autologous blood patch** - Your doctor can take blood from your arm and put it into your chest through a tube. This makes a patch on your lung that stops air leaks.
- **Surgery** - Sometimes surgery may be necessary to close the air leak. In most cases, the surgery can be performed through small incisions, using a tiny fiber-optic camera and narrow, long-handled surgical tools. The surgeon will look for the leaking area or ruptured air blister and close it off.

How to prevent pneumothorax? Anyone can take steps to reduce your chances of collapsed lung:

- Stop smoking.
- Avoid or limit activities with drastic changes in air pressure (scuba diving and flying). Follow your provider's recommendations if you do these activities.

HEMOTHORAX

A hemothorax is defined as the accumulation of blood between the membranes lining the lungs (the pleura). The most common cause is trauma, but heart and lung surgery, cancer, lung infections, or even excess doses of blood thinners may also be responsible.

Hemothorax symptoms: The symptoms of hemothorax can vary. Among the symptoms are:

- Anxiety.

- Chest pain.
- Low blood pressure.
- Pale and cold skin.
- Accelerated heart rate.
- Quick and shallow breathing.
- Restlessness.
- Difficulty breathing.

Causes: There are many possible causes of a hemothorax, and depending on the cause, the blood may originate from the lungs, the heart, the chest wall, or the large blood vessels present in the chest. Some of these include:

- Trauma to the chest.
- Emphysema.
- Lung cancer.
- Pleural mesothelioma, (a cancer that involves the pleura).
- Cancers that are metastatic (spread) to the lung such as breast cancer and colon cancer.
- Chest surgery (most commonly following lung and heart surgery).
- Biopsy of lung masses.
- Lung infections such as tuberculosis.

How is hemothorax diagnosed?

The specialist will go through a physical examination and look for a decrease in or disappearance of respiratory noises on the affected side. The signs or indications that the patient suffers from hemothorax can be observed through the following tests:

1. Chest X-ray.
2. CT scan.
3. Pleural fluid analysis.
4. Thoracentesis.

Treatment: Initial treatment for a hemothorax usually involves stabilizing the person and then inserting a chest tube to drain the blood and air that has built up or is building up between the lung membranes in the pleural cavity.

This can be achieved in the following ways:

- A pleural catheter is inserted through the chest wall between the patient's ribs to drain blood and air.
- A probe remains in the patient and is subject to suction for days to re-expand the lung.

In cases where a catheter cannot control the bleeding, the patient will need surgery (thoracotomy) to stop the bleeding. On the other hand, the cause of hemothorax must also be treated.

After the tube thoracostomy has been performed, a chest X-ray should be repeated to identify the position of the chest tube, to reveal other intrathoracic pathology and to confirm whether the collection of blood within the pleural cavity has been fully drained. The Pleural Effusion & Symptom Evaluation (PLEASE) Study findings reveal an improvement in breathlessness and exercise tolerance in most patients with symptomatic pleural effusion after drainage.

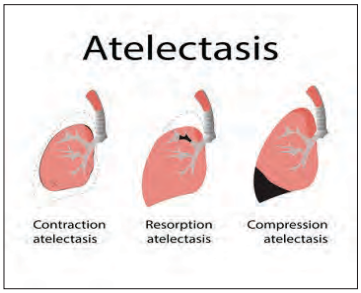
Physiotherapy Management: The following can be regarded as recommendations for management of patients with hemothorax:

- Help to improve ventilation, oxygenation and to re-inflate atelectatic lung areas. This could be done through deep breathing exercise techniques.

- Help to improve the patient's exercise tolerance and mobility. This could be done by assisting with mobilization or general strengthening exercises.
- Help to maintain airway clearance. This could be done by showing the patient assisted coughing techniques to help clear any secretions.

ATELECTASIS

Atelectasis is a lung condition that happens when your airways or the tiny sacs at the end of them don't expand the way they should when you breathe. Your alveoli help to exchange the oxygen in the air for carbon dioxide, a waste product from your tissues and organs. To do this, your alveoli must fill with air. When some of your alveoli don't fill with air, it's called "atelectasis." If enough of the lung is affected, your blood may not receive enough oxygen, which can cause health problems.



Atelectasis Symptoms: If you have atelectasis, you'll feel like you can't get enough air. Other symptoms can include:

- Coughing.
- Chest pain.
- A fast heart rate.
- Bluish skin or lips.
- Shortness of breath.

Types of Atelectasis: The two main types of atelectasis are obstructive (also called resorptive) and non-obstructive. Obstructive atelectasis happens when something physically blocks your airway.

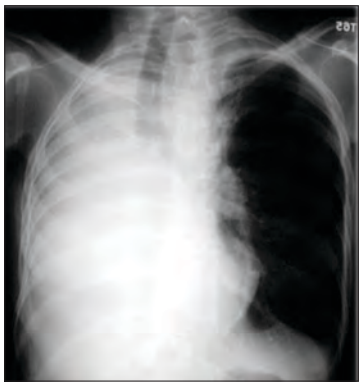
Types of non-obstructive atelectasis include:

- **Relaxation or compressive**: The lining of your chest wall and the surface of your lungs are usually in close contact, keeping your lungs expanded. But if fluid or air builds up and separates them, your lungs can pull inward, and your alveoli can lose air. Depending on where this happens in your lung, it's either relaxation or compressive atelectasis.
- **Adhesive:** The fluid that lines the alveoli in your lungs has a material in it called pulmonary surfactant. It helps your lungs in several ways, including keeping the alveoli stable and able to work. If there's a problem with this material (like if your body doesn't make enough of it), the alveoli can collapse. When that happens, it's called adhesive atelectasis. It can be caused by serious lung problems such as respiratory distress syndrome or a bruised lung (pulmonary contusion).
- **Cicatricial:** This type of atelectasis is when the tissue that makes up your lungs has scars that keep them from being able to hold as much air as they should. This scarring can happen because of certain serious lung conditions like sarcoidosis.
- **Replacement:** This is when your alveoli are filled by a tumor. That causes an area of your lung to collapse.
- **Acceleration:** When jet pilots fly straight up fast (between 5 and 9 G-forces), the acceleration can close the airways in our lungs, leading to this type of atelectasis. It can make it hard to breathe and cause chest pain and coughing.
- **Rounded (also called folded lung):** This type is linked to pleural diseases, conditions that affect the thin tissue that lines your chest cavity and surrounds your lungs (the pleura). One of the most common causes is asbestosis, when you breathe in asbestos over a long period of time, and this damages the pleura.

Causes: Atelectasis occurs from a blocked airway (obstructive) or pressure from outside the lung (non-obstructive).

- **General anesthesia** is a common cause of atelectasis. It changes your regular pattern of breathing and affects the exchange of lung gases, which can cause the air sacs (alveoli) to deflate.
- **Obstructive atelectasis** may be caused by many things, including:
- **Mucus plug:** A mucus plug is a buildup of mucus in your airways. It commonly occurs during and after surgery because you can't cough. Mucus plugs are also common in children, people with cystic fibrosis and during severe asthma attacks.
- **Foreign body:** Atelectasis is common in children who have inhaled an object, such as a peanut or small toy part, into their lungs.

- **Tumor inside the airway.** An abnormal growth can narrow the airway.
- **Injury.** Chest trauma — from a fall or car accident, for example can cause you to avoid taking deep breaths (due to the pain), which can result in compression of your lungs.
- **Pleural effusion.** This condition involves the buildup of fluid between the tissues (pleura) that line the lungs and the inside of the chest wall.
- **Pneumonia.** Various types of pneumonia, a lung infection, can cause atelectasis.
- **Pneumothorax.** Air leaks into the space between your lungs and chest wall, indirectly causing some or all a lung to collapse.
- **Scarring of lung tissue.** Scarring could be caused by injury, lung disease or surgery.
- **Tumor.** A large tumor can press against and deflate the lung, as opposed to blocking the air passages.



Diagnosis: To diagnose atelectasis, your doctor starts by reviewing your medical history. They look for any previous lung conditions you've had or any recent surgeries. Next, they try to get a better idea of how well your lungs are working. To do this, they might:

- Check your blood oxygen level with an oximeter, a small device that fits on the end of your finger
- Take blood from an artery, usually in your wrist, and check its oxygen, carbon dioxide levels, and blood chemistry with a blood gas test.
- Chest X-ray
- CT scan to check for infections or blockages, such as a tumor in your lung or airway.
- Bronchoscopy, which involves inserting a camera, located on the end of a thin, flexible tube, through your nose or mouth and into your lungs.

Treatment: Treatment of atelectasis depends on the cause. Mild atelectasis may go away without treatment. There are several options for treating a collapsed lung. For example: Antibiotics can be given to treat an infection. Sometimes, medications are used to loosen and thin mucus.

Chest physiotherapy: Techniques that help you breathe deeply after surgery to re-expand collapsed lung tissue are very important. These techniques are best learned before surgery. They include:

- Performing deep-breathing exercises (incentive spirometry) and using a device to assist with deep coughing may help remove secretions and increase lung volume.
- Positioning your body so that your head is lower than your chest (postural drainage). This allows mucus to drain better from the bottom of your lungs.
- Tapping on your chest over the collapsed area to loosen mucus. This technique is called percussion. You can also use mechanical mucus-clearance devices, such as an air-pulse vibrator vest or a hand-held instrument.

Surgery: Removal of airway obstructions may be done by suctioning mucus or by bronchoscopy. During bronchoscopy, the doctor gently guides a flexible tube down your throat to clear your airways. If a tumor is causing the atelectasis, treatment may involve removal or shrinkage of the tumor with surgery, with or without other cancer therapies (chemotherapy or radiation).

LUNG TUMORS

A lung tumor is an abnormal rate of cell division or cell death in lung tissue or in the airways that lead to the lungs. Types of benign lung tumors include hamartomas, adenomas, and papillomata. In almost all cases, benign lung tumors require no treatment, but your doctor will probably monitor your tumor for changes.

Types of benign lung nodules: There are several different types of benign lung nodules.

- Hamartomas are the most common type of benign lung nodule. They make up more than half of all benign lung tumors.

Most of them are found in the outer edges of the lung tissue. They're made up of excessive amounts of normal tissue like cartilage, fat, and muscle. They're usually less than 4 centimeters in diameter, and they usually look like they're coin shaped on an x-ray.

- Bronchial adenomas are tumors that can grow on the mucus glands or ducts of the windpipe. They can also grow on the large airway of the lung. This type of benign tumor is also common.
- Papillomata are a less common type of benign lung nodule. These grow in the bronchial tubes, and they can either be squamous or glandular. Squamous papilloma's can be the result of the human papilloma virus (HPV).

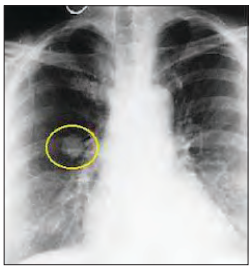
Symptoms: Benign lung nodules and tumors don't often cause symptoms, and they're often found accidentally on an imaging test. If they do cause symptoms, they can cause:

- Shortness of breath.
- Wheezing.
- Coughing for a long time.
- Coughing up blood.
- Fever.

Causes: Causes may include:

- Tuberculosis.
- An abscess.
- Sarcoidosis.
- Round pneumonia.
- A lung cyst that you're born with.
- Inflammation forms such diseases as Rheumatoid arthritis, sarcoidosis, Wegener's granulomatosis.

Diagnosis: Lung tumors and nodules can be seen on a chest X-ray or CT (computed tomography) scan. Often, the nodules are found accidently when you have a chest scan for something else.



Your doctor may want to perform a bronchoscopy to take a closer look at the mass and get a tissue sample (biopsy). Other ways to gather a tissue sample are by inserting a needle into the mass, guided by a CT-scan, to extract a small amount of tissue, or through a surgical incision.

Additional information your doctor uses to make the diagnosis include:

Size of the nodule: Your doctor may chart the rate of growth of your nodule. The smaller the nodule, the more likely it is to be benign. Also, benign nodules grow very slowly, while cancerous nodules on average can double in size every four months or less.

Nodule content, shape, and color: Another way to tell a benign lung nodule from a malignant one is to test its calcium content. Benign nodules have higher calcium content and are normally smoother and more regularly shaped. Benign nodules have a more even color pattern than malignant nodules. Malignant nodules more commonly have irregular shapes, rougher surfaces, and color variations or speckled patterns.

Treatment: In most cases, doctors will watch and wait to see what the benign nodule does. You may get multiple chest x-rays over several years to see if the nodule grows. If your nodule doesn't show any changes over two years, it's unlikely to be cancer. Your healthcare team may recommend a biopsy or surgery to remove the tumor if:

- You are a smoker or have a high risk of cancer.
- You have difficulty breathing or other troubling symptoms.
- Tests show that cancer could be present.
- The nodule continues to grow.

CHAPTER 5: ASSESSMENT FOR RESPIRATORY PATIENT'S

Most commonly, people with obstructive or restrictive lung disease seek a doctor because they feel short of breath.

Restrictive and obstructive lung diseases are identified using pulmonary function tests. In pulmonary function testing, a person blows air forcefully through a mouthpiece. As the person performs various breathing maneuvers, a machine records the volume and flow of air through the lungs. Pulmonary function testing can identify the presence of obstructive lung disease or restrictive lung disease, as well as their severity.

A doctor's subjective assessment (include smoking history, family history, prior illnesses, workplace information), physical exam, and lab tests may provide additional clues to the cause of obstructive lung disease or restrictive lung disease.

Imaging tests are almost always part of the diagnosis of restrictive and obstructive lung disease. These may include:

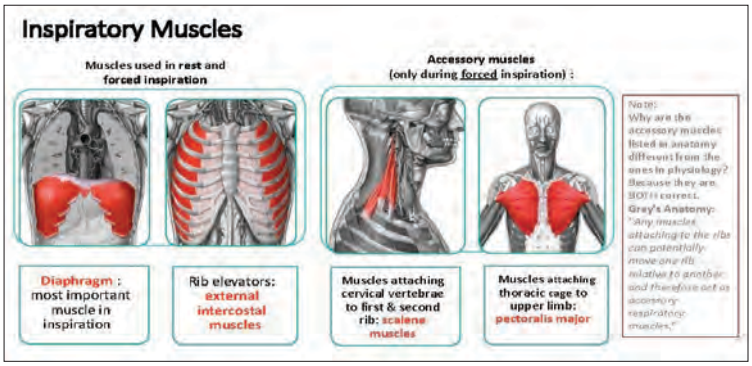
- Chest X-ray film.
- Computed tomography (CT scan) of the chest.

In some people, a bronchoscopy may be recommended to diagnose the lung condition causing obstructive or restrictive lung disease. In a bronchoscopy, a doctor uses an endoscope (a flexible tube with a camera and tools on its tip) to look inside the airways and take samples of lung tissue (biopsies).

Chest Examination: The pulmonary examination consists of inspection, palpation, percussion, and auscultation. The inspection process initiates and continues throughout the patient encounter. Palpation, confirmed by percussion, assesses for tenderness and degree of chest expansion. Auscultation, a more sensitive process, confirms earlier findings and may help to identify specific pathologic processes not previously recognized.

Inspection: Inspection is an active process. It is done with the eyes and the intellect. A great deal of information can be gathered from simply watching a patient breathe. Pay particular attention to:

1. General comfort and breathing pattern of the patient. Do they appear distressed, diaphoretic, labored? Are the breaths regular or deep?
2. Use of accessory muscles of breathing (e.g., scalene, sternocleidomastoids). Their use signifies some element of respiratory difficulty.



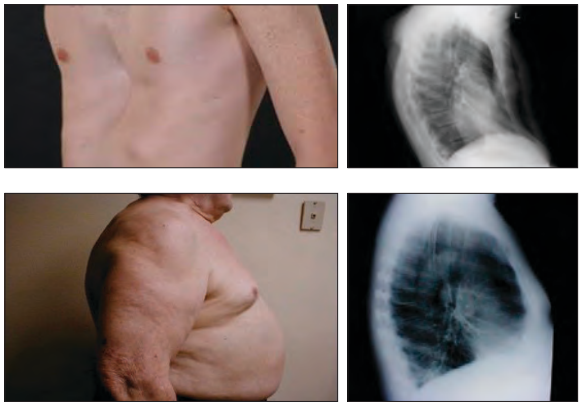
3. Color of the patient, around the lips and nail beds. Obviously, blue is bad.
4. Breathing pattern: Normal respiratory rates: 12–20/min in adults and 30–60/min in infants and neonates

- **Bradypnea:** Respiratory rate < 12/min in adults, < 30/min in infants and neonates, < 40/min in newborns
- **Tachypnea:** Respiratory rate > 20/min, shallow breathing in adults, > 60/min in pediatric patients.

- **Hyperpnea:** respiratory rate > 20/min, deep breathing.
- **Inspiratory: Expiratory ratio:** The ratio of the inspiratory time to expiratory time during spontaneous breathing, which is normally 1:2.
- Ability to speak: At times, respiratory rates can be so high and/or work of breathing so great that patients are unable to speak in complete sentences. If this occurs, note how many words they can speak (i.e., the fewer words per breath, the worse the problem).

5. **Abnormalities in the shape of the thorax:** The direction of abdominal wall movement during inspiration. Normally, the descent of the diaphragm pushes intra-abdominal contents down and the wall outward. In cases of severe diaphragmatic flattening (e.g., emphysema) or paralysis, the abdominal wall may move inward during inspiration, referred to as paradoxical breathing. If you suspect this to be the case, place your hand on the patient's abdomen as they breathe, which should accentuate its movement.

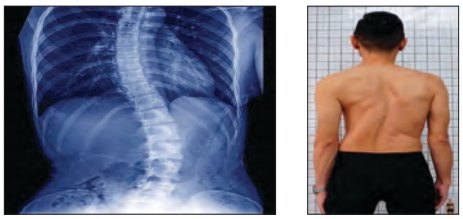
- **Pectus Excavatum:** Congenital posterior displacement of lower aspect of sternum. This gives the chest a somewhat "hollowed-out" appearance. The x-ray shows a subtle concave appearance of the lower sternum.



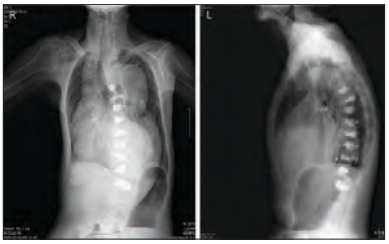
- **Barrel chest:** an increased anterior-posterior diameter of the thorax caused by hyperinflation of the lungs due to air trapping. Associated with advanced stage of chronic obstructive pulmonary disease (COPD). In a barrel-shaped chest, the anteroposterior diameter is equal to or greater than its lateral diameter and the thoracic ratio becomes >0.9. The ribs become more horizontal and dorsal kyphosis is present in most cases. The upper normal limit is approximately 0.9. Other features are prominent sternum, elevated clavicles, shortened neck, and widened intercostal spaces.

6. **Spine abnormalities:**

- **Kyphosis:** Causes the patient to be bent forward. Accompanying X-Ray of same patient clearly demonstrates extreme curvature of the spine.
- **Scoliosis:** Condition where the spine is curved to either the left or right. In the pictures below, scoliosis of the spine causes right shoulder area to appear somewhat higher than the left. Curvature is more pronounced on x-ray.



7. **Position of the trachea:** The trachea should be checked to see if it is in the normal central position. This means the distance between the trachea and the sterno-mastoid muscles should be equal on both sides. Tracheal deviation is indicative of mediastinal displacement to one side, which can be due to:



- Large volumes of air in the pleural space that push the lung away from the chest wall, for example pneumothorax.
- Large volumes of fluid in the pleural space that push the lung away from the chest wall, for example pleural effusion.
- Collapse of a single lobe or the complete lung, drawing the trachea towards the affected lung space.

Palpation: Palpation is the next stage of the examination. Palpation plays a relatively minor role in the examination of the normal chest as the structure of interest (the lung) is covered by the ribs and therefore not palpable. With the patient disrobed, place the entire palm of each hand first on the superior portion of both hemithoraces and then, gently though firmly, move the hand inferiorly to just below the twelfth rib. Repeat the process moving laterally and subsequently anteriorly, search for rib deformities, nodules, and areas of tenderness. Ask the patient to point to the area(s) of greatest discomfort. Palpate the area with increasing firmness to elicit tenderness and to assess if this maneuver reproduces the patient's symptoms. Pay particular attention to the costochondral junctions in patients

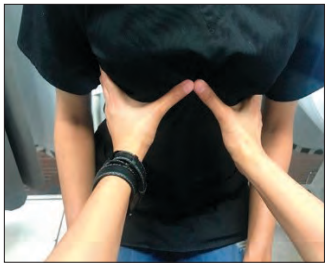
reporting anterior chest pain to evaluate the possibility of costochondritis.

Chest expansion: Chest expansion must be assessed to determine the depth and quality of movement on each side of the chest. Both sides should be assessed for symmetry. Unilateral decreased chest expansion, which is easier to detect, indicates pathology on that side, for example pneumothorax, pleural effusion, pneumonia and collapsed lung. Bilateral decreased chest expansion, which is more difficult to detect, is often seen in asthma and COPD. The symmetry and degree of chest expansion can be more accurately evaluated by observing chest movement than by palpating the chest wall.

Procedure

- Place the hands on either side of the patient's anterior chest.
- Position the thumbs together just either side of the midline, ensuring to keep them off the chest ('in the air'), so they can move freely with respiration.
- Advance the fingers around both sides of the chest as far as possible.
- Ask the patient to breath in and out as normal. During inspiration the thumbs should move apart during expiration the thumbs should return together.
- Repeat the procedure to check the patient's posterior chest.



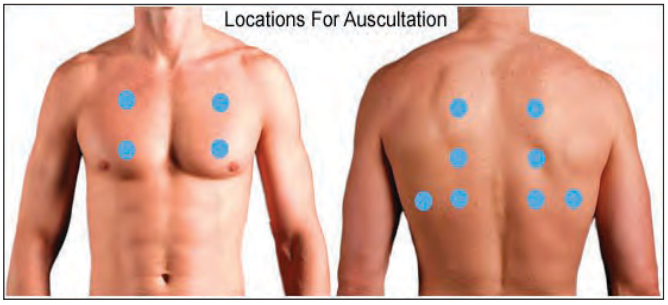
Tactile fremitus: Tactile vocal fremitus refers to the vibrations that can be felt on the chest wall when the patient speaks. This can be assessed by placing the palm of each hand on the two comparable positions on the patient's chest (anterior and posterior). Ask the patient to say, "toy boat" and feel for vibrations transmitted throughout the chest wall. Then check for differences in vibration while asking the patient to repeat the words. Can be asymmetrically decreased in effusion, obstruction, or pneumo-thorax, among others. Can be asymmetrically increased in pneumonia.

Percussion: The purpose of percussion is to determine if the area under the percussed finger is air filled (sounding resonant like a drum), fluid filled (a dull sound) or solid (a flat sound). To make this interpretation it is important not only to listen for the sound produced but also to feel the intensity and frequency of vibrations produced by this maneuver.

Press the distal phalanx of the middle finger firmly on the area to be percussed and raise the second and fourth fingers off the chest surface; otherwise, both sound and tactile vibrations will be blunted. If the sound and the vibrations produced seem suboptimal, make sure that the finger placed directly on the thorax is making very firm direct contact with the chest wall. Percuss the posterior, lateral, and anterior chest wall in such a manner that the long axis of the percussed finger is roughly parallel to the ribs. Compare one side to the other.

Over each area, begin percussion superiorly and extend inferiorly to identify the level of the diaphragm during quiet (tidal volume) breathing. Note the position of the diaphragm. Then ask the patient to inhale fully and "hold it"; continue to percuss inferiorly to determine the new level of the diaphragm, now during forced maximal inspiration. Then, ask the

patient to "breathe normally." The difference between the two levels is known as diaphragmatic excursion and should equal 2 to 3 cm.

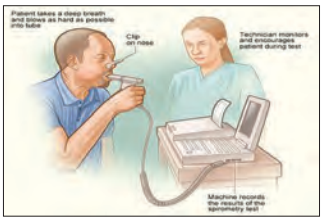


Auscultation: Auscultation of the chest is part of every chest examination, but it is the data collected during inspection, palpation, and percussion that alert the clinician what to listen for during auscultation to identify the correct diagnosis most effectively. The stethoscope is an instrument that does not significantly amplify sound, but, more important, acts as a selective filter of sound. Briefly, the bell filters high-frequency sounds greater than 1500 cycles per second and therefore should be used to detect low-frequency sounds. Auscultation of the chest ideally is performed in a quiet room with the patient either sitting or standing. When the posterior thorax is examined, the patient's arms should be crossed anteriorly to move the scapula laterally as much as possible. Comparing one side to the other is a helpful maneuver to identify the patient's "normal." Auscultation should be performed during tidal ventilation, deep forceful inspiration, and forceful expiration.

Pathological breath sounds: Also known as adventitious or added sounds. Consider secretions (such as in bronchitis) if breath sounds clear after coughing. Types of pathological breath sounds:

- Crackles or rales: discontinuous, intermittent
- Fine: soft, high-pitched (e.g., normal, asbestosis, sarcoidosis).
- Coarse: loud, low-pitched (e.g., COPD, pulmonary edema).
- Wheezes (sibilant wheezing): musical, prolonged.
- Rhonchi (Sonorous wheezing): low-pitched, snoring.
- Stridor: high-pitched, over trachea which may occur on
- Inspiration (inspiratory stridor): narrowing of the extrathoracic airway; characteristic of epiglottitis, pseudocroup, foreign body aspiration, bilateral vocal cord palsy.
- Expiration (expiratory stridor): obstruction of the intrathoracic airways; characteristic of bronchial asthma, COPD.
- Inspiration and expiration (biphasic stridor): obstruction at the level of the glottis.
- Pleural friction rub: scratchy, high-frequency sound.
- Muffled or absent breath sounds: suggest presence of air or fluid between the lung and the chest wall.

Pulmonary function tests (PFTs)



Pulmonary function tests (PFTs) are a group of tests that measure how well your lungs work. This includes how well you're able to breathe and how effective your lungs can bring oxygen to the rest of your body. PFTs are also known as lung function tests. These tests measure lung volume, capacity, rates of flow, and gas exchange. This information can help your healthcare provider diagnose and decide the treatment of certain lung disorders.

PFT's include three kinds of tests

1. Spirometry.
2. Lung Plethysmography.
3. Lung diffusion testing.

How pulmonary function tests are done?

- Pulmonary function tests are usually done in a special department of a hospital by a trained respiratory therapist.
- If you're on medications that open your airways, such as those used for asthma or chronic bronchitis, your doctor may ask you to stop taking them before the test.
- It's important that you don't eat a large meal before testing. A full stomach can prevent your lungs from inhaling fully. You should also avoid food and drinks that contain caffeine, such as chocolate, coffee, and tea, before your test.
- Be sure to wear loose-fitting clothing to the test. Tighter clothing may restrict your breathing. You should also avoid wearing jewelry that might affect your breathing.

PFT measures:

- Tidal volume (VT). This is the amount of air inhaled or exhaled during normal breathing.
- Minute volume (MV). This is the total amount of air exhaled per minute.
- Vital capacity (VC). This is the total volume of air that can be exhaled after inhaling as much as you can.
- Functional residual capacity (FRC). This is the amount of air left in lungs after exhaling normally.
- Residual volume. This is the amount of air left in the lungs after exhaling as much as you can.
- Total lung capacity. This is the total volume of the lungs when filled with as much air as possible.
- Forced vital capacity (FVC). This is the amount of air exhaled forcefully and quickly after inhaling as much as you can.
- Forced expiratory volume (FEV). This is the amount of air expired during the first, second, and third seconds of the FVC test.
- Forced expiratory flow (FEF). This is the average rate of flow during the middle half of the FVC test.
- Peak expiratory flow rate (PEFR). This is the fastest rate that you can force air out of your lungs.

Normal values for PFTs vary from person to person. The amount of air inhaled and exhaled in your test results are compared to the average for someone of the same age, height, sex, and race. Results are also compared to any of your previous test results. If you have abnormal PFT measurements or if your results have changed, you may need other tests.

Spirometry

During spirometry, you will be asked to breathe using a long tube with a cardboard mouthpiece. The long tube is attached to a computer that measures the amount of air breathed out over time. You may need to wear a nose clip to prevent air from leaking out of your nose. You will first be asked to breathe gently through the mouthpiece. You will then be asked to take in the biggest breath you can and then blow it out as hard, fast, and long as you can.

The test measures two things:

1. The most air you can breathe out after inhaling deeply. The results will let you know if you're less able to breathe normally.
2. How much air you can exhale in 1 second? The score tells your doctor how severe your breathing problem is.

Body plethysmography:

Body plethysmography is a test to find out how much air is in your lungs after you take in a deep breath, and how much air is left in your lungs after breathing out as much as you can. No matter how hard you try, you can never get all the air out of your lungs. Measuring the total amount of air your lungs can hold and the amount of air left in your lungs after you breathe out gives your healthcare provider information about how well your lungs are working and helps guide your treatment.

This test requires that you sit in box with large windows (like a telephone booth) that you can see through. You will be asked to wear a nose clip and you will be given in-

structions on how to breathe through the mouthpiece. You will be asked to take short, shallow breaths through the mouthpiece when it is blocked for a few seconds, which may be uncomfortable. It usually takes about 15 minutes to complete.

Lung diffusion capacity

A lung diffusion capacity test measures how well oxygen moves from your lungs into your blood. This test is like spirometry. You breathe into a tube attached to a machine. The test can help diagnose a disease of the blood vessels between your heart and lungs, and it can show the amount of damage done by a disease such as emphysema, a disease in which your air sacs are gradually destroyed.

Arterial Blood Gas Test (ABG)

An arterial blood gas (ABG) test measures oxygen and carbon dioxide levels in your blood. It also measures your body's acid-base (pH) level, which is usually in balance when you're healthy. As blood passes through your lungs, oxygen moves into the blood while carbon dioxide moves out of the blood into the lungs. An ABG test uses blood drawn from an artery, where the oxygen and carbon dioxide levels can be measured before they enter body tissues. An ABG measures:

- Partial pressure of oxygen (PaO2): This measures the pressure of oxygen dissolved in the blood and how well oxygen can move from the airspace of the lungs into the blood.
- Partial pressure of carbon dioxide (PaCO2): This measures the pressure of carbon dioxide dissolved in the blood and how well carbon dioxide can move out of the body.
- pH: The pH measures hydrogen ions (H+) in blood: The pH of blood is usually between 7.35 and 7.45. A pH of less than 7.0 is called acid and a pH greater than 7.0 is called basic (alkaline). So, blood is slightly basic.
- Bicarbonate (HCO3): Bicarbonate is a chemical (buffer) that keeps the pH of blood from becoming too acidic or too basic.
- Oxygen content (O2CT) and oxygen saturation (O2Sat) values: O2 content measures the amount of oxygen in the blood. Oxygen saturation measures how much of the hemoglobin in the red blood cells is carrying oxygen (O2).

In general, normal values include:

- Arterial blood pH: 7.38 to 7.42.
- Bicarbonate: 22 to 28 milli equivalents per liter.
- Partial pressure of oxygen: 75 to 100 mm Hg.
- Partial pressure of carbon dioxide: 38 to 42 mm Hg.
- Oxygen saturation: 94 to 100 percent.

Your blood oxygen levels may be lower if you live above sea level. Blood for an ABG test is taken from an artery. Most other blood tests are done on a sample of blood taken from a vein, after the blood has already passed through the body's tissues where the oxygen is used up and carbon dioxide is produced. Abnormal results can be signs of certain medical conditions, including the ones in the following table:

Blood pH	Bicarbonate	Partial pressure of Co2	Condition	Common cause
Less than 7.4	Low	Low	Metabolic acidosis	Kidney failure, shock, diabetic ketoacidosis
Greater than 7.4	High	High	Metabolic alkalosis	Chronic vomiting, low blood potassium
Less than 7.4	High	High	Respiratory acidosis	Lung diseases, including pneumonia or COPD
Greater than 7.4	Low	Low	Respiratory alkalosis	Breathing too fast, pain, or anxiety

CHAPTER 6: POSITIONING FOR AIRWAY CLEARANCE

Positioning can be used to:

- Optimize relaxation.
- Provide pain relief.
- Improve ventilation, ventilation-perfusion matching, and gas exchange.
- Minimize dyspnea.
- Minimize the work of breathing—i.e., promote efficient diaphragm and accessory muscle function.
- Promote airway clearance.

General guidelines for positioning:

- Use pillows to ensure comfort.
- Ensure patient is safely positioned in bed.
- Use bed rails appropriately.
- Ensure proper body alignments when positioning patients.
- Keep patient's joints in neutral or relaxed positions.
- Use pressure-reducing materials such as dressings or mattresses for patients who are susceptible to pressure.
- sores.
- Frequently change position to patient's tolerance.

Why positioning is important?

When working with positioning, it is possible to provide clients with stability and comfort, which will leave them calmer and more relaxed. A position offering good stability will have a positive impact on the client's sense of safety and will often also have a calming effect on anxious and outwardly reacting clients, thus improving the workplace health and safety. Good positioning can in some situations even result in the ability to do certain tasks alone, e.g., hygiene procedures, and thereby free up a co-worker to perform other tasks instead. The different positions used are described as follows,

1. Supine:
   - Decreases chest wall AP diameter.
   - Reduces FRC.
   - Pooling of secretions to the posterior (dependent) lung zone.
   - Increases central blood volume.
   - Increases airway closure.
   - Increases curvature of diaphragm at end-expiration—especially in those with weak abdominals.

2. Side-lying:
   - Increases chest wall AP diameter of the dependent region.
   - Increases ventilation to the dependent region but decreases tidal volume and FRC.
   - Theoretically speaking, positioning the good lung lowermost should improve oxygenation.

3. Prone:
   - Improves oxygenation in patients with ARDS or acute lung injury.

4. Sitting with arms supported on knees:
   - Improves diaphragm contraction and efficiency.
   - Facilitates accessory muscle contraction.
   - Decreases dyspnea.

5. Head down position:
   - Further increases central blood volume more so than supine.
   - Promotes basal expansion.
   - Increases curvature of diaphragm at end-expiration but imposes a greater load to inspire against.
   - Can increase dyspnea.

Relaxed positions during chronic diseases:

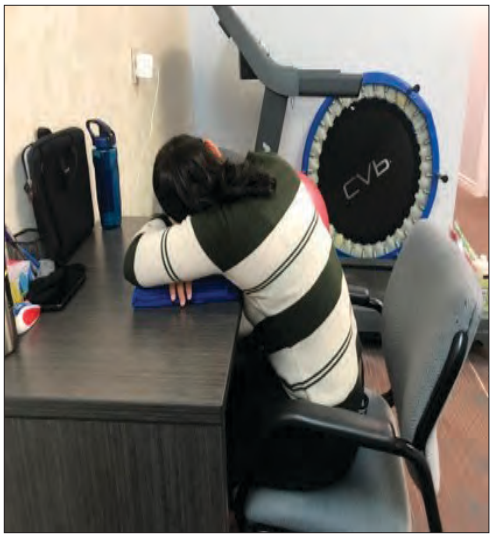
Different relaxation positions can be instructed to people with chronic respiratory disease to decrease dyspnea and to facilitate rest. Five different positions are often instructed that could be adopted by patients when trying to sleep, when resting where chairs are available, and when they are outside walking.

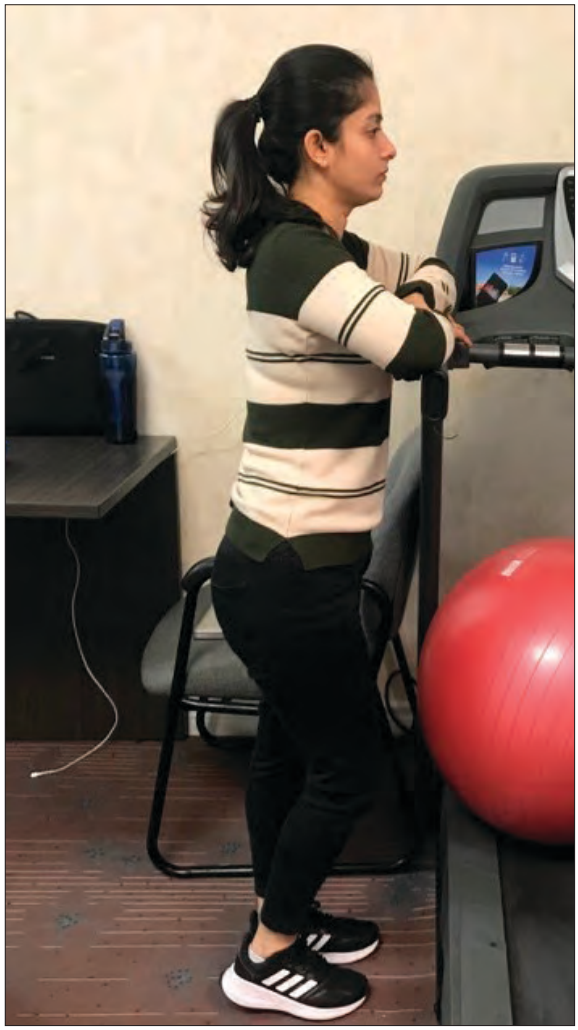
- When lying down for sleeping turn on to one side in upright position with pillows supported.
- When person is resting with the chairs available.
- When person is out for walk and starts getting shortness of breath.

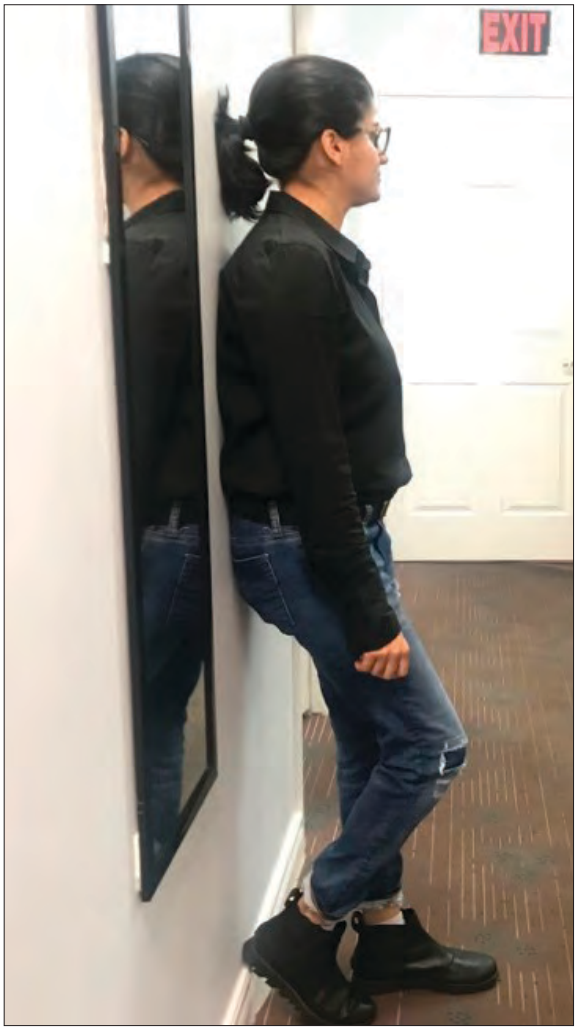
Steps for relaxation:

- In most positions, the upper body is supported. Be sure that the trunk is straight in all positions.
- Support with adequate pillows.
- Have patient perform breathing control and pursed lip breathing while in relaxation positions.
- Ensure head is supported and/or turned to side. Do not have patients bury their head in a pillow. This could make them feel more dyspneic.
- Keep in mind that all positions do not work for all patients. Select positions based on patients' needs and comfort, then modify

accordingly.







CHAPTER 7: AIRWAY CLEARANCE TECHNIQUES

Respiratory conditions are most common cause of prolonged stay in hospital settings, with a vast variety of clinical diagnosis being assessed and need physiotherapy contribution along with medical treatment. Conditions which necessitate a must physiotherapy involvement include pneumonia, chronic bronchitis, asthma, bronchiectasis, cystic fibrosis, hyperventilation, and chronic obstructive pulmonary disease. The physiotherapist's role in patient care includes assessment, advice, education, and active hands-on intervention. Traditionally, respiratory physiotherapists aid the mobilization and removal of secretions. However, their scope extends to an array of measures for further betterment of patients like:

- Mobilizing secretions leading to effective coughing and removal of secretions.
- To teach appropriate breathing patterns and control.
- To mobilize thorax and shoulder girdle with proper postural awareness.
- Reduce breathlessness and the work of breathing
- Improve the efficiency of ventilation support.
- Weaning from ventilators and support further non-invasive mechanical ventilation
- Improve functional abilities and exercise tolerance (i.e., carrying out daily tasks)
- Home management advice.

POSTURAL DRAINAGE

Postural drainage uses the force of gravity to assist in effectively draining secretions from the smaller airways into the central airway where they can either be coughed up or suctioned out. Each position consists of placing the target lung segment(s) superior to the carina. Positions should generally be held for 3 to 15 minutes (longer in special situations). Standard positions are modified as the patient's condition and tolerance level. Before determining the postural drainage position, it is very important to auscultate the lungs and identify the lung segments where added sound (Crepitus, Ronchi) is heard. Postural drainage can be facilitated with percussion and vibration in the postural drainage position.

The patient is placed in a head- or chest-down position and is kept in this position for up to 15 minutes. To obtain the head-down positions, the use of a pillow, beanbag chair, or couch cushions can be helpful. Often, percussion and vibration are performed in conjunction with postural drainage.

Positioning of Patient for Postural drainage:

Body position has also been shown to affect oxygenation. Alterations in ventilation–perfusion inequality have been suggested as the main reason for improved oxygenation in these body positions. The following pictures describe the positions for postural drainage. Pillows may be used for added comfort. If the person tires easily, the order of the positions can be varied, but all areas of the chest should be percussed or clapped.

- Please remember to clap and vibrate only over the ribs.
- Avoid clapping and vibrating over the spine, breastbone, stomach, and lower ribs or back to prevent trauma to the spleen on the left, the liver on the right, and the kidneys in the lower back.
- Do not clap or vibrate on bare skin.

Position 1. Upper Lobe Apical Segment: Have your patient sit upright. Clap on both sides of the upper front chest over the muscular area between the collarbone and the top of the shoulder blade.

Position 2. Upper Lobe Posterior Segment: Have your patient sit up and lean forward on a pillow over the back of a sofa or soft chair at a 30-degree angle. Stand or sit behind your patient and clap both sides of the upper back. Take care not to clap on your patient's backbone.


Position 3. Upper Lobe Anterior Segment: Have your patient lie on his or her back with arms to sides. Stand behind your patient's head. Clap both sides of your patient's chest between the collarbone and nipple.


Position 4. Lingula: The person will then lie on the right side, face down toward the foot of the bed, with the hips and legs propped on pillows. The body should be rotated about a quarter-turn towards the back. A pillow can also be placed behind the person. The legs should be slightly bent with another pillow placed between the knees. The caregiver will then percuss and vibrate just outside the nipple area.


Position 5. Middle lobe: For the middle lobe position, the person will lie face-down on his or her left side, a quarter-turn toward the back with the right arm up and out of the way. The legs and hips should be elevated as high as possible. A pillow may be placed on the back and between slightly bent legs. The caregiver will percuss and vibrate just outside the right nipple area.


Position 6. Lower Lobe Anterior Basal Segment: In this position, the person will lie on the right side, face down facing the foot of the bed, with a pillow propped behind the back. The hips and legs should be elevated as high as possible on pillows. The knees should be slightly bent with a pillow placed in between. The caregiver will percuss and vibrate over the lower ribs on the left side and repeat the right side.


Position 7. Lower Lobes Posterior Basal Segment: For this position, the person will lie on his or her stomach with hips and legs elevated on pillows. The caregiver will percuss and vibrate the lower part of the back over the left and right sides of the spine, taking care to avoid the spine and lower rib.


Position 8 Lower lobes lateral basal segment: For these positions, the person will lie on the right side, leaning forward about one-quarter of a turn with hips and legs elevated on pillows. The top leg may be flexed over a pillow for support and comfort. The caregiver will percuss and vibrate the uppermost portion of the lower part of the left ribs, repeating on the right side.


Position 9 Lower Lobes Superior Segment: For this final position, the patient will lie flat his or her stomach on a bed or table. Two pillows should be placed under the hips. The caregiver will percuss and vibrate the bottom part of the shoulder blades on both the right and left sides of the spine, taking care to avoid the spine itself.


Things to remember while doing postural drainage:

- You can nebulize the patient with saline or any bronchodilator agent before starting any physiotherapy exercise to reduce bronchospasm, decrease viscosity of mucus and sputum, and thereby liquefying them for enhancing secretion removal.
- Make suitable position as per the force of gravity to drain out bronchial secretions from affected lung segments to the dependent central airways.
- The required positions are determined depending on the location, severity, and duration of mucous obstruction.
- The physiotherapy exercises are performed at least twice or thrice a day before meals and bedtime and each position is done

for 5-15 minutes.

- If patients develop signs of hypoxemia (tachycardia, palpitations, dyspnea, or chest pain) the procedure should be discontinued if occurs. Immediately discontinue the exercise if hemoptysis occurs.
- Comfort of the patient must be of paramount consideration for active participation for positional physiotherapy exercises.
- Must ensure to auscultate the chest before and after the positional exercises to ascertain effectiveness of exercises and to further determine the areas of needed drainage.
- Encourage deep breathing and coughing after spending the adequate time in each position.
- Diaphragmatic breathing should be encouraged throughout the postural drainage (this helps in widening of airways for effective secretions drainage).

Indications for postural drainage:

These techniques are used at intervals on people who have conditions that cause a great deal of sputum to be produced, for example cystic fibrosis, bronchiectasis (irreversible widening of the airways), or sometimes COPD (chronic obstructive pulmonary disease). The techniques may also be used when people cannot cough up sputum effectively, as may happen with older people or with people who have muscle weakness or who are recovering from surgery, injury, or severe illness.

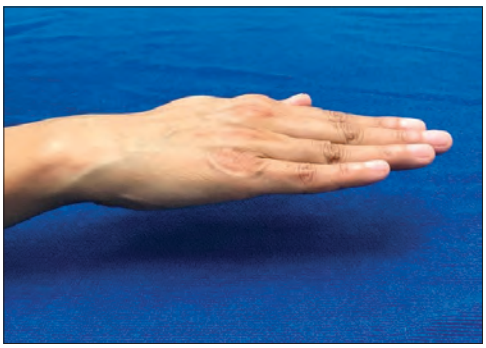
Contraindications: Postural drainage cannot be used for people who

- Cannot tolerate the position required
- Have recently vomited up blood
- Have had a recent rib or vertebral fracture
- Have severe osteoporosis
- Have a high risk of bleeding

Postural drainage also should not be used for people whose lung condition does not involve excess mucus secretion.

Self-Percussion -- Upper Lobes: The patient should sit upright and reach across his or her chest to clap on front of chest over the muscular area between the collarbone and the top of the shoulder blade. Repeat on the opposite site. Patient can also clap his or her own upper back if able to reach it.

Percussion



Percussion involves rhythmically striking the chest wall with cupped hands. It is also called cupping or clapping. The purpose of percussion is to break up thick secretions in the lungs so they can more easily be removed. Percussion is performed on each lung segment for one to two minutes at a time. Mechanical percussors are available and may be suitable for children over two years of age. The percussor is moved over one lobe of the lung for approximately 5 minutes, while the patient is encouraged to perform coughing and deep breathing techniques. This process is repeated until each segment of the lung is percussed. The hand is cupped as if to hold water but with the palm facing down (as shown in the picture below). The cupped hand curves to the chest wall and traps a cushion of air to soften the clapping.

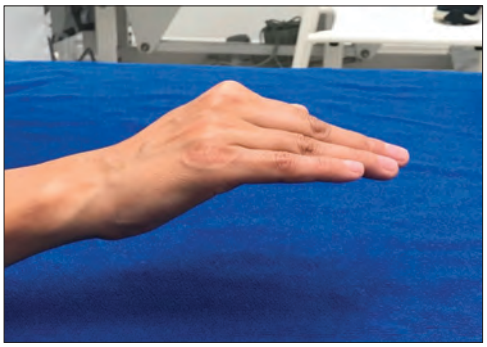
Percussion is done forcefully and with a steady beat. Each beat should have a hollow sound. Most of the movement is in the wrist with

the arm relaxed, making percussion less tiring to do.

Manual percussion technique:

- Clap the "congested" area.
- "Fast" clapping is 240 cycles/min and has sufficient magnitude to produce quivering of the voice.
- "Slow" (6 to 12 cycles/minutes) one-handed percussion is clapping the chest wall once at the
- beginning of a relaxed expiration following a maximal inspiration.
- "Fast" or "slow" clapping should coincide with slow deep breathing exercises and should last between 30 to 60 seconds.
- This is followed by 2 to 3 huffs or coughs.
- The patient should perform breathing control exercises until oxygen saturation is adequate and breathing has stabilized.

Vibration: As with percussion, the purpose of vibration is to help break up lung secretions. Vibration can be either mechanical or manual. It is performed as the patient breathes deeply. When done manually, the person performing the vibration places his or her hands against the patient's chest and creates vibrations by quickly contracting and relaxing arm and shoulder muscles while the patient exhales. The procedure is repeated several times each day for about five exhalations. Vibration is done with the flattened hand, not the cupped hand (see the figure). Exhalation should be as slow and as complete as possible.



"The therapist places a firm hand on the chest wall over the part of the lung being drained and tenses the muscles of the arm and shoulder to create a fine shaking motion."

REMOVAL OF SECRETIONS

Forced maneuvers like coughing and huffing, are considered as the main techniques of airway clearance, and, thus, an essential part of every combination of treatment modalities. The concept is to enhance mucus transport due to forced maneuvers and energy transfer between the high airflow velocity and the mucus layer thus dislodging the mucus and leading to its removal.

Coughing: It involves a deep breath (full lung volume), with the help of abdominal muscles to ensure that the expiration is sufficient to remove secretions from airways. Cough is stronger when the patient is in an upright position. After a deep inspiration to total lung capacity, a cough is initiated by an active sudden contraction of expiratory muscles against a closed glottis. There is a sudden, sharp rise in pleural pressure that can cause dynamic airway compression especially in subjects with decreased elastic recoil of the lung. During a cough, the near-explosive expulsion of air from the lung imparts very high shearing forces to the mucus lining the upper airways. Exposed to high shear stress, the mucus flows easily forward because of lowered effective viscosity. After the cough with the cessation of the shear force, the mucus does not flow back into the lung because its effective viscosity is higher again. Cough alone is only effective in clearing the central lung regions. Coughing can also produce a milking action on peripheral airways thus facilitating mucus clearance.

Huffing: It is a forced expiration again open glottis. It generates less intrathoracic pressure than coughing. The patient is instructed to take a medium size breath in (mid lung volume), involving the abdominal muscles with fast expiration making a strong sighing sound. It is performed with pursed lips with mouth slightly open. The patient is instructed to:

- Open the mouth to an O-shape and to keep the back of the throat (glottis) open
- To perform a forced expiration from mid-to-low lung volume to move the more peripheral secretions or a forced expiration from high-to-mid lung volume to move the more proximal secretions.
- Contract the chest wall muscles and abdomen simultaneously during this forced expiratory maneuver. The sound is like a sigh, but forced

- Often the patient is instructed using the analogy of "pretend you are holding a ping-pong ball in your mouth and then to blow it out with a forced breath."

Huffing, also known as huff coughing, is a technique that helps move mucus from the lungs. This technique is used to move secretions, mobilized by deep breathing/thoracic expansion exercises, downstream towards the mouth. A huff is exhaling through an open mouth and throat instead of coughing. Huffing helps moves sputum from the small airways to the larger airways, from where they are removed by coughing as coughing alone cannot remove sputum from small airways.

Forced Expiratory Technique: It involves taking one or two huffs from mid to low lung volumes, with open glottis. Prerequisite for this involves a period of relaxed controlled diaphragmatic breathing before and after the procedure, with deep slow breaths. There are two types of huffs:

- **Medium Volume Huff:** This helps to move secretions that are lower down in your airways. Take a normal-sized breath in and then an active, long breath out until your lungs feel quite empty. Imagine you are trying to steam up a mirror.
- **High Volume Huff:** This helps to move secretions in your upper airways. Take a deep breath in, open your mouth wide and huff out quickly. Only perform 1-2 huffs together, as repeatedly huffing can make your chest tight. Repeat the whole cycle for about 10 minutes or until the chest feels clearer. It must be explained to patients with mild disease that this technique may not result in the expectoration of any sputum. The cycle may move the small amount of sputum out of the peripheral airways and, with the assistance of the muco-ciliary escalator in the non-affected parts of the lung, it may be swallowed or coughed up an hour or so after practicing the technique.

Suctioning - Suctioning is recommended, in addition to postural drainage in case of an excessive accumulation of mucous in the lungs, probably due to poor cough function.

Turning - Turning from side to side permits lung expansion. The patient may turn on his or her own or be turned by a caregiver. Turning should be done at a minimum of every two hours if the person is bedridden. The head of the bed can also be elevated to promote drainage.

Active Cycle of Breathing Technique (ACBT)

Active cycle of breathing technique (ACBT) combines different breathing techniques that help clear mucus from the lungs in three phases. The first phase helps you relax your airways. The second phase helps you to get air behind mucus and clears mucus. The third phase helps force the mucus out of your lungs. It is a flexible method of treatment that can be used in conjunction with positioning and adapted for use with most patients. Each component can be used individually or as part of the ACBT cycle depending on the patient's problem. Once ACBT has been taught, the patient can be encouraged to use it independently.

ACBT consists of three main phases:

1. Breathing Control.
2. Deep Breathing Exercises or Thoracic Expansion Exercises.
3. Huffing or Forced Expiratory Technique (FET).

Additionally, a manual technique (MT) or positive pressure can be added when indicated, to create a more complex cycle to help improve removal of secretions on the lungs. this may include percussion or expiratory vibrations. Coughing is the most basic airway clearance technique (ACT). It can be an involuntary reflex, or it can be controlled as a healthy, natural way for the lungs to get rid of mucus.

Indications for ACBT

- Post-surgical /pain (rib fracture).
- Chronic bronchitis, cystic fibrosis.

- Acute increase sputum production.
- Sputum Retention.
- Bronchiectasis.
- Atelectasis.
- Respiratory muscle weakness.
- Mechanical ventilation.
- Asthma.

Precaution: It is important to constantly assess for dizziness or increased shortness of breath throughout ACBT. If a patient feels dizzy during deep breathing, decrease the number of deep breaths taken during each cycle and return to breathing control to reduce dizziness.

- Inadequate pain control where needed.
- Bronchospasm.
- Acute, unstable head, neck, or spinal surgery.

Contraindications

- Patients not spontaneously breathing.
- Unconscious patient.
- Patients who are unable to follow instructions.
- Agitated or confused.

Flutter

The flutter is an easy-to-use physiotherapy device based on oscillations of a steel ball during expiration through a pipe-type device. During exhalation, the steel ball vibrates, producing a variable positive expiratory pressure up to 20 cm H2O and an oscillating intratracheal pressure wave frequency of 6 to 20 Hz. The patient is instructed to:

- Seal his or her lips around the mouthpiece.
- Inhale deeply through the nose 10 to 15 times and hold each breath for 2 to 3 seconds.
- Exhale deeply into the flutter device.
- Tilt the flutter up or down until maximal vibration is felt throughout the chest wall.
- Once the secretions are loosened to more proximal lung regions, use the huffing technique to remove secretions.
- Treatment time is at least 15 minutes once or twice a day.

Positive expiratory pressure (PEP) mask:

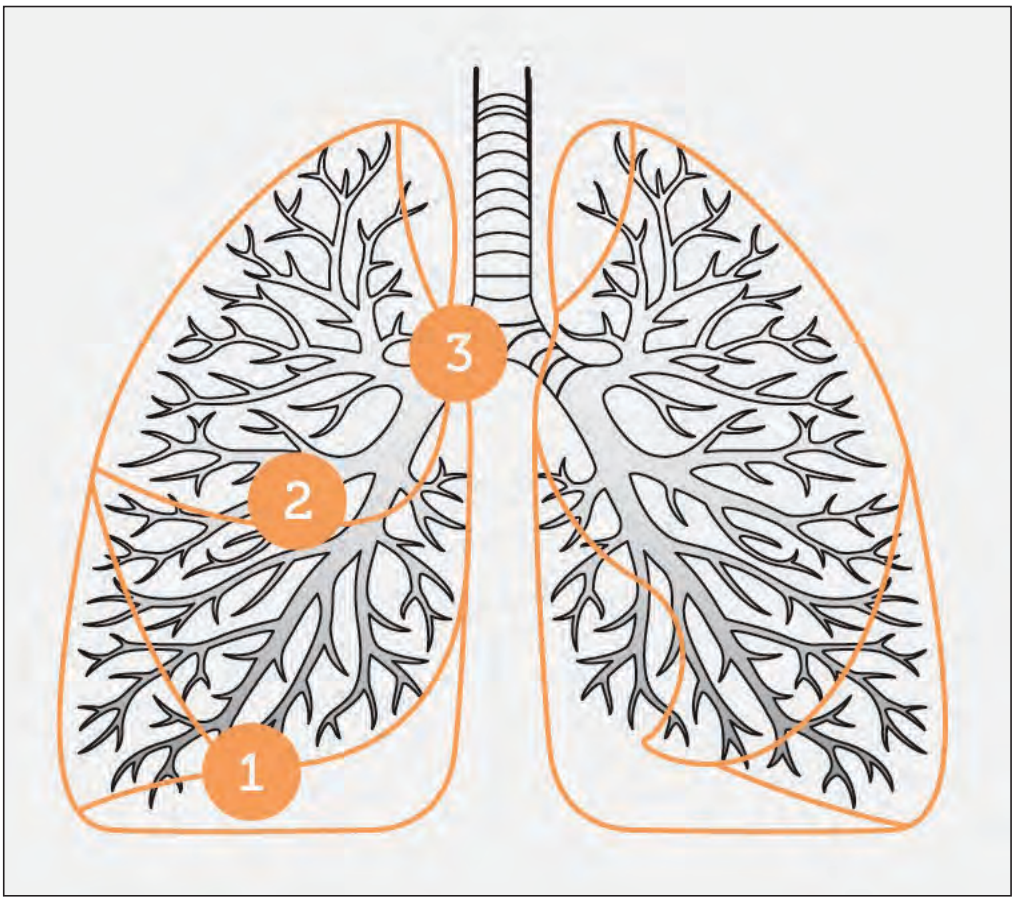
Positive Expiratory Pressure (PEP) consists of a mask and a 1-way valve resistor for expiration. A manometer is used to help select the resistor that provides a steady PEP of 10 to 20 cm H2O during mid expiration. The patient is instructed to:

- Breathe for about 15 breaths at normal tidal volumes and a slightly forced expiration through the mask.
- Huff off the mask 2 to 3 times and/or cough to remove mucus.
- To perform a breathing control phase for 1 to 2 minutes to relax.
- To perform a minimum of 6 sequences or a 20-minute session, once or twice a day.

Autogenic drainage:

AD is a breathing technique performed at different lung volumes and with different tidal volumes to assist in secretion removal. The different components of AD include:

- **Step 1:** Peripheral loosening of mucus—After a deep inspiration, the patient inhales to mid-tidal volume and exhales to just below functional residual capacity. The peripheral airways are compressed, and secretions are mobilized upward away from the peripheral lung field.
- **Step 2:** Collection of mucus in large airways—Breathing exercises are done at mid lung volumes (using a larger inspiration and less emptying than phase I during expiration).
- **Step 3:** Transport of mucus from the large airways to the mouth—Progressively larger inspirations are used with expiration to the functional residual capacity. A small burst of very gentle coughs is used to help expectorate the mucus.



CHAPTER 8: BREATHING EXERCISES

Breathing control

Helps relax the airways. You should breathe in through your nose and out through your mouth with very little effort. Use normal, gentle breathing with the lower chest while relaxing the upper chest and shoulders.

A good way to do this is to place one hand on your stomach as you breathe. Remember to breathe gently so you relax the airways. By using the pursed lip technique when breathing out (pursing your lips like you are kissing someone), you create back pressure in the airways that stents the airway open longer. Try closing your eyes to help you to focus on your breathing and to relax. Repeat breathing control for six breaths before moving to chest expansion exercises.

Deep Breathing Exercises or Thoracic Expansion Exercises

Deep breathing helps expand the lungs and forces an improved distribution of the air into all sections of the lungs. The person either sits in a chair or sits upright on bed and inhales then pushes the abdomen out to force maximum amounts of air into the lung. The abdomen is then contracted, and the person exhales. Deep breathing exercises are done several times each day for short periods.

Some people use a three-second breath hold to get more air into smaller airways and behind the mucus. This may be done with chest clapping or vibrating, followed by another cycle of breathing control. Because of the mind-body awareness required to perform coughing and deep breathing exercises, they are unsuitable for most children under the age of eight.

Home Management: The physiotherapist must discuss with each patient suffering chronic respiratory disease how treatment is carried out at home. This will include formal teaching to the patient and family members involved about the feasibility of postural drainage positions by performing some commonly used day to day activities. Breathing exercises with webbing belt helps the patient to practice basal expansion. Methods of safe disposing of sputum should be discussed. Self-percussion and vibration maneuver by commercially available vibrators and massagers along with timely nebulization and steam with regular exercises must be fitted in to the patient's lifestyle.

Breathing exercises to increase the lung capacity

Your lung capacity is the total amount of air that your lungs can hold. Over time, our lung capacity and lung function typically decrease slowly as we age after our mid-20s. Some conditions like chronic obstructive pulmonary disease (COPD) can significantly speed up these reductions in lung capacity and functioning. This leads to difficulty in breathing and shortness of breath. So, these are the exercises that can help maintain and increase lung capacity, making it easier to keep your lungs healthy and get your body the oxygen it needs.

Diaphragmatic Breathing: Diaphragmatic breathing is a type of breathing exercise that helps strengthen your diaphragm, an important muscle that helps you breathe as it represents 80% of breathing. This breathing exercise is also sometimes called (belly breathing or abdominal breathing). When the diaphragm is functioning effectively in its role as the primary muscle of inspiration, ventilation is efficient and the oxygen consumption of the muscles of ventilation is low during relaxed (tidal) breathing. When a patient relies substantially on the accessory muscles of inspiration, the mechanical work of breathing (oxygen consumption) increases, and the efficiency of ventilation decreases.

Controlled breathing techniques, which emphasize diaphragmatic breathing are designed to improve the efficiency of ventilation, decrease the work of breathing, increase the excursion of the diaphragm, and improve gas exchange and oxygenation.

Aims

1. To mobilize secretions.
2. To teach effective coughing and remove secretions.
3. To teach relaxation.

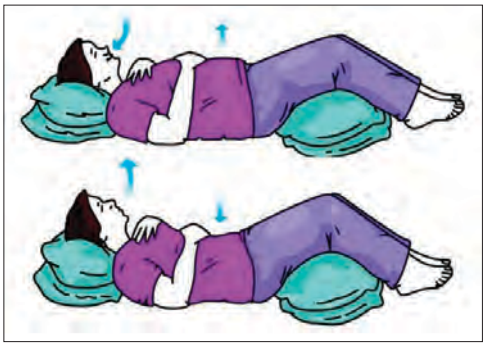
4. To teach breathing control.
5. To teach postural awareness.
6. To mobilize thorax and shoulder girdle.

Physiological Effect

1. It helps you cope with the symptoms of post-traumatic stress disorder (PTSD).
2. It improves your core muscle stability.
3. It improves your body's ability to tolerate intense exercise.
4. It slows your rate of breathing so that it expends less energy.
5. It helps you relax, lowering the harmful effects of the stress hormone cortisol on your body.
6. Improve respiratory capacity.
7. It helps lower your blood pressure.

Technique

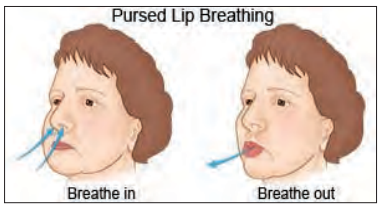
1. Lie on your back on a flat surface (or in bed) with your knees bent. You can use a pillow under your head and your knees for support if that's more comfortable.
2. Place one hand on your upper chest and the other on your belly, just below your rib cage.
3. Breathe in slowly through your nose, letting the air in deeply, towards your lower belly. The hand on your chest should remain still, while the one on your belly should rise.
4. Tighten your abdominal muscles and let them fall inward as you exhale through pursed lips. The hand on your belly should move down to its original position.



You can also practice this sitting in a chair, with your knees bent and your shoulders, head, and neck relaxed. Practice for five to 10 minutes, several times a day if possible.

Pursed Lip Breathing: To practice pursed lip breathing, breathe in slowly through your nose for two counts, keeping your mouth closed. Take a normal breath. Pucker or "purse" your lips as if you were going to whistle and breathe out.

Pursed lip breathing is one of the simplest ways to control shortness of breath. It provides a quick and easy way to slow your pace of breathing, making each breath more effective.



Effects of pursed lip breathing

- Improves ventilation.
- Releases trapped air in the lungs.
- Keeps the airways open longer and decreases the work of breathing.
- Prolongs exhalation to slow the breathing rate.
- Improves breathing patterns by moving old air out of the lungs and allowing for new air to enter the lungs.
- Relieves shortness of breath.
- Causes general relaxation.

Technique: Use this technique during the difficult part of any activity, such as bending, lifting or stair climbing. Practice this technique 4-5 times a day at first so you can get the correct breathing pattern.

- Relax your neck and shoulder muscles.

- Breathe in (inhale) slowly through your nose for two counts, keeping your mouth closed. Don't take a deep breath; a normal breath will do. It may help to count to yourself: inhale, one, two.
- Pucker or "purse" your lips as if you were going to whistle or gently flicker the flame of a candle.
- Breathe out (exhale) slowly and gently through your pursed lips while counting to four. It may help to count to yourself: exhale, one, two, three, four. With regular practice, this technique will seem natural to you.

Pursed lip breathing reminders

- Do not force the air out.
- Always breathe out for longer than you breathe in.
- Breathe slowly, easily, and relaxed ... in and out ... until you are in complete control.

Postural awareness

Rounded shoulders, kyphosis, lordosis, scoliosis, and head thrust forward are common postural abnormalities. Such abnormalities limit thoracic spine mobility and hence decrease chest expansion. Therefore, it is essential to teach patients to relax the upper tar so, straighten the spine and keep the head erect while walking or sitting. This must be applied in positions of work and when sitting resting, e.g., reading or watching television.

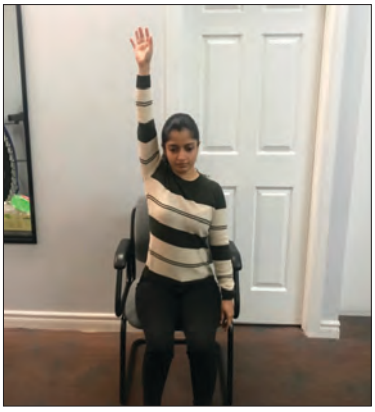
Mobilizing the thorax and shoulder girdle: Exercises involving thorax and shoulder are useful in mobilizing the lower part of the thorax and to encourage basal expansion to prevent atelectasis and improve coughing. Examples of such exercises are:

Elbow Touch

- Sit in a relaxed position with your arms bent at your side.
- Breathe in through your nose.
- Breathe out through your pursed lips and bring your elbows back, as if you were trying to make them touch.
- Breathe in.
- Breathe out and return to start position.
- Repeat 3 to 5 times.

Reaching to the sky

- Sit with your arms relaxed by your side.
- Breathe in through your nose.
- Breathe out and lift one arm up, reaching to the sky.
- Breathe in.
- Breathe out and return the arm to the start position.
- Repeat with the other arm.
- Repeat cycle 3 to 5 times.


Windmill

- Sit with arms relaxed by your side.
- Breathe in through your nose.
- Breathe out through your pursed lips and bring your arms up over your head and try to touch your palms together.
- Breathe in.
- Breathe out and bring your arms back to the start position.
- Repeat 3 to 5 times.


Seated Kicks

- Sit in a relaxed position with both feet flat on the floor.
- Breathe in through your nose.
- Breathe out through your pursed lips and kick your foot up off the floor.
- Breathe in.
- Breathe out and lower it back to the start position.
- Repeat with the other leg.
- Repeat cycle 3 to 5 times.

Shoulder Shrugging

- Sit with your shoulder relaxed and your arms by your side.
- Breathe in through your nose.
- Breathe out through your mouth and lift your shoulders up as if trying to touch your ears.
- Breathe in.
- Breathe out through your pursed lips and relax your shoulders to the start position.
- Repeat 3 to 5 times.

Shoulder Rolls

- Sit with your shoulders relaxed and your arms by your side.
- Breathe in through your nose and out through your pursed lips in a slow, controlled manner.
- Roll your shoulders backwards for 3 to 5 breath cycles.
- Repeat rolling your shoulders in a forward direction for 3 to 5 breath cycles.



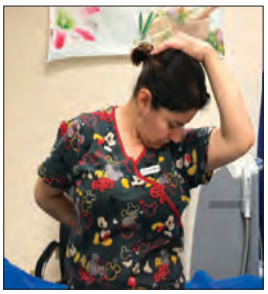
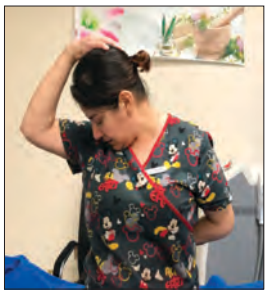
Foot Rocking

- Sit in a relaxed position with both feet flat on the floor.
- Breathe in through your nose and out through your pursed lips in a slow, controlled manner.
- Rock your feet from heel to toes in a smooth pattern.
- Continue for 3 to 5 full breath cycles.

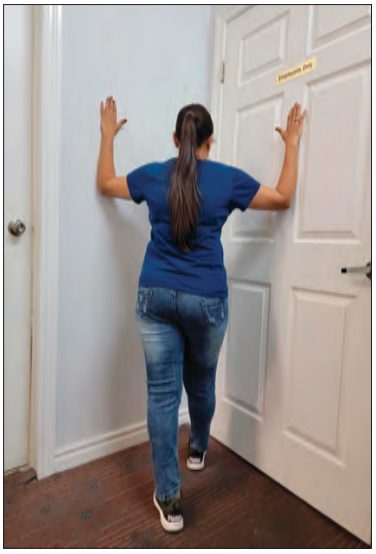
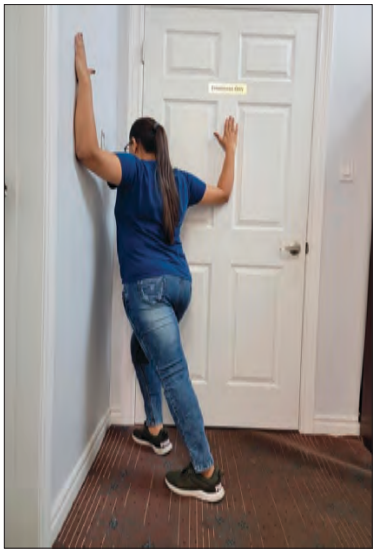


Neck Stretches: Sit in a relaxed position with your arms by your side. Do these slowly and gently.



Upper chests stretch – Take a corner of the wall. Stand with your elbows rested on the wall with one leg forwards as a stance position. You need to open your chest while moving forward and close to the wall. Hold the position for 10 seconds and repeat it for 3-4 times.

Child pose - Begin in tabletop position on your hands and knees, with your hands directly under your shoulders and knees under your hips. Extend your arms out in front of you, placing your palms flat on the floor. Slowly sit your hips back toward your heels, dropping your head and chest downward as your arms extend further and reach for the wall in front of you. If this stretch is too much, place a pillow under your belly to prop yourself up a bit and lessen the stretch of the low-back muscles. Hold this pose for 20 to 30 seconds or even longer.

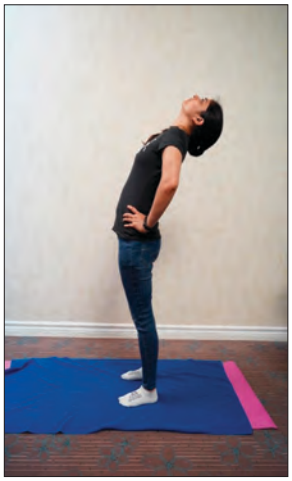

Cat and cow stretch - Begin in tabletop position on your hands and knees, with your hands directly under your shoulders and knees under your hips. Your spine should be parallel to the ground in this position. Then, round your back, stretching your mid-back between your shoulder blades—like how a cat stretches by rounding its back. Hold for five seconds, then relax and let your stomach fall downward as you gently arch your low back and hold here for another five seconds. Repeat these movements for 30 seconds or longer.



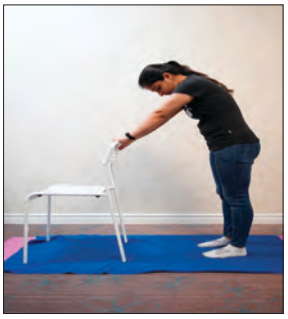
Thoracic stretch (Thread in needle) – Begin in tabletop position on your hands and knees, with your hands directly under your shoulders and knees under your hips. Your spine should be parallel to the ground in this position. Take your hand and put it inside your opposite shoulder as if you are threading the needle. Reach until the end and hold the position for 30 seconds. You will feel a stretch at your mid back as if your spine is getting unlocked. Repeat this for 3 times on each side.



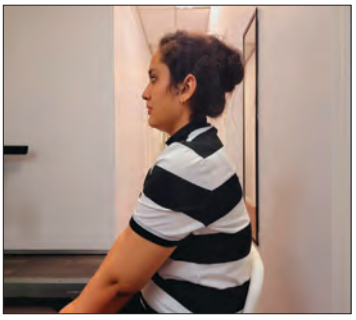

Bending Back - Stand pressing hands-on hips to support upper body, elbows lengthened away from armpits. Turn on inner core muscles to support body. Turn on lower buttock muscles to hold pelvis and hips still. Push upper body backwards, feeling breastbone sliding forward and upward. Hold on the position for 10 seconds.

Thoracic stretch on chair – Place your hands on a chair. Walk backward, lowering your chest to the ground. Once your hips are behind your ankles, straighten your legs. Relax the muscles in the fronts of the thighs and gently lift your tailbone. Hold your arms in place and keep pressing your armpits toward the floor. Hold for five to 10 breaths. Take a short break, then repeat two or three times.




Seated thoracic extension - Sit upright in a chair, with your feet flat on the floor. Place your hands behind your head for support, with your elbows out to the sides. Keeping your head still, slowly roll the top of your spine over the back of the chair. Hold for 5 to 10 seconds, then return to start position.




Back extension against wall - Stand against a wall, with your heels and buttocks touching the wall. Squeeze your shoulder blades together. Hold for 5 seconds, then relax. Repeat.

Side stretches in sitting - To start, sit in a chair with your feet flat on the floor. Shift your weight slightly forward to avoid rounding your back. Relax. Keep your ears, shoulders, and hips aligned. Stretch your right arm overhead. Slowly bend to the left. Don't twist your torso. Stay within your pain limits. Hold for 20 seconds. Return to starting position. Repeat 2 to 5 times. Then, switch to the other side.

Side stretches in standing - To start, stand with your feet flat on the floor. Keep your ears, shoulders, and hips aligned. Stretch your right arm overhead. Slowly bend to the left. Don't twist your torso. Stay within your pain limits. Hold for 20 seconds. Return to starting position. Repeat 2 to 5 times. Then, switch to the other side.

Lumbar flexion with rotation - Lie on your back with your hands at your side and your knees bent. Rotate your knees towards the sides.

Seated Trunk rotations - Begin the exercise sitting straight on a chair, feet flat on the ground and your head facing forward. Place your left arm behind your left buttocks and your right hand on your left knee. Rotate your trunk looking over your left shoulder – holding when you feel a slight stretch but are still comfortable. Hold position for a few seconds. Swap sides and repeat exercise.

CHAPTER 9: ACUPRESSURE POINTS

Acupressure for chest clearing & lung support

In Traditional Chinese Medicine, the lungs are a "tender organ" like Goldilocks. They prefer moderate conditions that are not too dry or moist and not too hot or cold. They are vulnerable to "external pathogens" such as viruses, bacteria, mold, but also other environmental particulate including pollen.

The lungs also play an important role in regulating immunity. The lungs is to circulate a thin protective, fluid layer that lies just below the skin's surface, called the "Wei qi", which in TCM theory, acts as a barrier to pathogens trying to invade our bodies.

Pericardium 6 - Neiguan: It's found in the center of your wrist, between 2 prominent tendons, about 2 fingers width above your inner wrist crease. Often achy, heavy, and tingly, it opens the chest, relieves congestion and helps to clear phlegm. It is also very effective for nausea and motion sickness.

Lung 6 – Kongzui: Palm-side up, it is on the midpoint along the line joining the thumb-side of your wrist (at the radial pulse) to the elbow crease. Often tight and tender, especially if you are experiencing symptoms, it relieves cough, phelgm, chest congestion and is beneficial for conditions such as asthma.

Kidney 27 – Shufu: Found in the hollow between the lower border border of your collarbones and the 1st rib. It is approximately 1.5 inches from the midline. Tender and deep, it opens the chest, relieves cough and calms rebellious LU qi. Helpful for asthma.
Hold each of these points firmly for 5 – 10 deep diaphragmatic breaths to ensure you thoroughly stimulate each point for the best results. These points are also very helpful for anxiety.

CHAPTER 10: SALT CAVE THERAPY

Salt cave therapy or Halotherapy

Halotherapy, or salt therapy, involves breathing in air with tiny salt particles to improve your breathing. Halotherapy is considered an alternative treatment for lung problems such as asthma, bronchitis, and cough. Halotherapy is often done in spa-like salt rooms.

History of salt therapy

Back in 1843, a Polish physician by the name of Feliks Boczkowski noticed that salt mine workers did not experience respiratory issues or lung disease vs other miners. Almost a hundred years later, a German named Karl Hermann Spannagel noticed that his patient's health improved after hiding out in the salt caves while avoiding heavy bombing during WWII. Research showed that the salty air the miners breathed helped keep their lungs free from infection and allergies. Over time, Eastern European salt mines or caves became popular tourist destinations. People from all over the world visited to inhale the salty air and ease their lung problems.

How does it work?

When fine salt particles are inhaled, they will fall on the airway linings and draw water into the airway, thinning the mucus and making it easier to raise, thus making people feel better. Also, these environments are allergen-free and thus good for people with allergies affecting their lungs.

Once inhaled, these salt particles are claimed to absorb irritants, including allergens and toxins, from the respiratory system. This process breaks up mucus and reduces inflammation, resulting in clear airways.

Types of Halotherapy

Salt therapy is usually done in salt rooms, which can be active or passive.

- **Active salt room.** This room has a machine called a halo generator, to which salt is added. The equipment breaks down the salt into tiny particles that circulate in the room.

- **Passive salt room.** This type of room does not have a machine to break down the salt. Instead, the room is filled with different types of salts, such as Himalayan salt. It looks like a salt cave, with controlled temperature and humidity.

The salt concentration in passive salt rooms is lower than in active salt rooms.

Salt therapy itself has two types.

- **Dry salt therapy.** This type is the kind known as halotherapy. It is done in active salt rooms with the help of a halo generator. This allows the small, dry salt particles to spread in the air and enter your lungs and skin.
- **Wet salt therapy.** This involves bathing in salty water containing minerals, gargling with or drinking salty water, or passing salty water through your nasal canal.

Health Benefits of Halotherapy

Studies have found that halotherapy can have benefits for respiratory conditions, skin problems, and allergies.

Salt is a natural and safe ingredient. It does not have any notable side effects. It is also:

- Mucoactive, clearing up mucus from your airways.
- Antibacterial, helping prevent infections.
- Anti-inflammatory.
- Immunity-boosting.

Anti-allergic: Research has found that because of these properties, Halotherapy can be used as part of the treatment for following conditions:

- Lung infection.
- Throat infection or pharyngitis.
- Chronic obstructive pulmonary disease (COPD).
- Smoking-related breathing problems.
- Respiratory allergies.
- Asthma.
- Bronchitis.
- Cold or cough.
- Pneumonia.
- Sinusitis.
- Rhinitis.
- Tonsillitis.

CHAPTER 11: HERBS USEFUL IN RESPIRATORY CONDITIONS

Herbs which protect your Respiratory System are,

There are a variety of ways that herbs can be used to support lung health. Whether added to food, taken as a tea, or the aroma inhaled, herbs can be incredibly beneficial to the lungs. Some herbs may promote clear breathing, while others may help fight off illness or even help break up mucus or relieve coughing. There are a host of holistic medicine remedies that can help you protect your respiratory system from ambient threats in the air, whether they stem from smog, pollution, excess ozone, smoke from wildfires, or viruses and bacteria. These herbs can help you prevent illness and lung damage by proactively strengthening your lungs and girding them against threats. Each of these herbs has a different role to play in respiratory health: thinning mucus to clear phlegmy coughs; relaxing irritated, dry, spastic coughs; soothing and opening the lungs.

Eucalyptus: Eucalyptus is one of the best herbs for lung health. It has long been used as a remedy to treat multiple health issues and to support the lungs. The main constituent of the eucalyptus leaf is 1, 8-cineole. Eucalyptus is commonly used for coughs, colds, asthma, bronchitis, respiratory issues, and more. It's effective at breaking up congestion, helps with inflammation, and the essential oil is even considered beneficial in stimulating the immune system. There are many ways to use eucalyptus to support lung health. The dried leaves can be consumed as a tea or made into an extract, or they can even be made into a decoction and the steam inhaled. Eucalyptus essential oil is also beneficial for supporting lung health and can be diffused and inhaled or even used in homemade preparations such as salves, balms, and personalized aroma blends.

Horehound Leaf (Marrubium vulgare): This famous cough drop and cough syrup ingredient eases spasms and loosens and expectorates mucus associated with wet coughs. This can be incredibly useful in any instance where mucus is excessive, including sinus infections, allergies, chest congestion, and post-nasal drip.

Lobelia: It has many names like Asthma weed, Bladderpod, Gagroot, Lobelia inflata, also known as Indian tobacco, has a long history of use as an herbal remedy for respiratory conditions such as asthma, bronchitis, pneumonia, and cough. Historically, Native Americans smoked lobelia as a treatment for asthma. In the 19th century, American physicians prescribed lobelia to induce vomiting in order remove toxins from the body. Because of this, it earned the name "puke weed." Today, lobelia is sometimes suggested to help clear mucus from the respiratory tract, including the throat, lungs, and bronchial tubes. Although few studies have evaluated the safety and effectiveness of lobelia, some herbalists today use lobelia as part of a comprehensive treatment plan for asthma.

Scientists think an active ingredient in the lobelia plant, lobeline, has similar effects to nicotine. For this reason, lobeline was once used as a nicotine substitute in many antismoking products and preparations designed to break the smoking habit. Lobelia is an attractive annual or sometimes biennial (reseeding every year or 2) herb that grows to a height of 3 feet. Its upright, hairy stem is angular, branching at the top, usually green with a tinge of violet. The pale green or yellowish leaves have a sharp taste and a slightly irritating odor. The sparse flowers are pale violet blue outside and pale-yellow inside.

The above-ground portions of the lobelia plant (namely the leaves and seeds) are used for medicinal purposes. Lobelia contains, among many other phytochemicals: Alkaloids, Ascorbic Acid, Calcium, Magnesium, Potassium, Lobeline, Lobelanine, and Pyridine Alkaloids.

How does it work?

Lobelia contains chemicals that might thin mucus (phlegm) to make it easier to cough up and help breathing, especially in people with asthma. One chemical in lobelia has actions like nicotine.

Medicinal Uses and Indications

Lobelia is sometimes used alongside conventional medications to help treat symptoms of asthma attacks, such as wheezing, uncontrollable coughing, and chest tightness.

This is because lobeline may relax your airways, stimulate breathing, and clear mucus from your lungs. Lobelia is also used to relieve pneumonia and bronchitis, two types of lung infections that cause coughing and difficulty breathing, among other symptoms.

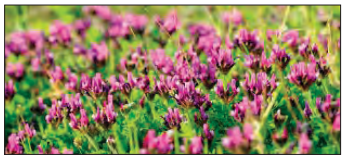
Precaution: Lobelia is considered a potentially toxic herb. It can cause serious side effects, such as profuse sweating, nausea, vomiting, diarrhea, tremors, rapid heartbeat, mental confusion, convulsions & hypothermia. People with high blood pressure, heart disease, liver disease, kidney disease, tobacco sensitivity, paralysis, seizure disorder, and shortness of breath, and those recovering from shock should not take lobelia.

Peppermint: Peppermint isn't just a delicious additive that can provide a pop of flavor to your favorite dishes and teas. It's also a power natural antihistamine, which means it can be particularly helpful in supporting the health of the respiratory system. It can prevent foreign bodies and allergens from causing inflammation in your respiratory tract, which keeps airways free and open. Its main constituent is menthol, which accounts for its cooling properties. Peppermint is considered useful for asthma, bronchitis, colds, coughs, breaking up phlegm, and many other health issues.

Osha Root: This powerful herb hailing from the Rocky Mountains has been used by indigenous cultures for centuries as a respiratory system cure-all. The root of the plant is used to cure coughs and colds as well as a wide range of other lung related conditions. It relieves congestion while also increasing blood flow to the lungs. It has potent antiviral properties which makes it a powerful full-spectrum lung care herb. The root is the part which is used as herb.

Mullein: Mullein has long been known as a lung-boosting plant that is a keystone of traditional medicine. It helps open the lungs, eases spasms, tightness, and cough, and soothes irritation and dryness. This weedy herb can be taken internally when a dry cough or scratchy throat is among the symptoms, as it increases production of mucous in inflamed membranes. Mullein can help clear phlegm and is effective when used for inflammation, as well as containing antiviral, antifungal, and antibacterial properties. It has historically been used to treat coughs, colds, lung issues, breathing issues, and more. A tea, extract, or decoction can be made from the flowers and leaves and then consumed to support lung health. It can also be formulated into a poultice that is spread on the chest to draw out infection and reduce inflammation.

Lungwort: Another long-used herb for respiratory health is lungwort, a weed known to grow in damp, pristine locations. The herb is rich in antioxidants that support over health but are particularly effective in boosting respiratory function. It's been used since at least the 1600s as a lung remedy and is ground into a powder for supplement use or used as a tea.



Astragalus: Astragalus is an herb that provides a powerful proactive measure that can help fight off respiratory illnesses such as the flu. It's loaded with antioxidants so it's an effective immune system booster. That makes it perfect for fighting off colds and flu. It's also an effective treatment for asthma as well. Specifically, the roots of the astragalus plant are used in herbal medicine. Due to the earthy

flavor of the roots, some good ways to use astragalus are tinctures, added to soups, ground in supplement form, or used in combination with other herbs.

Plantain Leaf: Plantain is most famously used as a poultice for bug bites and bee stings, but the leaves are also soothing and healing in lung recipes. They ease irritation and dryness as well as boggy dampness, gently moisturizing while also helping to dry, tighten, and tone the mucus lining. They may offer antimicrobial activity as well. Consider it for tea and syrups.

Thyme: Thyme is another fantastic herb that supports lung health. Thyme has many uses, but specifically for lung health it is considered beneficial for coughs, colds, respiratory issues, bronchitis, promoting breathing, and breaking up phlegm. One of the simplest ways is to add it liberally to your food. However, it can also be made into a tea, extract, decoction, or the essential oil can be used as well. Make a simple thyme syrup to help with respiratory illnesses during cold and flu season.

Oregano: Oregano is another herb that is commonly used to season food, but also happens to be a great choice for lung health as well. Like thyme, it is a member of the mint family and shares many of the same therapeutic properties that other members of the mint family possess. Oregano is a potent antiseptic with antibacterial, antiviral, and antifungal properties. Therefore, it is often used to treat and fight off infection. However, it's also useful for respiratory issues, coughs, colds, and clearing the bronchial passages and lungs. Additionally, it's a potent antioxidant and is considered useful for fighting inflammation. To support lung health, oregano can be consumed, or its spicy aroma can be inhaled. It can be added liberally to food, taken as a tea or extract, or the essential oil can be diffused.

Licorice: Licorice root is a versatile herb that contains many therapeutic properties including antiviral, antimicrobial, and anti-inflammatory properties. The root is the part of the plant that is used medicinally, and it looks like small sticks. It has a long history of use as a lung-supporting herb and has traditionally been used to treat asthma and coughs, as well as many other ailments, particularly of the digestive variety.

Due to its anti-inflammatory properties, licorice is well-suited to situations where there is inflammation. Additionally, it is believed to help soothe the mucous membranes and is frequently used for sore throats. However, it is important to note that licorice should not be used in excessive amounts or for extended periods of time since it can potentially lead to increased sodium levels, reduced potassium levels, and elevated blood pressure. A great way to use licorice is to drink it as a tea. Simply steep 1 tsp. of the dried herb in boiling hot water for 5-10 minutes. Then, sip the hot tea and make sure to inhale deeply of the sweet aroma.

Marshmallow Leaf and Root (Althaea officinalis): Mallows are the supreme moisturizing herbs, soothing and slimy and useful whenever the lungs and respiratory system feel dry or irritated.

Himalayan Salt: Himalayan Salt is the world's purest and richest, boasting 84 minerals and trace minerals. It's become increasingly popular nowadays, as many have attributed numerous health benefits to it. When salt particles are inhaled, they make their way on the linings of the airway and draw water into it. This thins the mucus and helps the body clear it so that you can breathe easier. Himalayan salt has properties that can purify air by removing dust, pollen, smoke, and various oth-

er types of contaminants. It can cleanse the respiratory system and provide relief during breathing. Himalayan salt may temporarily relieve symptoms associated with asthma, allergies & sinus conditions.

The healing properties of pink Himalayan salt are believed to restore restful sleep, relieve muscle aches, and increase energy in body. Other than being beneficial for muscle aches and pains, it can also be used to relieve muscle spasms. When infused the salt in carrier oil and applied to anybody area, the natural antioxidants present can help to prevent free radical damage.

Black Pepper: People take black pepper by mouth for asthma, bronchitis, bacterial infection, stuffy nose, sinus infection, colic, depression, diarrhea, gas, headache, arthritis, menstrual pain, upset stomach and many more. Black pepper contains a chemical called piperine. This chemical seems to have many effects in the body. It seems to reduce pain, improve breathing, and reduce inflammation.

Ginger: Ginger contains compounds called gingerols and shogaols. Researchers believe that these compounds give ginger its medicinal properties. For respiratory problems, it is one of the most effective home remedies. Antiviral, antimicrobial, and anti-inflammatory properties of ginger effectively fight the root cause of the respiratory tract infection. You can chew a few slices of ginger every day with some salt. You could also drink ginger tea by boiling a few slices of ginger in water.

Turmeric: Turmeric is a spice often used in East Indian foods. Turmeric has anti-inflammatory effects. Turmeric also increases antioxidant activity. That means it may help reduce irritation and boost your immunity. Curcumin is commonly found in turmeric (Curcuma longa). Long used in traditional Asian medicine, curcumin has been shown to reduce airway inflammation. A powerful antioxidant, curcumin may help the oxidative stress believed to underlie COPD, while blocking inflammation at the molecular level. Inflammation and excessive mucous secretions are the two main irritants in COPD that diminish airflow to lungs. Curcumin for COPD can turn out to be a natural remedy to bring down inflammation and to reduce mucous secretions.

Olive oil: Consuming olive oil may help protect against respiratory conditions like asthma. Olive oil is a concentrated source of anti-inflammatory antioxidants, including polyphenols and vitamin E, which are responsible for its powerful health benefits. Olive oil may help fight the health risks associated with air pollution like increased blood pressure and impaired blood vessels factors that can reduce your oxygen supply, make your heart pump faster and make breathing more difficult.

Garlic: Garlic is known to be a wonder drug for respiratory problems as it helps prevent ailments ranging from the common cold, flu, asthma, bronchitis, tuberculosis to pneumonia. Garlic acts as a powerful herbal remedy that effectively treats most of the chronic respiratory diseases. The active ingredients present in this miracle herb not only act against bacteria and fungi, but also protects against various parasites, yeast, and viral infections. Allicin present in garlic possess antioxidant properties that help in treating throat infections and reducing the severity of upper respiratory tract infections. Garlic helps in relieving cold and preventing various lung disorders that include difficulty in breathing and asthma. This medicinal herb also aids in decreasing tissue inflammation caused due to respiratory congestion. It is one of the best natural expectorants that is widely used to treat chronic bronchitis.

Ways to use herbs for lung health

Interestingly, each individual herb has a vast number of unique compounds that make it useful for numerous health issues. To experi-

ence all the therapeutic properties of an individual herb, it's ideal to consume the herb in its entirety, when feasible. However, that's not always possible and the truth is, the beneficial properties of herbs can be utilized in many ways. A few of those ways include:

- Culinary – Some of the herbs can be added to food. This is a fantastic and simple way to utilize the whole herb and its benefits.
- Tea – A simple tea can be made by steeping fresh or dried plant material in a cup of water. It's a great way to consume more liquids and simultaneously experience the therapeutic properties of the herb.
- Decoction – In a decoction, the plant material is boiled for several minutes, resulting in a more potent finished product.
- Extract – Extracts are made by soaking plant material in a solvent for longer periods of time. They are more concentrated than a tea or decoction, but not as concentrated as an essential oil.
- Essential oil – Essential oils are highly concentrated volatile oils that are extracted from different parts of each plant. Large amounts of plant matter are used to make a very small amount of essential oil, and very little is needed when using them.

Recipe for turmeric and lemon peel Oil:

Ingredients:

- 3 teaspoons of turmeric powder.
- Half a teaspoon of black pepper.
- A teaspoon of lemon peel.
- A teaspoon of Himalayan salt.
- ¾ cup of regular drinking cups of olive oil.

Method:

- Take all the ingredients and coarse grind in the mixture. Take the powder and add olive oil into it and stir it up. You can store this in a dark color bottle to prevent it from direct sunlight.
- Also, it can be placed in a refrigerator to ensure its protection.
- Take small amount of oil, massage on your upper back with gentle pressure, try working on the areas which are stiff.
- After massage, you can take a hot compress and gently wipe off your skin.
- Massage can be done once in a day.

Benefits:

- Relieves acute pain.
- Stimulates blood circulation.
- Stimulates and revitalizes nerves.
- Reduces inflammation.
- Moisturizes the skin and nourishes the muscle.

Recipe for Olive and Thyme oil:

Ingredients:

- 3 teaspoons ground dry olive leaves.
- 6 teaspoons of dried sour grapes.
- 3 teaspoons of dried wild thyme.
- Half a cup of drinking cups of extra-virgin olive oil.

Method:

- Take the amount of dried olive leaves, thyme, and dried sour grapes, grind the dry ingredient until it becomes like powder.
- Then, add virgin olive oil and mix it well.
- And put in an airtight container, away from heat and sun or in the fridge
- Take small amount of oil, massage on your upper back with gentle pressure, try working on the areas which are stiff.
- Use it 3 to four times a day with gentle pressure on back.
- After massage, you can take a hot compress and gently wipe off your skin.




Recipe for Pepper and Sesame seed oil:

Ingredients:

- A teaspoon of hot pepper.
- 5 spoons of green tea.
- 3 teaspoons of sesame seeds.
- 2 teaspoons of salt.
- A full cup of extra-virgin olive oil.

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a fine powder.
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun and in the fridge
- Use 3 times a day (morning, noon, and evening) with gentle pressure on the back.
- After massage, you can take a hot compress and gently wipe off your skin.
- Make sure you stir the mixture before using.








Benefits:

- Eliminates pain directly.
- Stimulates blood circulation.
- It stimulates and revitalizes the nerves and aids in healing.
- Eliminates inflammation.
- Nourishes muscle and moisturizes the skin.

Recipe for Turmeric and Olive oil:

Ingredients:

- 3 teaspoons of fine turmeric powder.
- 3 teaspoons of sage powder.
- A teaspoon of cinnamon powder.
- A cup of regular cups olive oil.

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a fine powder
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun and in the fridge
- Use 3 times a day (morning, noon, and evening) with gentle pressure on the back.
- Make sure you stir the mixture before using.
- After massage, you can take a hot compress and gently wipe off your skin.

Recipe for Sesame seed and Olive oil:

Ingredients:

- 3 teaspoons of sesame seeds.
- 2 teaspoons of cinnamon bark.
- 4 teaspoons of Cress seeds.
- Half a large cup of olive oil.

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a fine powder
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun and in the fridge.
- Take a small amount and Use 3 times a day (morning, noon, and evening) with gentle pressure on the back.
- Make sure you stir the mixture before using.

Benefits:

- Reduces the pain.
- It activates the free nerve endings and blocks the pain. receptors.
- Stimulates blood circulation.
- Reduces inflammation and swelling.

Recipe for Mustard and Olive oil:

Ingredients:

- A teaspoon of black mustard.
- A teaspoon of sesame.
- 3 teaspoons of ground bay leaves.
- Half a large cup of drinking glasses of olive oil.

Method:




- Take all the dry ingredients and grind it in a coffee grinder until it becomes a coarse powder.
- Add virgin olive oil to it and mix well
- Place it in an airtight container, away from heat and sun or store it in the refrigerator.
- Use 3 times a day (morning, noon, and evening) with gentle pressure on the back.
- Make sure you stir the mixture before using.
- After massage, you can take a hot compress and gently wipe off your skin.



Benefits:

Reduces the pain.

- It activates the free nerve endings and blocks the pain receptors.
- Stimulates blood circulation.
- Reduces inflammation and swelling.
- Stimulates nerves.
- Reduces inflammation.

Recipe for Mustard and Black seed oil:

Ingredients:

- 5 teaspoons of mustard.
- 5 teaspoons of black seeds.
- 5 teaspoons of chia seeds.
- 1 cup of olive oil.

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a coarse powder.
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun or store it in the refrigerator.
- Use 4 times a day with gentle pressure on the back.
- Make sure you stir the mixture before using.
- After massage, you can take a hot compress and gently wipe off your skin.




Benefits:

- Relieving acute pain.
- Relaxes the muscle and calms the nerves, in addition to softening and lightening the skin.
- Stimulates nerves.
- Reduces inflammation.

Recipe for Ginger and Olive oil:

Ingredients:

- 5 teaspoons of ground ginger.
- 2 teaspoons of fenugreek.
- 3 teaspoons of bay leaf powder.
- 2 teaspoons of wild thyme powder.
- Half cup of olive oil.

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a coarse powder.
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun or store it in the refrigerator.
- Use 3 times a day with gentle pressure on the back.
- Make sure you stir the mixture before using.
- After massage, you can take a hot compress and gently wipe off your skin.

Benefits:

- Relieving acute pain.
- Relaxes the muscle and calms the nerves, in addition to softening and lightening the skin.
- Stimulates nerves.
- Reduces inflammation.

Recipe for Garlic and Thyme oil:

Ingredients:

- A teaspoon of basil.
- 4 teaspoons of green thyme.
- 1 teaspoon of cumin.
- A teaspoon of garlic powder.


Method:

- Take all the dry ingredients in a bowl and mix well.
- Add virgin olive oil to it and mix well.

- Place it in an airtight container, away from heat and sun or store it in the refrigerator.
- Use 3 times a day with gentle pressure on the back.
- Make sure you stir the mixture before using.
- After massage, you can take a hot compress and gently wipe off your skin.




Recipe for Mint and Mustard Oil:

Ingredients:

- 3 teaspoons of fenugreek.
- 3 teaspoons of mustard.
- 3 teaspoons of mint.
- A large cup of olive oil.

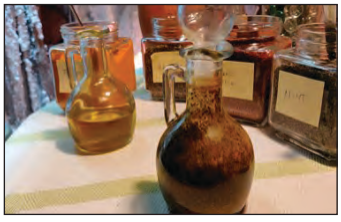
Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a coarse powder.
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun or store it in the refrigerator.
- Use 2-3 times a day with gentle pressure on the back.
- Make sure you stir the mixture before using.







Benefits:

- Relieving acute pain.
- Relaxes the muscle and calms the nerves, in addition to softening and lightening the skin.
- Stimulates nerves.

Recipe for Turmeric and Mint oil:

Ingredients:

- 5 teaspoon turmeric.
- 4 teaspoons of basil powder.
- 4 teaspoons of cress seeds.
- 6 teaspoons of mint.
- Half cup of olive oil.

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a coarse powder.
- Add virgin olive oil to it and mix well.
- Place it in an airtight container, away from heat and sun or store it in the refrigerator.
- Use 2-3 times a day with gentle pressure on the back.
- Make sure you stir the mixture before using.

Benefits:

- Relieving acute pain.
- Relaxes the muscle and calms the nerves, in addition to softening and lightening the skin.
- Stimulates nerves.
- Reduces inflammation.

Recipe for Turmeric and Olive oil:

Ingredients:

- 3 teaspoons of honey.
- 5 teaspoons of basil.
- 4 teaspoons of turmeric.
- Half cup of olive oil.

Method:

- Take all the dry ingredients and grind it in a coffee grinder until it becomes a coarse powder.
- Add virgin olive oil and honey to it and mix well.
- Place it in an airtight container, away from heat and sun or store it in the refrigerator.

- Use 2-3 times a day with gentle pressure on the back.
- Make sure you stir the mixture before using.

Benefits:

- Relieving acute pain.
- Relaxes the muscle and calms the nerves, in addition to softening and lightening the skin.
- Stimulates nerves.
- Reduces inflammation.

CHAPTER 12: BENEFITS OF MASSAGE ON RESPIRATION

In any respiratory conditions the muscles surrounding the ribcage and abdomen starts getting tight. This results in shortness of breath instead of normal breathing and constricts the air passage.

Here, massage plays an important role in relaxing the muscles and help improve breathing. Respiratory issues, such as allergies, sinus problems, asthma, and bronchitis, are one group of conditions that can benefit from massage therapy. Many muscles in the front and back of the upper body are accessory respiratory muscles, when any of these muscles are chronically tight and shortened, they can restrict normal breathing and disrupt breathing patterns. Massage techniques works to lengthen and relax these muscles improve breathing capacity and function.

Massage therapy can not only improve breathing, but also posture. This can lead to an opening of the chest area, as well as the structural alignment and rib cage expansion needed for optimal lung function. Plus, when the parasympathetic nervous system responds to massage your breathing rate slows and becomes deep and regular. Massage stimulates the blood flow to the heart; it lengthens the muscles improving breathing and lung function.

Benefits of massage therapy are:

- Encourages deeper breathing
- Calms the nervous system down
- Loosening the intercostal muscles allowing the rib cage to expand
- Lowers blood pressure and moves congestion
- Generates heat to raise the respiratory rate and body temperature
- Stimulates proprioceptors in the joints and increases respiration

Massage Techniques for improving respiration:

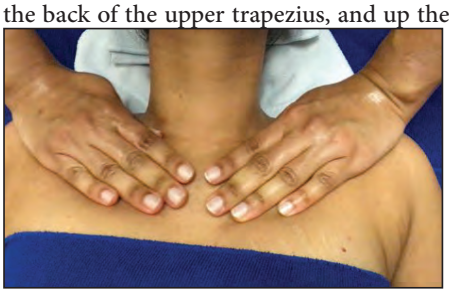
A particularly beneficial way of relieving respiratory issues through massage therapy is tapotement, a rhythmic, percussive stroke used in Swedish massage. When performed on the back, along with vibration and shaking, tapotement can loosen mucus in the lungs and

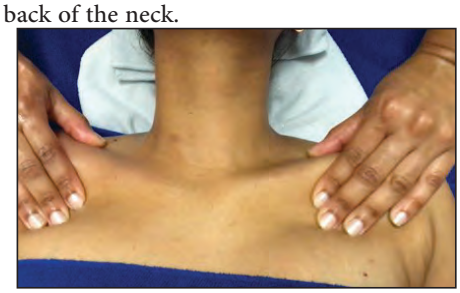
increase airway clearance for better lung function.

Areas to focus:

Chest:

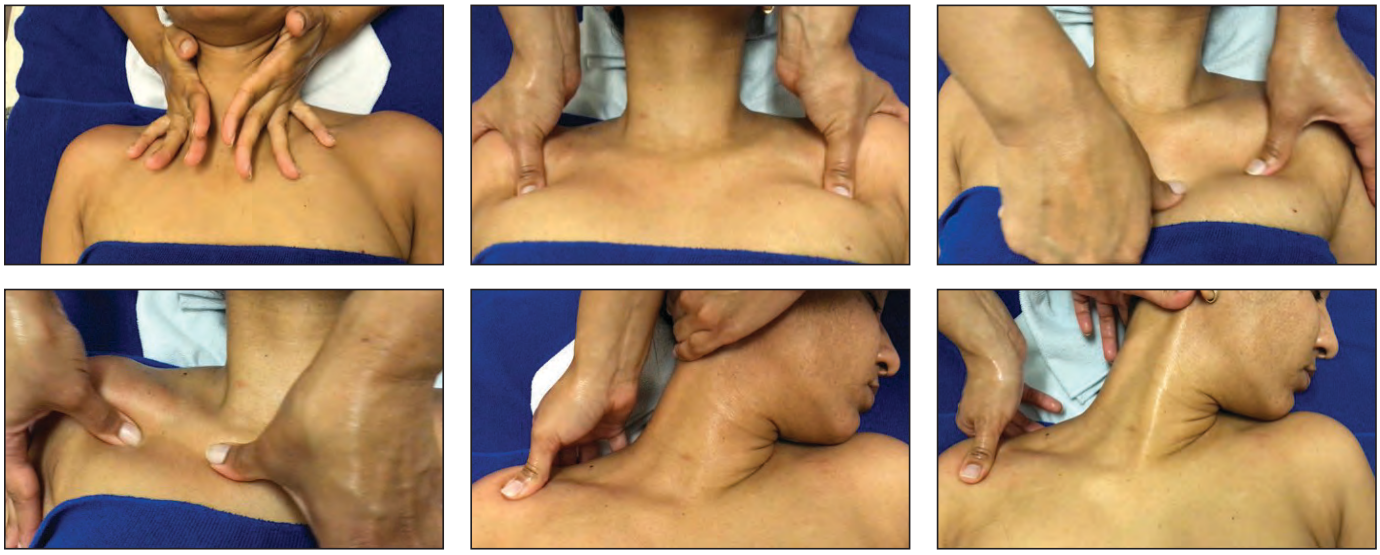
Effleurage the chest (pectoralis) with fingers pointing toward the sternum (not down toward the breasts), out over shoulders, around the back of the upper trapezius, and up the back of the neck.





Repeat several times; give the neck a gentle traction as you draw the hands up the neck. Thumb glide from clavicles downward slightly (staying on the pectoral muscle and above the breasts).

Work one side of the sternum and then the other. Step to the client's left, lay the right arm out to the side, and glide with your fingertips over the pectoralis from sternum to shoulder, changing to a flat hand over the shoulder joint. Maintaining con- tact with the shoulder, walk around to the other side, slide the hands down the arm to place it back on the table. Repeat the movements on the left side of chest (pectoralis).



Upper Back:

With lubricant, effleurage the entire back several times. Effleurage on one side of the spine (over the paraspinals) with one hand placed on top of your other hand; follow with the same movement on the other side.

Thumb glide intercostals and up under the scapula. Stepping to the head of the table on the client's left side, use one or both thumbs to glide and friction rhomboid attachments along the vertebral border of the scapula and spine, thumb glide rhomboids.

Stepping back to client's right side, carefully remove the client's hand from the low back and lower the arm off the table. Compress the infraspinatus; use thumb glide and friction. Glide your hands down the arm to pick it up and place back on the table.




Effleurage the upper trapezius and neck. Use the back of loose fists to further effleurage. Hold pressure points across the trapezius (using both thumbs, simultaneously hold points nearest the neck, move laterally and hold two more points, move laterally, and hold two more points, then move back medially on same points). Effleurage. Glide the palmar surface of your left hand up the neck to the occipital ridge and hold the ridge.




With your right thumb, glide from occiput to levator attachment at the scapulae; move laterally and glide from the occiput over the trapezius. The palmar surface of your right-hand glides over the shoulder and up the back of the neck to the occipital ridge to position your left thumb to perform the same movements on the left side of the neck. Effleurage the trapezius and neck.



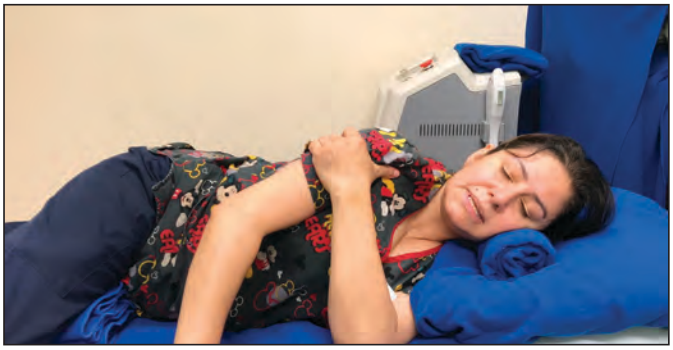



Self-Massage techniques

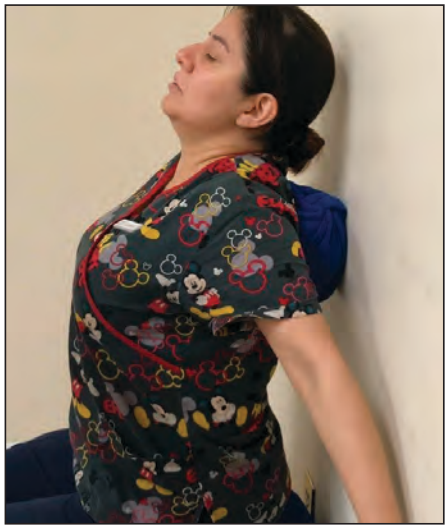
Shoulder and upper back in sitting



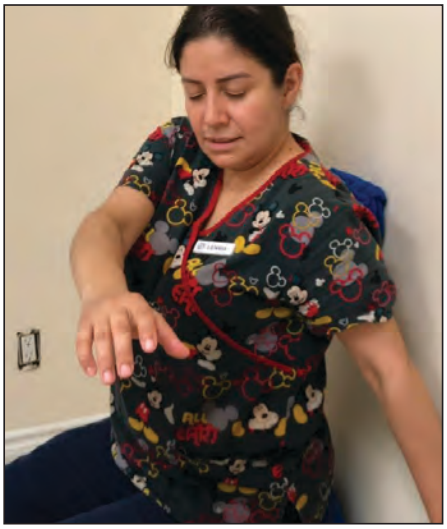
Shoulder and Upper back lying down:




Upper back against the wall






Lower back






CHAPTER 13: HERBAL TEAS FOR RELAXATION

Herbal teas have been used for centuries, both for their health benefits and for pleasure. Some people claim that certain herbal teas have properties that can help reduce symptoms of stress, anxiety, and other mental health concerns. Some herbal teas may help take the edge off occasional stress and anxiety, while others may be better used as a routine complementary therapy for an underlying condition.

Herbal Teas	Benefits
Ashwagandha tea 	• Reducing stress. • Reducing anxiety and depression. • Reducing fatigue and increasing physical endurance. • Boosting immune system. • Improving fertility. • Promote longevity. • Protecting the brain. • Protecting digestive system.
Barley Tea 	• Boosts Your Immune System. • Improves Blood Flow and Circulation. • Prevents Tooth Decay. • It Can Help You Unwind. • Can Increase Weight Loss. • May Boost Fertility in Men.
Chamomile tea 	• Slowing or preventing osteoporosis. • Treating diabetes and lowering blood sugar. • Reducing inflammation. • Cancer treatment and prevention. • Helping with sleep and relaxation. • Treating cold symptoms. • Treatment for mild skin conditions. • Reducing menstrual pain.
Cinnamon Tea 	• Loaded with antioxidants • Lowers inflammation and may improve heart health • May help reduce blood sugar • May promote weight loss • Fights off bacteria and fungi • May reduce menstrual cramps and other PMS symptoms

Cranberry Tea 	• Antioxidants. • Urinary tract infection. • Oral Hygiene's. • Boost immune system and fights infection. • Vitamin packed. • Stress relief. • Eye Health. • Kidney health. • Fat burning.
Hibiscus Tea 	• Packed With Antioxidants. • May Help Lower Blood Pressure. • May Help Lower Blood Fat Levels. • May Boost Liver Health.
Ginger Tea 	• 1Blood pressure and heart health. • Pain relief. • Immune support and cancer prevention. • Weight and blood sugar control.
Rosehip Tea 	• Rich in antioxidants. • May have antidiabetic properties. • May improve bone health. • May have cancer-fighting properties.
Lemon tea 	• Natural antibacterial. • Treats insomnia. • Treats diabetes. • Natural antibacterial. • Lavender Tea Health Benefits. • Improves Sleep.
Lemongrass tea 	• Relieving anxiety. Many people find sipping hot tea to be relaxing, but lemongrass tea may offer further anxiety-reducing properties. • Lowering cholesterol. • Preventing infection. • Boosting oral health. • Relieving pain. • Boosting red blood cell levels.
Valerian Root 	• Insomnia. • Menopausal Symptoms. • Anxiety. • Stress Management.

Turmeric tea 	• Eases arthritis symptoms. • Helps prevent Alzheimer's disease. • Helps prevent cancer. • Maintains ulcerative colitis remission. • Boosts the immune system. • Lowers cholesterol. • Can help treat uveitis.
Tulsi 	• High Cholesterol. • Metabolic Syndrome. • Anxiety.
Sage tea 	• Rich in anti-inflammatory and antioxidant compounds. • May promote healthy skin and wound healing. • Promotes oral health. • May have anticancer properties. • Improves blood sugar control.
Rosemary Tea 	• High in antioxidant, antimicrobial, and anti-inflammatory compounds. • May help lower your blood sugar. • May improve your mood and memory. • May support brain health.
Rose tea 	• Naturally caffeine-free. • Hydration and weight loss benefits. • Rich in antioxidants. • May alleviate menstrual pain.
Honey bush 	• Rich in antioxidants. • May support a healthy immune system. • May aid weight loss. • May protect against heart disease.
Rooibos Tea 	• Low in Tannins and Free from. • Caffeine and Oxalic Acid. • Packed With Antioxidants. • May Boost Heart Health. • May Reduce Cancer Risk.

Peppermint Tea 	• May Ease Digestive Upsets. • May Help Relieve Tension Headaches and Migraines. • May Freshen Your Breath. • May Relieve Clogged Sinuses.
Olive leaves tea 	• relax and ease arthritic pain. • reduce bad cholesterol. • lower glucose levels. • lower blood pressure. • strengthen the cardiovascular system – a heart tonic. • stimulate the immune system. • help fight infections.

CHAPTER 14: HERBAL INHALATIONS AND GARGLING FOR RELAXATION

Steam inhalation, also known as steam therapy, has been around since ancient times. The Egyptians were the first known users of inhalation therapy and often included dry plants and minerals in their preparations. Today, steam therapy is still a common non-pharmacologic treatment to help clear mucus and open the nasal passages, throat, and lungs. There are several ways to inhale steam, which is created by boiling water with various herbs and then breathing in the steam it releases.

BENEFITS OF STEAM INHALATION:

A stuffy nose is triggered by inflammation in the blood vessels of the sinuses. The blood vessels can become irritated because of an acute upper respiratory infection, such as a cold or a sinus infection. The main benefit of breathing in moist, warm steam is that may help ease feelings of irritation and swollen blood vessels in the nasal passages. The moisture may also help thin the mucus in your sinuses, which allows them to empty more easily. This can allow your breathing to return to normal, at least for a short period of time. Steam inhalation may provide some temporary relief from the symptoms of:

- the common cold.
- the flu (influenza).
- sinus infections.
- bronchitis.
- nasal allergies.

How to do steam inhalation with herbs? The most common method of steam inhalation is a do-it-yourself treatment.

- Put two quarts of water in a pot.
- Heat the water until it's not quite boiling, just steamy.
- Put two handfuls of herbs in the water and let steep for 10 minutes.
- Create a tent with a towel over your head to inhale the steam.
- Inhale the steam for no more than 10 minutes.
- Keep the decoction, or extract, of water and herbs on your counter for a few hours after you're finished.

At that point, the herbs have become more concentrated, and the chemicals they release into the air from their essential oils can be left to dissipate in the air, where they can continue to help refresh you and your environment. You can toss the liquid after a few hours. Additional steam therapy methods include inhaling steam from baths, showers, and steam rooms. These methods are the best way to use steam inhalation to relieve symptoms of sore throat and nasal congestion in children. In recent years, portable steam inhalers, also known as vaporizers, have become popular. Herbs most beneficial for steam inhalation: Many herbs can help increase the beneficial effects of steam therapy. Here are five popular choices:

- Thyme: This herb is an expectorant (helps loosen mucus) and has antibacterial properties. It's the most used essential oil for steam therapy because it has great benefits, and it's not an irritant like some stronger oils can be.
- Mint: Mint leaves in steam therapy decoctions is very effective. It has a nice scent, and it helps loosen mucus and is also antibacterial, but cautions against using peppermint essential oil for steam therapy, as it is very strong. Spearmint oil used in vaporizers may be a better choice.
- Eucalyptus: It has cooling qualities and is used as a natural decongestant and can help with respiratory ailments. It's great for loosening mucus, but use it in small doses, as it can be overpowering.
- Basil: It's a decongestant and is naturally antiseptic and antibacterial. It is an essential oil which can be used to sharpen concentration and alleviate some of the symptoms of depression. It may relieve headaches and migraines.
- Rosemary: This herb has antiviral, anti-inflammatory, and antimicrobial properties. It is a stimulating essential oil that can boost mental activity and sharpen your focus. It can also be used to ease pain and cramping.

The best part of using these herbs that they are readily available locally, or even in your own indoor or outdoor herb garden. Physiology behind inhalation of Essential Oils: Essential Oils have tiny molecules, which disperse into the air (especially when diffused) and enter through the nose. When inhaled, the scent molecules reach the olfactory epithelium, which consists of millions of receptor cells located at the top of the nostrils, just below and between the eyes. Odors are then converted to messages, which are converted and relayed to the brain for processing. Inhalation provides the most direct route to the brain. With every breath, some scent molecules inescapably travel to the lungs. Some molecules are absorbed by the mucous lining of the respiratory pathway. Other molecules reach the alveoli and are transferred into the bloodstream.

Therefore, inhalation of essential oils not only influences emotions but also has a physical impact. Interaction with the limbic system (emotional brain). During inhalation, odor molecules travel through the nose and affect the brain through a variety of receptor sites, one of which is the limbic system, which is commonly referred to as the "emotional brain." The limbic system is directly connected to those parts of the brain that control heart rate, blood pressure, breathing, memory, stress levels, and hormone balance. This relationship helps explain why smells often trigger emotions. Knowing this, we can hypothesize how inhalation of essential oils can have some very profound physiological and psychological effects.

What do essential oils do?

Different oils have different uses and effects.

- Basil essential oil is used to sharpen concentration and alleviate some of the symptoms of depression. It may relieve headaches and migraines. It should be avoided during pregnancy.
- Bergamot essential oil is said to be useful for the urinary tract and digestive tract. When combined with eucalyptus oil it may help relieve skin problems, including those caused by stress and chicken pox.
- Black pepper essential oil is commonly used for stimulating the circulation, muscular aches and pains, and bruises. Combined with ginger essential oil, it is used to reduce arthritis pain and improve flexibility.
- Chamomile essential oil can treat eczema.
- Citronella essential oil is a relative of lemongrass and acts as an insect repellent.
- Clove essential oil is a topical analgesic, or painkiller, that is commonly used for toothache. It is also used as an antispasmodic antiemetic, for preventing vomiting and nausea, and as a carminative, preventing gas in the gut. It has antimicrobial, antioxidant, and antifungal properties.
- Eucalyptus essential oil can help relieve the airways during a cold or flu. It is often combined with peppermint. Many people are allergic to eucalyptus, so care should be taken.
- Geranium essential oil can be used for skin problems, to reduce stress, and as a mosquito repellant.
- Jasmine essential oil has been described as an aphrodisiac. While scientific evidence is lacking, research has shown that the odor of jasmine increases beta waves, which are linked to alertness. As a stimulant, it might increase penile blood flow.
- Lavender essential oil is used as an antiseptic for minor cuts and burns and to enhance relaxation and sleep. It is said to relieve headache and migraine symptoms.
- Lemon essential oil is said to improve mood and to help relieve the symptoms of stress and depression.
- Rosemary essential oil may promote hair growth, boost memory, prevent muscle spasms, and support the circulatory and nervous systems.
- Sandalwood essential oil is believed by some to have aphrodisiac qualities.
- Tea tree essential oil is said to have antimicrobial, antiseptic, and disinfectant qualities. It is commonly used in shampoos and skin care products, to treat acne, burns, and bites. It features in mouth rinses, but it should never be swallowed, as it is toxic.
- Thyme essential oil is said to help reduce fatigue, nervousness, and stress.
- Yarrow essential oil is used to treat symptoms of cold and flu, and to help reduce joint inflammation.
- Household fumigation: Essential oils are important and necessary things in every home, other than their benefits in treating many diseases for their anti-inflammatory, antioxidant and anti-microbial properties, they also give an atmosphere of peace and comfort to the home and give a refreshing atmosphere to family members.

Useful oil for Respiratory system

- Thyme oil: can remove excess mucus in the airways, eliminate infection and open airways that can worsen respiratory symptoms. How to use: This essential oil can be added to the vaporizer by 3-6 drops,
- Lavender oil: It has some soothing and anti-inflammatory properties that make it ideal for the respiratory system. It can reduce swelling in the respiratory tract and calm muscle spasms, preventing bronchospasm that can cause wheezing. How to use: You can add lavender oil to a warm bath and inhale the resulting aromatic vapors deeply or mix lavender oil with jojoba oil.
- Eucalyptus oil: It is known to be a demulcent and expectorant that can also break up excess mucus in the respiratory tracts. It is soothing for infections of the throat and breathing passages How to use: Add 5 drops of camphor oil to the vaporizer or diffusers.
- Tea tree oil: It stimulates an immune system response in the form of excess mucus production in inflamed airways. Tea tree oil can counteract this injury directly by the body. How to use: Add five to six drops to a bowl of hot water. Put a towel on your head and take deep breaths.
- Frankincense oil: It will cut the mucus and relieve tightness in the chest, promoting normal and healthy breathing, even during an asthma attack. How to use: Many people choose to spread frankincense oil in the air for all-day, which gives relief from breathing conditions. A diluted version of this oil (along with coconut oil) can also be applied to your chest at night, as it will help you breathe normally throughout the night without interruption while you sleep.
- Clove oil: It can prevent the respiratory tracts from developing allergies, and this oil relieves muscle tension in the throat as well, so that breathing continues without interruption. How to use: Clove oil has a wonderful scent, which makes it a popular choice for diffusing it in rooms, as well as for steam inhalation treatments. Some people choose to mix it with a carrier oil (such as almond or olive oil) and apply it to the chest. However, sensitivity to this oil is very high, so never apply undiluted oil to the skin.
- Mint leaves oil: Armed with decongestant, antispasmodic, sedative, and anti-inflammatory properties. It can open breathing passages and prevent an asthma attack from becoming more severe.
- Chamomile oil: This legendary anti-inflammatory oil can calm respiratory inflammation and support the immune system, and it does not have any significant catalytic reactions. It can also act as a repellent to get rid of excess mucus from the throat and lungs, making asthma attacks less severe. How to use: You can add a few drops of chamomile oil to a cup of hot chamomile tea during a steam inhalation treatment to help you keep your breathing easy throughout the day.
- Peppermint oil: Peppermint oil is one of the essential oils you always have because it not only smells great, but it also helps relieve pain. You can use peppermint essential oil to treat several health problems. Research has found peppermint oil to be a good natural oil for relieving headaches, improving depression, relieving muscle pain, clearing congestion, and soothing skin ailments.

Antibacterial oils

- Lemon essential oil: Lemon essential oil comes in the top list as one of the best scented essential oils for your home that also have medicinal properties. It removes germs from surfaces and kills bacteria on the skin. Apply 4-6 drops.
- Clove essential oil: Clove is another essential oil that smells good and has many therapeutic uses to help improve your health. Contains antimicrobial and antioxidant properties, only use 2-3 drops
- Oregano oil: Oregano oil is commonly used with carrier oils to help treat and prevent wound infections. Studies have shown that oregano essential oil is effective against infection with staphylococcus aureus bacteria.
- Sage oil: It works to expel parasites, fungi and bacteria from the house and cleanse the general atmosphere of the house by dropping a few drops of oil in the vaporizer. 2-4 drops
- Ginger oil: It sterilizes the house and has a pleasant smell that helps to expel bacteria from the house and even mosquitoes and bugs can be placed 5 drops.

Here are some recipes for inhalation:

Recipe 1: Rosemary and thyme water

Ingredients:

- 5 cups lukewarm water
- 1 teaspoon vinegar
- 6 teaspoons rosemary
- 2 teaspoons thyme

Method: Put the water in a bowl and boil and add herbs to it. When the water is boiling, and you see steam coming out of it switch the flame off and add vinegar and cover it. Put a towel on the face with the bowl inside and inhale for half an hour or 20 minutes and then wash face with cold water. Repeat the process daily for a week.

Recipe 2: Lavender and Lemon Water

Ingredients:

- 5 cups lukewarm water
- 5 teaspoons of lavender oil
- 3 teaspoons chamomile
- 3 drops of lemon oil

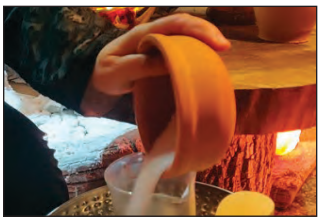
Method: Put water in a bowl and boil and add herbs to it and then add vinegar and put a towel on the face and inhale for half an hour or 20 minutes and then wash face with water. Repeat the process daily for a week. Lavender oil treats dry skin or eczema. It is very

useful for relaxing.

Recipe 3: Camphor Water

Ingredients:

- 5 cups lukewarm water
- 1 teaspoon Camphor

Method: Put the water in a bowl and boil then add camphor. Put a towel on your face and inhale from the bowl for half an hour or 20 minutes and then wash face with water repeat the process daily for a week.

Benefits

- Calm the nerves.
- Stimulates the body and vitality.
- Good pain reliever.

Recipe 4: Orange Peel and Lemon Water

Ingredients:

- 5 cups lukewarm water
- 1 cup orange peel and lemon
- 3 teaspoon vinegar







Method: Put the water in a bowl and boil then add vinegar. Put a towel on the face and inhale from the bowl for half an hour or 20 minutes and then wash face with water. Repeat the process daily for a week.

Benefits:

- Reduces pain
- Calm the nerves.
- Detox
- It fragments skin pores and stimulates circulation.

Steps involved to prepare for inhalation:

You'll need the following materials:

- a large bowl
- water
- a pot or kettle and a stove or microwave for heating up water
- towel

Here's the process:

1. Heat up the water to boiling.
2. Put the ingredients in the boiling water as mentioned in the above following recipes. You can choose any recipe according to your condition.
3. Carefully pour the hot water into the bowl.
4. Drape the towel over the back of your head making a tent over your head.
5. Turn on a timer.
6. Shut your eyes and slowly lower your head toward the hot water until you're about 8 to 12 inches away from the water. Be extremely careful to avoid making direct contact with the water.
7. Inhale slowly and deeply through your nose for at least two to five minutes. Don't steam longer than 10 to 15 minutes for each session. However, you can repeat steam inhalation two or three times per day if you're still having symptoms.








GARGLING

A traditional home remedy of gargling warm saltwater is sometimes recommended to soothe a sore throat. Physiological changes that occur when you do saltwater gargle: Soreness of throat is generally due to the infection of the bacterium called Streptococcus. So it is called strep throat. A strep throat is usually inflamed due to bacteria making widespread damage on our soft tissues or mucosa. These inflammations (known as edemas) are usually filled with water. When we gargle with warm salt water that is saltier than our body fluids (hypertonic solution), through osmosis the salt draws out the edema fluid.

The principle behind it is that if a porous partition separates dilute and concentrated solutions then the dilute solution permeates through the porous partition into the concentrated solution. This process does not stop till the concentration of both the solutions is equal. Salt water is more concentrated than the water in bacteria. The membrane of the cell of inflammatory tissue acts as a porous partition. So the salt draws water from the swollen cells that are causing pain and the inability to swallow foods.

Not only that, it will also draw water from the bacteria. When the bacteria gradually lose their body fluid they cannot remain active after dehydration. So they wither and die. This phenomenon is called plasmolysis. The other benefits are; when the salt water enters the throat, the solution helps to neutralize acids in the throat, restoring the natural pH balance that had been disrupted by the sore throat. By doing this, the burning sensations are relieved, and the mucous membranes become less irritated, which can speed healing.

Benefits of saltwater gargle:

Saltwater gargles can be effective for treating mild pain, discomfort, and tickles in the mouth and throat. Maintains the pH level. The mixture helps to neutralize the acids in the throat that is produced by bacteria. It helps to maintain a healthy pH balance, which prevents the growth of unwanted bacteria in the mouth.

- Sore throats: Saltwater gargles can be an effective way to relieve discomfort from sore throats. Clears nasal congestion Gargling with salt water also helps to remove the mucus build-up in your respiratory tract and nasal cavity. The concoction reduces the inflammation and relieves the pain in the throat. Apart from that, it flushes out the bacteria and virus, which if let unattended can lead to congestion.
- Gives relief from tonsillitis: Tonsils are two lump tissues located at the back of the throat, which gets inflamed due to a bacterial and viral infection. Inflamed tonsillitis might cause pain in swallowing the food. Gargling with salt water can help you get relief from the pain and ease these symptoms.
- Canker sores: Canker sores are painful ulcers that can develop in the mouth. Gargling with salt water may help ease pain and promote healing of the sores.
- Allergies: Some allergies, such as hay fever, can cause a person's nasal passages and throat to swell, which can be uncomfortable. Though gargling with salt water will not prevent the allergy, it may help alleviate some of the throat discomforts.
- Respiratory infections: Gargling with salt water may help relieve the symptoms of the common cold.
- Dental health: Regularly gargling with salt water can assist in removing bacteria from the gums, which helps in cleaning and preventing the buildup of plaque and tartar. A buildup of bacteria in the mouth can lead to gum disease and tooth decay.

How does gargling help in relaxation?

It innervates the heart, lungs, and gut, it can powerfully alter your physical reaction to stress and improve your mental and emotional state. The activity of the vagus nerve is described by Vagal tone— the higher the tone, the better the parasympathetic response and the calmer we feel. Gargling for 10-20 seconds can be a strong stimulus for the vagus nerve.

Here are some recipes for gargling:

Recipe 1

Ingredients:

- Half a teaspoon of salt
- 3 teaspoons chamomile
- 2 tablespoons honey
- 1 cup of water

Method: Put the chamomile in water and boil then add honey and salt and stir well and gargle with it 3 times a day.

Benefits:

- Pharyngeal cleanses protect against germs and viruses
- Reduces inflammation
- Stimulates nerves
- Activates circulation

Recipe 2:

Ingredients:

- 2 teaspoons mint
- 2 teaspoons green tea
- 2 teaspoons of sage

- ½ a teaspoon of table salt

Method: Boil everything together and drain and then add salt to it and gargle with it 3-4 times a day.

Benefits:

- Pharyngeal cleanses protect against germs and viruses.
- Protects against diseases and reduces infections
- Relieves pain and congestion
- Stimulates nerves and tasteful senses
- Activates circulation

Recipe 3:

Ingredients:

- 2 teaspoons salt
- 2 cups warm water

Method: This gargle is an inexpensive natural remedy and easily available in every house. Boil water and then add salt to it and gargle 3-4 times a day.

Benefits:

- Protects against diseases and reduces infections
- Relieves pain and congestion
- Stimulates nerves and tasteful senses
- Benefits in light pain relief
- Strengthens gums and reduces infections

CHAPTER 15: BODY AND FOOT SOAK RECIPES FOR RELAXATION

But first let us understand how soaking helps?

Salt is considered a home remedy for generations. Soaking the foot with it relieves aches and pains, reduces inflammation, improves blood circulation, reduces, or removes unpleasant odors from the feet, and has anti-fungal and microbial properties. It helps with skin infections and wounds, including athlete's foot, nail fungus and small wounds. In addition, there is a lot of research indicating that it helps to remove toxins from the body and relieve stress. Skin absorption of minerals relieves cramping and foot pain, enhances the absorption of magnesium through the skin, which helps relax muscles and nerves and relieves foot pain. It has antibacterial and anti-fungal properties, improving blood flow to the skin, thus enhancing the chances of recovery.

Recipes for body soaking

Recipe 1: Apple cider vinegar and basil

Ingredients:

- A cup of Epsom salt/Dead Sea or homemade table salt
- Half a cup of apple cider vinegar
- Dry chamomile, mint, basil, and thyme

Method:

- Mix all the dry herbs and boil it with water until simmers.



- Add warm water and stir well.


- Add salt, apple cider vinegar and stir well.


- Soak your body in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).


Benefits:

- It reduces toxins present in the body and lessens the pain
- Reduces infections, bacteria, and fungus
- Stimulates blood circulation
- Nourishes the skin and make it smooth.

Recipe 2; Rosemary and mint

Ingredients:

- Half a cup of Dead Sea Salt or Epsom salt
- 10 teaspoons of dry or fresh mint leaves
- 10 teaspoons of dry or fresh mint leaves
- 10 teaspoons of rosemary
- 5 A cup of apple cider vinegar
- teaspoons of chamomile

Method:

- Mix all the dry herbs in a bowl.




- Add warm water, salt, and apple cider vinegar into it and mix
- Soak your body in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).

Benefits:

- It reduces toxins present in the body and lessens the pain
- Reduces infections, bacteria, and fungus
- Stimulates blood circulation
- Nourishes the skin and make it smooth.

Recipe 3: Sesame seeds and black seed with apple cider vinegar

Ingredients:

- 10 teaspoons of table salt
- A large cup of apple cider vinegar
- 3 teaspoons of mint
- 3 teaspoons of sesame
- 5 teaspoons of wild thyme
- 5 teaspoons of black seed powder
- 5 teaspoons of flaxseed

Method:

- Take flax seeds, black seeds, sesame seeds, and grind it well. Take it in a bowl.



- Mix all the dry herbs (mint, thyme, and salt) in a bowl.



- Add warm water, olive oil, and apple cider vinegar into it and mix well.



- Then, soak your body in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).

Benefits:

- It reduces toxins present in the body and lessens the pain
- Reduces infections, bacteria, and fungus
- Stimulates blood circulation
- Nourishes the skin and make it smooth.

Recipes especially for foot soaking:

Recipe 1: Ginger and mint wirh sea salt

Ingredients:

- 2 teaspoons of fennel
- 3 tablespoons of mint
- 5 spoons of ginger
- 4 tablespoons of sage
- 4 tablespoons of table salt
- A cup of white vinegar

Method:

- Mix all the dry herbs in a bowl.

- Add warm water, olive oil into it and mix well.

- Then, soak your feet in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).
- Prefer a bowl or tub which is non-metallic.

Recipe 2: Lavender and pepper

Ingredients:

- 3 tablespoons of ginger
- 2 tablespoons of lavender
- 4 tablespoons of mint
- 3 tablespoons of cumin
- 2 tablespoons of hot pepper
- 7 tablespoons of table salt

Method:

- Mix all the dry herbs in a bowl.

- Take hot pepper and grind it well. Take it in a bowl and mix with the other herbs.



- Add warm water, olive oil, and lavender into it and mix well.




- Then, soak your feet in tub filled with this mixture every evening for 30 minutes. (Repeat it for 2 times a day).
- Prefer a bowl or tub which is non-metallic.

Recipe 3: Moringa and cinnamon with olive oil

Ingredients:

- A cup of apple cider vinegar
- 3 teaspoons of Moringa
- 3 teaspoons of sesame seeds
- 5 teaspoons of cinnamon
- A quarter cup of olive oil

Method:

- Mix all the dry herbs (moringa and cinnamon powder) in a bowl.


- Take sesame seeds and grind it well. Take it in a bowl and mix with the other herbs.




- Add warm water, olive oil into it and mix well.




- Then, soak your feet or the whole body in tub filled with this mixture every evening for 15-20 minutes. (You can be there for longer time if you need).

Benefits:

- It reduces toxins present in the body and lessens the pain
- Reduces infections, bacteria, and fungus
- Stimulates blood circulation
- Nourishes the skin and make it smooth.

Recipe 4: Thyme and coriander with Olive oil

Ingredients:

- A cup of apple cider vinegar
- 3 tablespoons of coriander seed
- 5 spoons of moringa sowing
- 5 spoons of cinnamon
- 3 tablespoons of basil
- 2 tablespoons of thyme
- A cup of extra-virgin olive oil

Method:

- Mix all the dry herbs in a bowl.


- Add warm water, olive oil into it and mix well.



- Then, soak your feet or whole body in tub filled with this mixture every evening for 30 minutes. (Repeat it for 2 times a day).
- Prefer a bowl or tub which is non-metallic for foot.

How to prepare foot soak:

To best ease soreness, a foot soak should be between 92°F and 100°F. foot soak involves immersing the feet in warm water. Follow these steps to perform a foot soak:

1. Fill a basin or foot spa or a bucket with enough warm water to cover the feet up to the ankles.
2. Add any of the following ingredients mentioned above for foot soak, according to your conditions to the water.
3. Place the feet in the soak for about 20 to 30 minutes.
4. Dry thoroughly after the soak and then moisturize the feet.




An Epsom salt foot soak can dry out the feet, so it is best not to do it every night. Try soaking the feet once or twice a week to make sure it does not cause dryness. Always end your foot soak with moisturizer.

Benefits:

- It reduces toxins present in the body and lessens the pain
- Reduces infections, bacteria, and fungus
- Stimulates blood circulation
- Nourishes the skin and make it smooth.

CHAPTER 16: NUTRITIONAL FACTS AND BENEFITS OF BALANCE DIET

It's been said that you are what you eat, and that's true when it comes to chronic pain. "A lot of pain is the result of inflammation, and the evidence is quite strong that your diet can contribute to increased systemic inflammation, "Research shows that foods and drinks that reduce inflammation can reduce pain and improve your mood. The best dietary approach to help your immune system, and thus help reduce chronic inflammation, is to cut out the bad inflammatory foods and adopt more of the good anti-inflammatory kinds.

Best Foods for Lung Health

Keeping your lungs healthy is essential to feeling your best. Research has shown that lifestyle modifications, including following a nutrient-rich diet, can help protect your lungs and even reduce lung damage and symptoms of disease.

Beets and beet greens: The vibrantly colored root and greens of the beetroot plant contain compounds that optimize lung function. Beetroot and beet greens are rich in nitrates, which have been shown to benefit lung function. Nitrates help relax blood vessels, reduce blood pressure, and optimize oxygen uptake. Additionally, beet greens are packed with magnesium, potassium, vitamin C, and carotenoid antioxidants all of which are essential to lung health.

Peppers: Peppers are amongst the richest sources of vitamin C, a water-soluble nutrient that acts as a powerful antioxidant in your body. Getting enough vitamin C is especially important for those who have respiratory issues or who live in area which has higher pollutant concentration and people who smoke.

In fact, due to the damaging effects of smoke on your body's antioxidant stores, it's recommended that people who smoke consume an extra 35 mg of vitamin C per day. Consuming just one medium-sized (119-gram) sweet red pepper delivers 169% of the recommended intake for vitamin C.

Apples: Regularly eating apples may help promote lung function. Studies show that apple intake is associated with a slower decline in lung function in ex-smokers. Additionally, consuming five or more apples per week is associated with greater lung function and a reduced risk of developing COPD.

Apple intake has also been linked to a lower risk of asthma and lung cancer. This may be due to the high concentration of antioxidants in apples, including flavonoids and vitamin C.

Pumpkin: The brightly colored flesh of pumpkins contains a variety of lung-health-promoting plant compounds. They're especially rich in carotenoids, including beta carotene, lutein, and zeaxanthin all of which have powerful antioxidant and anti-inflammatory properties.

Turmeric: Turmeric is often used to promote overall health due to its potent antioxidant and anti-inflammatory effects. Curcumin, the main active component in turmeric, may be especially beneficial for supporting lung function.

Tomatoes: Tomatoes are among the richest dietary sources of lycopene, a carotenoid antioxidant that has been associated with improved lung health. Consuming tomato products has been shown to reduce airway inflammation in people with asthma and improve lung function in people with COPD.

Berries: Red and blue fruits like blueberries and strawberries are rich in a flavonoid called anthocyanin, which gives them their color and is also a strong antioxidant. Research suggests this pigment can slow down your lungs' natural decline as you age.

Leafy Green Vegetables: Green leafy vegetables like spinach, Swiss chard, and other leafy greens particularly Chinese greens are good for lowering the chance of getting lung cancer. This could be because they are high in carotenoids, which are antioxidant.

Edamame: Edamame beans contain compounds called isoflavones. Diets rich in isoflavones have been associated with a reduced risk of numerous diseases, including COPD. Isoflavone intake is significantly associated with better lung function and reduced shortness of breath.

Green tea: Green tea is a beverage that has impressive effects on health. Epigallocatechin gallate (EGCG) is a catechin concentrated in green tea. It boasts antioxidant and anti-inflammatory properties and has been shown to inhibit fibrosis or scarring of tissues.

Oysters: Oysters are loaded with nutrients that are essential to lung health, including zinc, selenium, B vitamins, and copper.
Studies show that people with higher blood levels of selenium and copper have greater lung function, compared with those with lower levels of these nutrients.

Yogurt: Yogurt is rich in calcium, potassium, phosphorus, and selenium. According to research, these nutrients may help boost lung function and protect against COPD risk.

Brazil nuts: Brazil nuts are amongst the richest sources of selenium that you can eat. Studies show that a high selenium intake may help protect against lung cancer, improve respiratory function in people with asthma, and enhance antioxidant defenses and immune function, which may help improve lung health.

Lentils: Lentils are high in many nutrients that help support lung function, including magnesium, iron, copper, and potassium.

Consuming a diet high in nutritious foods and beverages is a smart way to support and protect lung health. Keeping your lungs healthy is as easy as getting the right nutrients. The above-mentioned natural foods and herbs can foster stronger lungs. They may even help you breathe easier. Whether you're hoping to build powerful lungs that can power you through everyday physical activity or you simply want to breathe easier, it's possible. And what you eat just might make a big difference.

Recipes for salads

Recipe 1: Red beans Salad

Ingredients: - ¼ cup boiled red kidney beans, drained, ¼ 1 cup boiled and drained pinto beans, ½ cup chopped red onion, ½ cup chopped red pepper, ½ cup chopped yellow pepper, ½ cup chopped cucumber, ½ cup chopped parsley

For the dressing: - ¼ cup olive oil, ¼ cup vinegar, 2 tablespoons lemon juice, 1 clove of minced garlic, 2 teaspoons ground cumin, 1 teaspoon ground coriander, ½ 1 teaspoon black pepper, ½ 1 teaspoon chili (optional), ¾ 1 teaspoon salt

Method: In a bowl, mix all the vegetables. Then, put all the ingredients for dressing gradually. Stir the salad and mix it well. Top it with fresh parsley and serve it directly. It can be used as a side dish with soup or main course.

Recipe 2: Tuna Salad

Ingredients: 1 cup chopped arugula, 2 cups of chopped salmon or tuna, 1 cup chopped tomatoes, ½ cup of colored capsicum, ¼ cup of black olives, 2 tablespoons of chopped parsley, ½ cup of chopped red cabbage

For dressing: 1 tablespoon olive oil, 1 clove of minced garlic, 2 teaspoons lemon juice, Pinch of chili, Pinch of salt.

Method: In a bowl, mix all the vegetables. Then, put all the ingredients for dressing gradually. Stir the salad and mix it well. Top it with fresh parsley and serve it directly. It can be used as a side dish with soup or main course.






Recipe 3: Potato and herbs salad

Ingredients: 3 medium potatoes boiled and diced, ½ cup chopped green onions, 2 tablespoons of chopped parsley, 2 tablespoons mayonnaise, a tablespoon of tahini, ¾ 1 teaspoon salt, and ½ 1 teaspoon black pepper

Method: Cover the potatoes with water in a deep bowl, add a tablespoon of salt, and boil them until a little tender. Peel the potatoes and cut them into medium cubes, then add half of the seasoning mixture. Add parsley and onions to the remaining seasoning, add to potatoes, squeeze a lemon, and then serve.










Recipe 4: Wheat and greens salad

Ingredients: 2 cups of finely chopped parsley, 1 onion, finely chopped, 2 tablespoons of groats of wheat soaked in water, ¼ cup of pure olive oil, ½ cup of finely chopped tomatoes, 2 tablespoon of squeezed lemon, ¼ cup of finely chopped hot pepper - to taste, ½ cup of washed lettuce or any green leaves of your choice.

Method: Put the soaked wheat, tomatoes, onions, mint, parsley and hot pepper and green leaves in a bowl and mix. Add lemon, salt, olive oil and mix until combined. Pour the salad into a large serving dish and serve fresh.








Recipe 5: Green Greek salad

Ingredients: 2 cups of medium chopped tomatoes, 2 cups of chopped cucumbers, 1 cup medium chopped lettuce, 1 cup chopped onion, ½ cup chopped white cheese, 1 cup chopped sweet green pepper, few slices of black olives, ½ cup of lemon juice, pinch of salt, 1 tablespoon of vinegar, 2 tablespoons of olive oil, 1 tablespoon of thyme.

Method: Put all the ingredients together, and stir them except for the white cheese, onions, and black olives. Add salt, olive oil, thyme, vinegar, and lemon juice and mix well. Top the salad with cheese, onions and black olives while serving. It can be used as a side dish or main course.








Recipe 6: Fruit bowl Salad

Ingredients: ¼ cup of chopped kiwi, ¼ cup of chopped strawberries, ¼ cup of chopped pineapple, ¼ cup of chopped bananas, ¼ cup of pomegranate, 1 teaspoon of finely chopped ginger, 1 teaspoon of honey, ¼ cup of orange juice, ¼ cup of lemon juice and ¼ cup chopped mint.

Method: Put the fruits in a bowl. Add honey, ginger, lemon juice, orange juice and mix well. Top it with freshly chopped mint and serve.

Recipes for juices

Recipe 1 – Green Juice

Ingredients: 1 orange, 2 cups of pineapple, a cup of chopped avocado, 2 sticks of celery, 2 pears, lemon juice, a piece of ginger, 2 spoons of turmeric, a little black pepper, half a spoon of honey

Method: take all the ingredients and blend it in a blender. Don't use the juicer machine as we want to keep the pulp for good results. Pour in a glass and consume fresh.

Recipe 2 – Hot Juice

Ingredients: 5 medium chopped tomatoes, half a lemon, a bunch of parsley mixed with dill, a slice of garlic, and a glass of water (can be replaced with tomato juice)

Method: take all the ingredients and blend it in a blender. Don't use the juicer machine as we want to keep the pulp for good results. Pour in a glass and consume fresh.

Benefits of this drink:

- Relieves pain, swelling and edema.
- Reduces arthritis.
- Reduces osteoporosis.
- stimulates the nerves.
- Stimulates blood circulation because it contains a large amount of vitamin C.

Recipe 3: Vitamin C juice

Ingredients: Half a banana,1 orange, 2 pieces of kiwi, 2 teaspoons of flaxseed, 2 teaspoons of sesame, ¼ cup of pomegranate, 2 pieces of walnuts and almonds, 2 spoons of honey

Method: Mix all together and bled it in a mixture. Drink it in the morning.

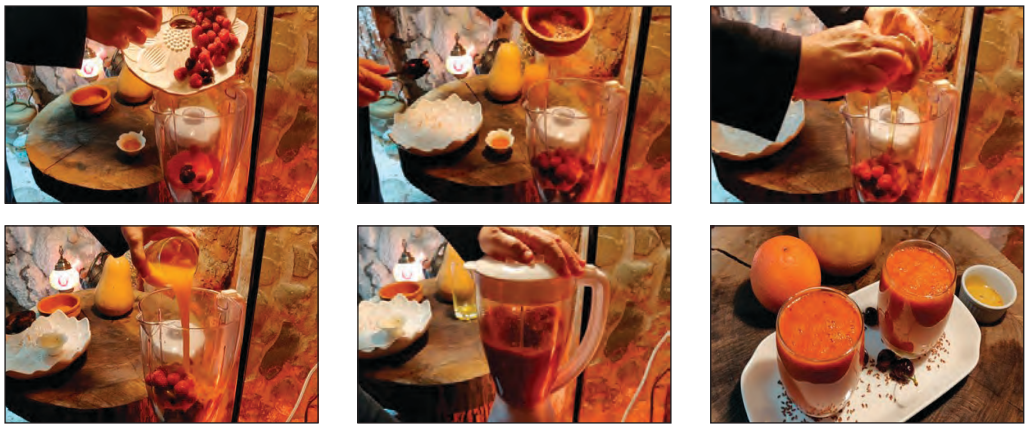
Benefits of this drink:

- It is a stimulant for the blood circulation.
- Stimulates the nerves.
- Reduces joint and respiratory infections.
- Lessens the pain.

Recipe 4: Pumpkin juice

Ingredients: 1 cup of boiled red pumpkin,1 cup of grapefruit, Quarter cup of lemon, ½ cup of cranberry, ¼ cup of cherries, ¼ teaspoon of turmeric, ½ teaspoon of flaxseed, ½ teaspoon of nigella, a teaspoon of cinnamon, 3 tablespoons of honey.

Method: All materials are added to the mixer and drink two cups daily.



Benefits of this drink

- Activates blood circulation.
- It stimulates the nerves.
- Strengthens bones and relieves pain.
- It is a rich source of many vitamins, such as folic acid, vitamin B3, and vitamin B, which are important for the functioning of various vital processes in the body, and the work of enzymes.
- Maintains the integrity and functions of nerves, in addition to contain important minerals, such as: potassium, calcium, copper, magnesium, and phosphorous.

Recipe 5: Milk cocktail with chia and flax seed

Ingredients: Two cups of milk, 1 teaspoon of chia seed, 1 teaspoon of nigella, a teaspoon of flaxseed, a teaspoon of honey, 1 teaspoon of turmeric, a teaspoon of honey, 2 tablespoons of oats.

Method: Mix everything in a blender and drink daily.

Benefits of drinking this mixture:

- Helps relieve pain.
- Repairs bones.
- Relieves osteoporosis and pain .
- Relaxes muscles.
- Reduces inflammation.
- Stimulates blood circulation.

Recipes for soup

Recipe 1 – Bone broth soup

Ingredients: 1 liter water, Bones of meat, fish, or poultry, preferably meat, 1 teaspoon of vinegar, Pinch of salt and pepper.

Method: Boil the ingredients in a suitable size pot over medium heat for 4 to 6 minutes, stir occasionally. After the water boils, reduce the flame and add Onions, Celery, Carrots, Parsley, Thyme and Garlic to add some flavours. Now cook with covered lid for 10 to 24 minutes. After that, turn off the flame and let it cool down. Once cooled, filter the broth with a cheesecloth or strainer. Add salt and pepper according to your taste.

Recipe 2: Mushroom soup

Ingredients: 1 cup of sliced potatoes, 1 cup of chopped carrots, 1 cup of chopped onions, 2 cups of chopped brown or white mush-

rooms, 3 tablespoons of olive oil, ¼ cup chopped parsley, 1 teaspoon of shredded ginger, 1 teaspoon of salt and pepper, 1 cup chopped pot .

Method: Sautee onions and carrot with butter in a suitable size pot over medium heat for 4 to 6 minutes, then add mushrooms to it and sauté it for another 5mins. Now add salt and pepper to it. Add 3 cups of lukewarm water or you can use vegetable broth instead and bring it to boil. Add the shredded ginger, parsley and serve.

Recipe 3: Meat curry

Ingredients: 2 medium sized onions finely chopped, 2 kg of yogurt, 1 kg of lamb meat, 3 leaves of laurel, 1 teaspoon of ginger chopped finely, ½ cup of carrot chopped, 1 cinnamon sick, 6 grains of cardamom, 4 teaspoons of starch dissolved in ½ cup of water and Salt to taste.

Method: Put the meat in a liter of water pot and boil. Put another pot with 1 and ½ liter of water and bring it to boil. After 10 minutes, transfer the meat to the second pot with water and add carrots, ginger, cinnamon, cardamom, bay leaves and salt (as per your taste). Simmer the mixture until it boils and cook it on low flame for 90 minutes. Now the meat is tender. Take a pan add 2 cups of water, onions and boil it for 5 minutes. Drain it and set it aside. Take a bowl add yogurt, water, and whisk it well until it comes smooth. Put this mixture on a low flame and stir well. Add salt in batches at interval of every 3 minutes and stir well. Remove the pot from the heat and set aside. Put the boiled meat and onions in a saucepan at low flame, add the milk and stir the ingredients from time to time with a wooden spoon for five minutes. Pour the mixture into a plate and serve with rice.

Recipe 4: Wheat soup

Ingredients: 2 tablespoons of olive oil, 1 medium chopped onion, 2 medium chopped sweet red pepper, 1 teaspoon of salt, 1 teaspoon of pepper, 3 cloves of crushed garlic, 1 teaspoon of dried and ground mint, ½ teaspoon smoked paprika, 1 tablespoon of tomato paste, 1 can of tomato pulp, 4 cups of chicken stock, 2 cups of water, ¾ cup of wheat and ½ cup of chopped fresh mint.

Method: In a saucepan add oil, onions, red pepper, salt, and sauté over a medium heat for 6-8 minutes until the color changes to brown. After that add garlic, mint, smoked paprika and stir it until this mixture starts releasing oil. Add tomato paste and simmer for 1 minute. Put on the tomato pulp and cook for 10 minutes. After that add chicken stock, water, and wheat until it starts boiling. Cook until the wheat becomes soft. At last, add salt and pepper up to the taste and garnish with fresh mint.

Recipe 5: Lentil Soup

Ingredients: 1 and ½ cup of lentils, 4 cups vegetable broth, 2 tablespoons vegetable oil, 1 tablespoon butter grated onion, 1 chopped bell pepper, half a grated tomato, 2 cloves garlic minced, 1 celery stick, chopped, half a teaspoon of cumin, half a teaspoon of curry, half a teaspoon of turmeric, half a teaspoon of sweet pepper, Quarter of a teaspoon of ginger, salt and pepper as needed Toast with butter and herbs.

Method: Heat a saucepan, add oil, butter, onions, leeks, celery and garlic and fry for 5 minutes. Add bell pepper, tomatoes and stir for 5 minutes more. Add the lentils, stirring constantly, then add the turmeric, curry, paprika, cumin, pepper, salt, and ginger, and stir well for two minutes. Add the broth, stir, and leave it on the fire until it boils. Cover the pot and leave for 35 minutes, until the lentils are well cooked. Blend the soup with a hand mixer until smooth. Return the soup to the pot and cook until boiled. Serve hot.

This book aims to help improve the function of the respiratory muscles through specific exercises, positions and breathing. It is helpful in improving respiratory functions of people with any chronic conditions like COPD, asthma or in athletes and healthy individuals as well to promote enhanced functioning. Because the respiratory muscles are also essential for postural control and core stability, with this course one can also improve conditions like back pain and reduce falls risk. An understanding of this technique can, therefore, enhance the practice of physiotherapists from a range of backgrounds and the general population. This course aims to provide you with an understanding of the emergence, advancement and techniques behind chest physiotherapy. At the end of this book, you will be able to, design or self-treat the respiratory condition in variety of patients ranging from athletes to chronic conditions, identify the mechanism behind each condition, rationale in between different conditions, list the indications – contraindications and precautions while doing the exercise.

Apart from the basic medical knowledge, there will also emphasize on the effects of herbs and many natural techniques, which will fasten the process of recovery. There are variety of recipes for inhalation and massage included in this course. All treatment options will be explained under one roof.

Dr. Mahmoud Sous – Ph.D.

During the period of 1995-1999, I went to the medical school in Poland to research about the various methods of back pain treatment. After finishing my PhD, I took variety of courses including naturopath, acupuncture, and manual techniques. This gave me an idea that exercises, and massage could be helpful in treatment of chronic pain. But my findings didn't stop me here, I also worked as a naturopath practitioner in Canada where I got familiar about treatments with Chinese medicines, osteopath techniques and some other manual therapies which helps in pain management.

Fixing injuries requires an understanding of anatomy and biomechanics. That is why my research and treatment belong to the holistic approach of using different techniques and remedies for the treatment of back pain. In 1990, I realize that there are some complex spinal aspects and issues which leads to of back pain. So, from my case studies I formulated a guideline which is clear and easy to understand and will fix your issues.

My goal is to help people visualize how the body functions and what happens inside when you experience pain. Healing requires to focus on one's action because pain results due to faulty actions and movements. This thought motivated me to work on a book which will include all home remedies where people can treat themselves to fix their pain. I have included knowledge based on my clinical research using manual massage therapy, food habits, nutrition facts, heat, sauna, hydrotherapy, cold water treatments which overall helps in pain management. It gives me pleasure to introduce this book to the community where I have shared all my experienced treatment plans.

Priyanka Yadav (Physiotherapist)

I started my career in 2011, since then I have worked as a Physiotherapist in several clinics and hospitals in India. Working mostly in the Outpatient department made me realize that Physio's role is extremely crucial in the rehabilitation and recovery process of a patient. My desire to reach out to more people motivated me to work for this book. Have worked with Dr. Mahmoud on several research books on self-pain management. We have been constantly working on curating the best suited protocol for various Musculoskeletal conditions. Additionally, we have also included approaches with alternative medicine.

Bhoomika Pathak (Physiotherapist)

After graduating in 2014, I have been working with various clinical conditions like sports injury, musculoskeletal injury, and neurological disorders for more than 5 years. Along with Dr. Mahmoud & colleagues I have worked on treatment and pain management for various musculoskeletal injuries and pain population. With all the successful outcomes till now, we have designed this book with stagewise guide to treat your knee pain.