Respiratory Diseases

Abstract:

Some of the more well-known respiratory diseases include asthma, chronic obstructive pulmonary disease (COPD), bronchitis, emphysema, pulmonary fibrosis, pneumonia, and lung cancer. A respiratory disease is a type of disease that affects the lungs and other parts of the respiratory system. These diseases disrupt the way oxygen is transported throughout the body and can lead to many chronic conditions. Respiratory diseases can be inherited or caused by environmental exposures, or behaviors. Some of these causes would include infections in the lungs, smoking tobacco, or by breathing in secondhand tobacco smoke, exposure to radon, asbestos, or other forms of air pollution. Several of these lung diseases will be covered in this course.

Learning Objectives:

1. Identify several of the more commonly known lung diseases.
2. Describe symptoms associated with these lung diseases.
3. Explain treatments utilized for these lung diseases.
4. List the best preventative measures for lung diseases.

Introduction

The two types of respiratory diseases are infectious and chronic. Chronic lung diseases fall into one of two main classes, either obstructive or restrictive. Both types can cause shortness of breath. Obstructive lung diseases, such as asthma and chronic obstructive pulmonary disorder (COPD), cause more difficulty with *exhaling* air, while restrictive lung diseases such as pulmonary fibrosis and sarcoidosis can cause problems by restricting a client's ability to *inhale* air.

Obstructive Lung Diseases

Obstructive lung diseases are characterized by an obstruction in the air passages, with a slow and shallow exhalation. Obstruction can occur when inflammation and swelling cause the airways to become narrowed or blocked, making it difficult to expel air from the lungs. This can cause an expiratory wheeze and leave air trapped in the lungs. When air is trapped in the lungs it may lead to more difficult inhalation, leading to increased respiratory issues.

The following lung diseases are categorized as obstructive:

1. Chronic obstructive pulmonary disease (COPD)
2. Chronic bronchitis
3. Asthma
4. Cystic fibrosis

Restrictive Lung Diseases

Lung diseases with restrictive properties are defined by difficulty filling the lungs with air during inhalation. This is caused by the body's inability to create room for air in the lungs. Stiffness of the lungs or other surrounding tissues prevents air from entering the lungs. The occupancy of other tissues such as fluid, increased adipose, or tumors take up space leading to less lung volume. Deformities of the body like curvatures of the spine or trauma prevent the expansion of the lungs and the natural inflow of air.

Intrinsic Restrictive Lung Diseases

Intrinsic restrictive disorders are those that occur due to restriction in the lungs (often a "stiffening") and include:

1. Pneumonia
2. Acute Respiratory Distress Syndrome (ARDS)
3. Tuberculosis
4. Sarcoidosis
5. Pulmonary Fibrosis

Extrinsic Restrictive Lung Diseases

Extrinsic restrictive disorders refer to those that originate outside of the lungs. These include impairment caused by:

1. Scoliosis
2. Obesity
3. Pleural effusion
4. Malignant tumors
5. Ascites
6. Pleurisy
7. Rib fractures

Asthma

Asthma is an *obstructive* condition in which airways become inflamed, and narrowed, and there is the production of extra mucus, all of which makes it difficult to breathe.

Symptoms

1. Coughing
2. Wheezing on exhale
3. Tightening of the chest
4. Breathing difficulties
5. Rapid breathing (tachypnea)

Causes

1. Airborne allergens
    a. pollen
    b. dust mites
    c. mold spores
    d. pet dander
    e. particles of cockroach waste
2. Respiratory infections
    a. common cold
3. physical activity
4. cold air
5. air pollutants and irritants
    a. smoke

Types of Asthma

1. Intermittent Asthma

    a. Symptom frequency
        i. Symptoms may occur about 2 days a week or less often.
    b. Nighttime awakenings
        i. Symptoms may wake a person two or fewer times each month.
    c. Severity
        i. Symptoms will not interfere with regular activities.
    d. Lung capacity
        i. The result of a forced expiratory volume (FEV) lung capacity test is usually 80 percent or more of normal values.
    e. Inhaler use

        i. A client will need to use a short-acting beta agonist (SABA) inhaler to control symptoms on 2 or fewer days each week.

2. Mild Persistent Asthma

    a. Symptom frequency
        i. Symptoms will occur more often than twice a week but not every day.
    b. Nighttime awakenings
        i. Symptoms tend to wake a person three or four times a month.
    c. Severity
        i. Symptoms may have a minor impact on regular activities.
    d. Lung capacity
        i. The result of a FEV lung capacity test is often 80 percent or more of normal values.
    e. Inhaler use
        i. A client will need to use a SABA inhaler to control symptoms more often than twice a week but not daily.

3. Moderate Persistent Asthma

    a. Symptom frequency
        i. Symptoms will occur on a daily basis.
    b. Nighttime awakenings
        i. Symptoms will wake a client more often than once a week but not every night.
    c. Severity
        i. Symptoms will limit regular activities somewhat.
    d. Lung capacity
        i. The result of a FEV lung capacity test tends to be 60–80 percent of normal values.
    e. Inhaler use
        i. A person will need to use a SABA inhaler on a daily basis.

4. Severe Persistent Asthma (most serious form of asthma)

    a. Symptom frequency
        i. Symptoms will arise throughout the day.
    b. Nighttime awakenings
        i. A client will likely be woken by symptoms every night.

c. Severity
    i. Symptoms will significantly limit regular activities.
d. Lung capacity
    i. The result of a forced vital capacity lung function test tends to be less than 60 percent of normal values.
e. Inhaler use
    i. A client will need to use a SABA inhaler to control symptoms several times a day.

Treatment

Preventive, long-term control medications can reduce the inflammation in the airways. Quick-relief inhalers (bronchodilators) quickly reduce the inflammation in the airways that are causing shortness of breath.

Long-term asthma control medications

These medications are normally taken every day and are preventative. If taken as prescribed there is less likelihood that the client will have an asthma attack. Types of long-term control medications include:

Inhaled Corticosteroids:

1. fluticasone propionate (Flovent HFA, Flovent Diskus, Xhance)
2. budesonide (Pulmicort Flexhaler, Pulmicort Respules, Rhinocort)
3. ciclesonide (Alvesco)
4. beclomethasone (Qvar Redihaler)
5. mometasone (Asmanex HFA, Asmanex Twisthaler)
6. fluticasone furoate (Arnuity Ellipta)
    a. It may take several days to weeks for these medications to reach
    b. their maximum benefit and have a low risk of serious side effects.

Leukotriene Modifiers:

1. montelukast (Singulair)
    a. Agitation, aggression, hallucinations, depression, and suicidal thinking are side effects of montelukast.
2. zafirlukast (Accolate)
3. zileuton (Zyflo)

Combination Inhalers:

1. fluticasone-salmeterol (Advair HFA, Airduo Digihaler)
2. budesonide-formoterol (Symbicort)
3. formoterol-mometasone (Dulera)
4. fluticasone furoate-vilanterol (Breo Ellipta)
    a. These medications contain a long-acting beta agonist along with a corticosteroid.

Theophylline:

1. Theophylline (Theo-24, Elixophyllin, Theochron)
    a. An oral pill is taken daily that keeps airways open by relaxing the muscles that surround the airways. This medication requires regular blood tests to keep within therapeutic levels and is not frequently utilized in clients because of this monitoring.

Quick Relief (Rescue) Medications:

These medications are used as needed for rapid, short-term symptom relief during an asthma attack. They can also be utilized prior to exercise if prescribed by a provider. Types of quick-relief medications include:

Short-Acting Beta Agonists:

1. albuterol (ProAir HFA, Ventolin HFA)
2. levalbuterol (Xopenex, Xopenex HFA)
    a. Short-acting beta agonists are portable. They are hand-held inhalers or can be used in a nebulizer.

Anticholinergic Agents:

1. ipratropium (Atrovent HFA)
2. tiotropium (Spiriva, Spiriva Respimat)
    a. Relax the airways rapidly, aiding in breathing. Normal uses are for emphysema and chronic bronchitis but can be used to treat asthma.

Oral and Intravenous Corticosteroids:

1. prednisone (Prednisone Intensol, Rayos)
2. methylprednisolone (Medrol, Depo-Medrol, Solu-Medrol)
    a. Rapidly relieves airway inflammation caused by severe asthma. Due to the serious side effects of these medications that are only used to treat severe asthma symptoms.

Allergy Medications

Allergy medications may be used in conjunction with preventive, long-term control medications if your asthma is triggered or worsened by allergies. These include:

Allergy shots (immunotherapy):

Allergy shots gradually reduce your immune system's reaction to specific allergens.

Biologics:

1. omalizumab (Xolair)
2. mepolizumab (Nucala)
3. dupilumab (Dupixent)
4. reslizumab (Cinqair)
5. benralizumab (Fasenra)
    a. Biologics help prevent symptoms, rather than treating the symptoms. They target the cells and the pathways that normally lead to an allergic inflammatory response.

Treatments

Bronchial Thermoplasty

This treatment is used when there is little to no improvement with inhaled corticosteroids or other long-term asthma medications. The treatment uses heat to reduce the smooth muscle inside the airways, preventing the constriction of the airways during an asthma attack. This limits the ability of the airways to tighten, making breathing easier and possibly reducing asthma attacks.

Asthma Action Plan

An asthma action plan outlines in writing when to take certain medications or when to increase or decrease the dose of certain medications based on symptoms. This plan should also include triggers that lead to an asthma attack and how to avoid these. This plan is created by the client in conjunction with the provider and is tailored specifically for the client. Additionally, a peak flow meter can be utilized on a regular basis to monitor control but also to determine the likelihood of an asthma attack.

Chronic Obstructive Pulmonary Disease (COPD)

Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease that causes obstructed airflow out of the lungs. Difficulty breathing, cough, increased mucus production, and wheezing are common symptoms associated with COPD. COPD is most likely due to long-term exposure to some form of irritation to the lung tissue. This could be from contaminants in the air, most often though, it is the exposure to cigarette smoke. Clients with COPD have an increased risk of developing heart disease, lung cancer, and a variety of other conditions.

Contributors to the development of COPD are emphysema and chronic bronchitis. These conditions are likely to occur together. With chronic bronchitis, the linings of the bronchial tubes become inflamed, decreasing airflow to the alveoli of the lungs for oxygenation. Bronchitis creates increased mucus production leading to a chronic cough. Emphysema on the other hand develops because of repetitive insult to the alveoli deep within the lungs from cigarette smoke or other irritants. This repetitive exposure leads to the destruction of the alveoli and permanent damage to the lung tissue.

COPD is a progressive disease but with good symptom control, quality of life can be obtained. Through proper management of the disease, there can be a reduction in other associated conditions such as lung cancer or heart disease.

Symptoms

1. Shortness of breath
2. Wheezing
3. Chest tightness
4. Chronic productive cough
5. Frequent respiratory infections
6. Lack of energy
7. Unintended weight loss
8. Edema (ankles, feet, or legs)

Risk Factors

1. Exposure to tobacco smoke:
2. Clients with asthma:
3. Occupational exposure to dusts and chemicals:
4. Exposure to fumes from burning fuel:

5. Genetics:

Treatments

Many clients with COPD need little therapy due to the mild form and smoking cessation could be their only treatment. Even for those more advanced stages of the disease, effective therapy is available.

Quitting smoking

The most important step in treating COPD is to stop smoking. By ceasing smoking the progression of symptoms can be halted. Utilize nicotine replacement products and medications to help in the process. Support groups can help the client not feel so alone in the process. Avoiding situations where others are smoking, which will increase the temptation to smoke, and lead to exposure to secondhand smoke.

A great resource for quitting smoking is 1-800-QUIT-NOW or go to:

https://www.cdc.gov/tobacco/campaign/tips/

Medications

Several kinds of medications are used to treat the symptoms and complications of COPD. Some of the medications are taken on a daily schedule while others are on an as-needed basis.

Bronchodilators

Bronchodilators usually come as an inhaler. These medications serve to relax the muscles around and in the airways which enables air to enter and leave the lungs. There are short-acting and long-acting bronchodilators.

Short-acting bronchodilators include:

1. albuterol (ProAir HFA, Ventolin HFA)
2. ipratropium (Atrovent HFA)
3. levalbuterol (Xopenex)

Long-acting bronchodilators include:

1. aclidinium (Tudorza Pressair)

2. arformoterol (Brovana)
3. formoterol (Perforomist)
4. indacaterol (Arcapta Neoinhaler)
5. tiotropium (Spiriva)
6. salmeterol (Serevent)
7. umeclidinium (Incruse Ellipta)

Inhaled steroids

Inhaled corticosteroids are used for clients who experience frequent exacerbations of COPD. Corticosteroids decrease inflammation within the airways opening them for ease of breathing.

Inhaled steroids include:

1. fluticasone (Flovent HFA)
2. budesonide (Pulmicort Flexhaler)

Combination inhalers:

Combined inhalers consist of more than one medication, usually bronchodilators and inhaled steroids.

Combination inhalers include:

1. fluticasone and vilanterol (Breo Ellipta)
2. fluticasone, umeclidinium and vilanterol (Trelegy Ellipta)
3. formoterol and budesonide (Symbicort)
4. salmeterol and fluticasone (Advair HFA, AirDuo Digihaler)

Combination inhalers also include more than one type of bronchodilator medication.

Combined inhalers include:

1. aclidinium and formoterol (Duaklir Pressair)
2. albuterol and ipratropium (Combivent Respimat)
3. aormoterol and glycopyrrolate (Bevespi Aerosphere)
4. glycopyrrolate and indacaterol (Utibron)
5. olodaterol and tiotropium (Stiolto Respimat)
6. umeclidinium and vilanterol (Anoro Ellipta)

Oral steroids:

When clients experience frequent exacerbations of COPD, oral steroids for short durations may be used to prevent further worsening of COPD. Long-term use of oral steroids can cause serious side effects such as weight gain, diabetes, osteoporosis, cataracts, and increase the risk of infection. Below are oral steroid medications.

1. *Phosphodiesterase-4 inhibitor:*
    a. Phosphodiesterase-4 inhibitor decreases airway inflammation and relaxes the smooth muscles around and within the airway. This drug can cause diarrhea and weight gain.
        i. roflumilast (Daliresp)
2. *Phosphodiesterase inhibitor:*
    a. A phosphodiesterase inhibitor called theophylline is used when other treatments have not been effective. Theophylline is a less expensive medication and has been shown to improve breathing and prevent exacerbations of COPD. Side effects are dose-related and may include nausea, headache, tachycardia, and tremor, so labs are drawn to monitor the level of this drug within the blood.
        i. theophylline (Elixophyllin, Theo-24, Theochron)

Antibiotics:

1. *Antibiotics:*
    a. Antibiotics are used to treat respiratory infections. Antibiotics help treat episodes of worsening COPD but are not used for prevention. Studies have shown that Zithromax has prevented episodes of worsening COPD.
        i. azithromycin (Zithromax)

Therapy

1. Oxygen therapy
    a. Supplemental oxygen can be delivered through portable units that you can take with you or through oxygen concentrators at home. Oxygen therapy can help extend and improve life for those with COPD.
2. Pulmonary rehabilitation program
    a. Education, exercise training, nutrition advice, and counseling are usually combined for better client outcomes. These programs are tailored to each client and provide clients with a variety of specialists.

3. In-home noninvasive ventilation therapy
    a. In-home use of noninvasive ventilation therapy has shown improved breathing and a decrease in the retention of carbon dioxide which is common in COPD clients. Bilevel-positive airway pressure (BiPAP) is an example of noninvasive ventilation therapy.

Pulmonary Fibrosis

Pulmonary fibrosis scars and thickens lung tissue. Damage occurs in the connecting tissue in the lung and the alveoli (air sacs inside the lungs). This gradually gets worse over time causing the lungs to become stiff and non-pliable. As the disease progresses lung tissue will no longer expand, causing shortness of breath and an inability to inhale air into the lungs.

As the disease progresses, increased damage to the alveoli occurs. Alveoli assist the lungs in getting oxygen into the bloodstream and when they are damaged less oxygen is distributed to the body. This leads to shortness of breath, fatigue, and a loss of quality of life.

Causes

Risk factors of pulmonary fibrosis include:

1. Older age:
    a. Most clients diagnosed with pulmonary fibrosis will be between the ages of 50 and 70 years of age.
2. Male biological sex:
    a. Pulmonary fibrosis affects more men than women.
3. Smoking:
    a. Cigarette smoking increases your risk of getting pulmonary fibrosis.
4. Working around dust or fumes:
    a. Continued exposure to chemicals or hazardous substances can damage the lungs. Those working in industries that deal with this hazardous substance may include farmers, ranchers, hairdressers, stone cutters/polishers, and metal workers may be at increased risk.
5. Other medical conditions:
    a. Other medical conditions like viral infections or an autoimmune disease could lead to pulmonary fibrosis.
6. Other factors:
    a. Clients exposed to radiation or chemotherapy for cancer treatment, or heart medications may damage lung tissue causing them to not work properly.

7. Hereditary factors:
    a. Research has indicated that clients may inherit pulmonary fibrosis through genes that run in families. However, inheriting pulmonary fibrosis is very rare.

Symptoms

Pulmonary fibrosis symptoms include:

1. Breathing in short, shallow spurts
2. Dry cough that doesn't go away
3. Fatigue (extreme tiredness, no matter how much you sleep)
4. Shortness of breath, especially during or soon after exercise
5. Weight loss that's not on purpose or easily explained

As the disease progresses, some people experience:

1. Clubbing
    a. Fingertips or toes that look different, such as wider or more round.
2. Cyanosis
    a. Bluish skin (in fair-skinned people) or gray or white skin around the mouth or eyes (in dark-skinned people) from too little oxygen in the blood.

Medications

Most pulmonary fibrosis treatments focus on easing symptoms and improving your quality of life. No cure for pulmonary fibrosis exists today.

Medication:

1. pirfenidone (Esbriet®)
2. nintedanib (OFEV®)

These medications may slow down lung scarring and help preserve lung function.

Treatments

1. Oxygen therapy
    a. Assists in breathing more easily and may increase energy and strength.
2. Pulmonary rehabilitation
    a. Special exercise programs may improve everyday tasks or activities.

3. Lung transplant
    a. A lung transplant uses a donor lung or lungs to replace the diseased lungs in an effort to improve the quality of life. Not everyone is a candidate for a lung transplant.

Pneumonia

Pneumonia is an inflammation and consolidation of the lungs. Pneumonia is primarily caused by infections from bacteria or viruses. Sometimes pneumonia can be caused by fungi and parasites, but this is rare.

Risk Factors

1. Age
    a. The very young and the elderly have increased susceptibility to pneumonia.
2. Aspiration
    a. Aspiration is defined as the inhalation of a foreign substance into the lungs. When a foreign substance is aspirated into the lungs, gastric contents enter as well, leading to infection. Clients who are likely to aspirate are those who have had a:
        i. stroke
        ii. seizure
        iii. fainting episode

Those clients with a nasogastric or endotracheal tube in place are also at risk of aspiration.

The gag reflex is a protective mechanism that prevents something from entering the throat except during voluntary swallowing. Permanent damage to the gag reflex (stroke), temporary disruption of the gag reflex (seizure/fainting), or a mechanical blockage (nasogastric/endotracheal tube) can create conditions for aspiration.

3. Chronic Diseases
    a. Chronic diseases can increase the risk of developing pneumonia:
        i. asthma
        ii. chronic obstructive pulmonary disease (COPD)
        iii. cancers
        iv. diabetes
        v. liver disease
        vi. renal disease
4. Immunocompromised Patients

a. Clients who have a compromised immune system are at risk of developing pneumonia.
    i. immune deficiency syndrome (AIDS)
    ii. some cancers
    iii. receiving chemotherapy
    iv. malnourished
    v. organ transplant

5. Intravascular Devices
    a. Patients who have indwelling intravascular devices such as a percutaneous indwelling central catheter (commonly called a PICC line) can develop pneumonia because the PICC line allows microorganisms access to the bloodstream through either the skin at the catheter insertion site or through the catheter hub.
6. Lifestyle Factors
    a. Chronic alcohol or drug use and cigarette smoking increase the risk of developing pneumonia.

Signs and Symptoms

Pneumonia causes inflammation and consolidation within the alveoli. Consolidation is caused by increased blood flow, excess mucus, and the production of puss. When these substances enter the alveoli of the lungs, oxygen is unable to reach the bloodstream to oxygenate the body and its vital organs.

Two primary signs of pneumonia:

1. Productive cough
2. Dyspnea (difficulty breathing)

The other common signs and symptoms of pneumonia are:

1. Cough
2. Chills
3. Diarrhea
4. Fatigue
5. Headache
6. Tachypnea (respiratory rate >20 breaths per minute)
7. Muscle pain
8. Nausea
10. Tachycardia (heart rate > 100 beats per minute)
11. Sweating

12. Vomiting
13. Weakness

Some of the common symptoms of pneumonia are further elaborated on below.

1. Cough
    a. When the respiratory passages are inflamed and filled with excess mucus and pus, the body's natural response to these fluids that block the passage of air is a cough. Some clients who have pneumonia may have a dry cough, but most will have a wet, productive cough, allowing for the movement of mucus and pus out of the lungs in the form of sputum.
2. Fatigue
    a. The body expends significant amounts of energy trying to fight the infection leaving the client feeling fatigued.
3. Fever
    a. A high body temperature is common and the body's way of destroying microorganisms. It is important to understand that having a fever is not essential for a diagnosis of pneumonia. Some clients over the age of 65 may not have a fever and present with a low body temperature.

    Tachypnea (rapid breathing)

    b. Pneumonia prevents oxygen from reaching the bloodstream because of the excess mucus, pus, and fluid within the lungs. A client who has pneumonia will breathe faster and deeper in an attempt to circulate blood and oxygen faster.
4. Tachycardia (rapid heart rate)
    a. The body needs oxygen so the heart beats faster to pump more blood in an attempt to circulate oxygen to the body.

Pneumonia decreases the amount of oxygen that is delivered to the body. The brain needs a high amount of oxygen to function, and some clients cannot tolerate a drop in oxygen delivery. In those clients, pneumonia may cause dizziness, confusion, and disorientation.

Clients who have pneumonia will typically feel very ill. Most clients will have a cough, fever, headache, and some type of shortness of breath. Of those clients with pneumonia, 20% will experience gastrointestinal symptoms. Clients with pneumonia could be limited in daily activities and others may not be able to get out of bed. In most cases, the infection is localized to the lungs, it is treatable with antibiotics and supportive care, and the patient recovers.

Treatments

Pneumonia which is caused by bacteria is treated with antibiotics. These can be given orally, intramuscularly, or intravenously (IV). If a client has pneumonia and is not seriously ill they will be given antibiotics orally or intramuscularly. If hospitalized the client will most likely be given IV antibiotics so the effects of the medication will begin more rapidly.

Rather than delaying the treatment of antibiotics, empirical therapy will be started. Empirical therapy means giving an antibiotic that is effective against the most likely pathogen-causing pneumonia. This will not delay treatment until this pathogen is identified by running a culture and sensitivity test. This will identify the pathogen and what antibiotic it is sensitive to.

If the pneumonia is caused by a virus, antibiotics will not be effective. But, if the pneumonia is caused by the influenza virus, antiviral drugs such as Amantadine or Tamiflu® may be prescribed. Amantadine is normally used to treat Parkinson's Disease but works against the influenza A virus by stopping the spread of the virus in the body.

Choice of Treatment

Treating the signs and symptoms of pneumonia is commonly called symptomatic-supportive care. Symptomatic-supportive care consists of nutrition, fluids, oxygen, antipyretics, lots of rest, and over-the-counter medications.

Nutrition

Fighting an infection takes energy, and good nutrition is essential for the proper functioning of the immune system to fight this infection.

Fluid Intake

Adequate fluid intake is very important for someone who has pneumonia. Fever, sweating, diarrhea, and vomiting are sources of fluid loss. Fever which leads to sweating and fluid loss is more common than diarrhea and vomiting with pneumonia. Maintaining normal fluid levels helps with comfort for clients along with helping the immune system function more optimally. Immune cells move through fluid and if the fluid in the body is low the immune system will operate more slowly.

Hydration is essential in keeping congestion loose enough to be expelled through coughing. When caring for a client with pneumonia adequate records of intake and output should be maintained to ensure proper hydration.

Antipyretics

Antipyretics are medications that lower fever. Either acetaminophen or ibuprofen can be used to lower fever. Acetaminophen is normally preferred because it has fewer potential side effects than ibuprofen and it is better tolerated by most patients than ibuprofen.

Dosing for ibuprofen in adults and teenagers is 1200 milligrams (mg) up to 3200 mg per day divided into three or four equal doses. Ibuprofen can cause ulcers in the stomach or gut, especially if taken by mouth for a long time or in doses exceeding 3200 mg daily.

Checking the labels of all other medicines is important because they may also contain acetaminophen. It is not safe to use more than 4 grams (4,000 milligrams) of acetaminophen in a 24-hour period. For Tylenol® Extra Strength, the maximum dose is 3,000 milligrams per 24-hour period. Taking above the recommended dose of Acetaminophen will not provide increased benefits and could cause injury to the liver.

Fever is often the most pronounced sign of pneumonia or any infection. A fever is the body's natural response to an infection and the body's way of fighting the microorganisms that are causing the infection. A fever is not dangerous unless it becomes too high but can be uncomfortable for the client. Fever control is helpful for symptom control, but antibiotics are far more important.

Rest

Rest is often overlooked as a therapy. Pneumonia decreases the amount of oxygen that is delivered to the body and when the body is at rest, less oxygen is needed. The body works hard to fight infection and the need for oxygen is high during that time. Rest will enable the body to utilize more oxygen to fight the infection rather than utilizing it for movement.

Rest will allow oxygen to be delivered to tissues needing healing and assist the immune system in eliminating the infection-causing pneumonia.

Oxygen Therapy

Clients who have pneumonia can be managed at home or in the hospital depending on other health concerns. Those being cared for at home will rarely need supplemental oxygen. Those admitted to the hospital and those who cannot tolerate decreased oxygen levels will be placed on supplemental oxygen. Oxygen delivery can be greatly decreased by pneumonia, and some clients such as those with cardiovascular disease cannot tolerate a decreased oxygen level.

Oxygen is given to clients through a written order by their provider. This will include the type of delivery, nasal cannula or mask, and the liter amount per minute. Remember, oxygen is, essentially, a drug and the amount of oxygen the patient receives should never be decreased or increased unless a provider has given specific directions for this.

Over-the-counter Medication

There are many over-the-counter medications to treat fever, colds, and coughs. These products can contain acetaminophen, antihistamine, cough suppressant, and decongestant, or a combination of any of these ingredients. These products are self-limiting and only work to relieve symptoms and are not a cure for pneumonia.

These products have the potential for overuse because they are readily available and can be bought without a prescription. Excessive use can be very harmful to those using the products. These products in excess can be harmful to the body and when taken with other prescription medications, interactions can occur. These products may only relieve symptoms minimally and some clients may take more than what is recommended thinking it will help relieve their symptoms if they take more. Rest, good nutrition, and lots of fluids are safer and probably more effective for providing symptom relief.

Lung Cancer

Lung cancer is a type of cancer that begins in the lungs. The lungs are two spongy organs in the chest that take in oxygen when inhaling and release carbon dioxide when exhaling.

Symptoms

Lung cancer typically doesn't cause signs and symptoms in its earliest stages. Signs and symptoms of lung cancer typically occur when the disease is advanced.

Signs and symptoms:

1. New cough that does not go away
2. Coughing up blood (small amount)
3. Shortness of breath
4. Chest pain
5. Hoarseness
6. Losing weight without trying
7. Bone pain
8. Headache

Causes

Smoking causes the majority of lung cancers, this is in both smokers and in clients exposed to secondhand smoke. Lung cancer can however occur in clients that have never smoked or have never been exposed to secondhand smoke. There may never be a clear picture of how these cases of lung cancer occur.

It is believed that smoking causes lung cancer by damaging the cells that line the lungs. When the carcinogens from cigarette smoke are inhaled, the tissue within the lungs is immediately damaged. The more exposure to the carcinogens the more damage will occur.

In the beginning stages of smoking the body does a good job of repairing the damage done to the lung tissues but if the insult of smoking continues the body is unable to repair the extensive damage. As time goes on, these damaged cells no longer look like the original cells and no longer function properly. These lung tissue cells can begin to develop into cancer cells.

Types of Lung Cancer

Lung cancer is divided into two major types. This is based on the appearance of the lung cancer cells when viewed under a microscope. Treatment will be based on which type of cancer is identified.

The two general types of lung cancer include:

1. Small cell lung cancer
    a. Small cell lung cancer occurs almost exclusively in heavy smokers and is less common than non-small cell lung cancer.
2. Non-small cell lung cancer
    a. Non-small cell lung cancer is an umbrella term for several types of lung cancers. Non-small cell lung cancers include squamous cell carcinoma, adenocarcinoma, and large cell carcinoma.

Cancer Staging

TNM Classification

Three factors are used to determine lung cancer stage. The stage of lung cancer is determined by a combination of all of these factors.

1. **T**
    a. **T**umor (size and location)
2. **N**
    a. Regional lymph **N**ode involvement. Lymph nodes are small ball-shaped immune system organs distributed throughout the body. It is important to know whether the lung cancer has spread to the lymph nodes around the lung.
3. **M**
    a. **M**etastasis status. Metastasis status refers to which tissues and/or organs the cancer has spread to.

Non-small Cell Lung Cancer Stages

Non-small cell lung cancer stages range from one to four, usually expressed in Roman numerals (0 through IV). The lower the lung cancer stage, the less the cancer has spread and the better the prognosis.

1. **Stage 0** (carcinoma/tumor in-situ)
    a. Non-small cell lung cancer is an early stage of lung cancer that is only in the top lining of the lung or bronchus and has not spread.
2. **Stage I**
    a. Non-small cell lung cancer (NSCLC) is divided into two sub-stages, 1A and 1B, based on the size of the tumor. In Stage I NSCLC, the cancer has not spread to the lymph nodes or other parts of the body.
3. **Stage II**

a. Non-small cell lung cancer is divided into stage IIA and IIB, with each stage then broken into additional sections, depending on the size of the tumor, where it is found, and whether the cancer has spread to the lymph nodes. These tumors may be larger than those in stage I and/or have begun to spread to nearby lymph nodes. The cancer has not spread to distant organs.

4. **Stage III**
    a. Lung cancers are classified as stage IIIA, IIIB, or IIIC, depending on the size and location of the tumor and how far it has spread. Most commonly the cancer has spread to the lymph nodes in the mediastinum (the area in the chest between the lungs).
5. **Stage IV**
    a. Non-small cell lung cancer (NSCLC) is the most advanced form of lung cancer. In stage IV, the cancer has metastasized or spread to the lining of the lung or other areas of the body.

Small Cell Lung Cancer Stages

1. **Limited Stage**
    a. Lung cancer is only in one lung with or without spreading to the lymph nodes in the mediastinum (area in the chest between the lungs).
2. **Extensive Stage**
    a. Lung cancer has spread to tissue outside of the originally affected lung like the opposite lung or distant organs.

Risk factors

There are things a client can do to decrease the likelihood of lung cancer such as quitting smoking but there are also risk factors that cannot be changed, such as their family history. Risk factors for lung cancer include:

1. Smoking
    a. The more cigarettes a client smokes and the longer the client smokes increase the risk of lung cancer. Quitting at any age can significantly lower the risk of developing lung cancer.
2. Exposure to secondhand smoke
    a. Being around secondhand smoke even if the client does not smoke, increases the risk of lung cancer.
3. Previous radiation therapy
    a. Radiation therapy to the chest for another type of cancer may increase the likelihood of developing lung cancer.
4. Exposure to radon gas

    a. Radon is a gas produced by the natural breakdown of uranium in soil, rock, and water. This gas is released and eventually becomes part of the air. Radon levels have been found to be higher in basements, cellars, and living spaces that are in direct contact with the ground. Unsafe levels of radon gas are 4 pCi/L or higher. There are safe ways to reduce these levels.
5. Exposure to asbestos and other carcinogens
    a. Exposure to asbestos and other substances are known to cause cancer such as arsenic, chromium, and nickel can increase the risk of developing lung cancer, especially if the client smokes.
6. Family history of lung cancer
    a. Clients with a parent, sibling, or child with lung cancer have an increased risk of the disease.

Lung cancer can cause complications, such as:

1. Shortness of breath
    a. People with lung cancer can experience shortness of breath if cancer grows to block the major airways. Lung cancer can also cause fluid to accumulate around the lungs, making it harder for the affected lung to expand fully when you inhale.
2. Coughing up blood
    a. Lung cancer can cause bleeding in the airway, which can cause you to cough up blood (hemoptysis).
3. Pain
    a. Advanced lung cancer that spreads to the lining of a lung or to another area of the body, such as a bone, can cause pain. Many treatments are available to control pain.
4. Fluid in the chest (pleural effusion)
    a. Lung cancer can cause fluid to accumulate in the space that surrounds the affected lung in the chest cavity (pleural space). Fluid accumulating in the chest can cause shortness of breath. Treatments are available to drain the fluid from your chest and reduce the risk that pleural effusion will occur again.
5. Cancer that spreads to other parts of the body (metastasis)
    a. Lung cancer often spreads (metastasizes) to other parts of the body, such as the brain and the bones. Cancer that spreads can cause pain, nausea, headaches, or other signs and symptoms depending on what organ is affected. Once lung cancer has spread beyond the lungs, it's generally not curable. Treatments are available to decrease signs and symptoms and to help you live longer.

Prevention

Reduction of lung cancer can be accomplished by:

1. Don't smoke
    a. Clients can educate themselves on the health risks associated with smoking. Educate others about the risks associated with smoking and how these risks can be eliminated by not smoking.
2. Stop smoking
    a. Stop smoking now. Quitting reduces the risk of lung cancer, even if the client has smoked for years. Options include nicotine replacement products, medications, and support groups.
3. Avoid secondhand smoke
    a. Ask others to smoke outside or discuss the option of quitting. Avoid locations where you will be exposed to secondhand smoke.
4. Test for radon
    a. Have the radon levels checked, especially in areas where radon is known to be elevated. For information on radon testing and how to decrease levels if they are high, contact the local department of public health or a local chapter of the American Lung Association.
5. Avoid carcinogens at work
    a. Take precautions from exposure to toxic chemicals at work. Wear protective equipment when it is available. Smoking increases the risk of lung damage from workplace carcinogens.
6. Eat a healthy diet
    a. A healthy diet contains a variety of fruits and vegetables. Food sources of vitamins and nutrients are best.
7. Exercise
    a. Begin an exercise routine if not already doing so. This could include 10-15 minutes of walking, increasing to 20-30 minutes most days of the week. If you don't exercise regularly, start out slowly.

Treatments

Treatment for Lung cancer depends on the type of lung cancer and the extent of growth. Non-small cell lung cancer is treated with surgery, chemotherapy, radiation therapy, targeted therapy, or a combination of these treatments. Small cell lung cancer is usually treated with radiation therapy and chemotherapy.

1. Surgery

a. Surgical removal of the cancer tissue.

2. Chemotherapy
    a. Chemotherapy is a cancer treatment that uses one or more anti-cancer drugs as part of a standardized chemotherapy regimen. Chemotherapy may be used with a curative intent, to prolong life, or reduce symptoms.
3. Radiation therapy
    a. The use of high-energy radiation sources to kill cancer cells and shrink tumors. Radiation may be administered externally or internally. There is external-beam radiation therapy, internal radiation therapy or brachytherapy, and systemic radiation that travels in the blood to tissues throughout the body. Systemic radiation is also called irradiation or radiotherapy.
4. Targeted therapy
    a. The use of medications to block the growth and spread of cancer cells is called targeted therapy. These medications can be taken orally or given intravenously. Target therapy is utilized on specific cancer cells and tests will be needed to determine if this is the best form of treatment.

Clinical Trials

Clinical trials use new treatment options to see if they are safe and effective for the general population. For more information, visit the sites listed below to find a clinical trial.

https://www.cancer.gov/about-cancer/treatment/clinical-trials

https://www.cancer.gov/about-cancer/treatment/clinical-trials/search/

https://www.clinicaltrials.gov/

Summary

It was reported that in 2017, 545 million people lived with a chronic respiratory disease, which was a 39.8 percent increase since 1990. Chronic respiratory diseases accounted for 3.9 million deaths in 2017 and 1470 per 100,000 people were diagnosed with a disability due to a chronic respiratory disease. These numbers are staggering and most are preventable. Smoking is the biggest contributing factor to respiratory diseases and is a modifiable behavioral change. Environmental exposures include breathing in secondhand

tobacco smoke, radon, asbestos, or other forms of air pollution. There are different treatments for respiratory diseases but prevention is key.

Resources:

Mayo Clinic. Asthma - Diagnosis and treatment - Mayo Clinic. Mayoclinic.org. Published March 5, 2022. https://www.mayoclinic.org/diseases-conditions/asthma/diagnosis-treatment/drc-20369660

Mayo Clinic. Lung Cancer - Symptoms and Causes. Mayo Clinic. Published March 23, 2021. https://www.mayoclinic.org/diseases-conditions/lung-cancer/symptoms-causes/syc-20374620

Centers for Disease Control and Prevention. How Is Lung Cancer Diagnosed and Treated? Centers for Disease Control and Prevention. Published October 18, 2021. https://www.cdc.gov/cancer/lung/basic_info/diagnosis_treatment.htm

Lung Cancer Staging. www.lung.org. https://www.lung.org/lung-health-diseases/lung-disease-lookup/lung-cancer/symptoms-diagnosis/lung-cancer-staging

Pneumonia. John Hopkins Medicine. Published 2019. https://www.hopkinsmedicine.org/health/conditions-and-diseases/pneumonia

Tylenol Dosing (Acetaminophen). https://www.mayoclinichealthsystem.org/~/media/Local%20Files/Albert%20Lea/Documents/Peds/Tylenol%20Dosing.pdf

Ibuprofen (Oral Route) Proper Use - Mayo Clinic. www.mayoclinic.org. https://www.mayoclinic.org/drugs-supplements/ibuprofen-oral-route/proper-use/drg-20070602#:~:text=Adults%20and%20teenagers%E2%80%94400%20milligrams

Clinical Trials Information for Patients and Caregivers. National Cancer Institute. Published 2019. https://www.cancer.gov/about-cancer/treatment/clinical-trials

https://www.cancer.gov/about-cancer/treatment/clinical-trials/search/. www.cancer.gov. Published June 23, 2016. https://www.cancer.gov/about-cancer/treatment/clinical-trials/search/

Home - ClinicalTrials.gov. www.clinicaltrials.gov. https://www.clinicaltrials.gov/

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