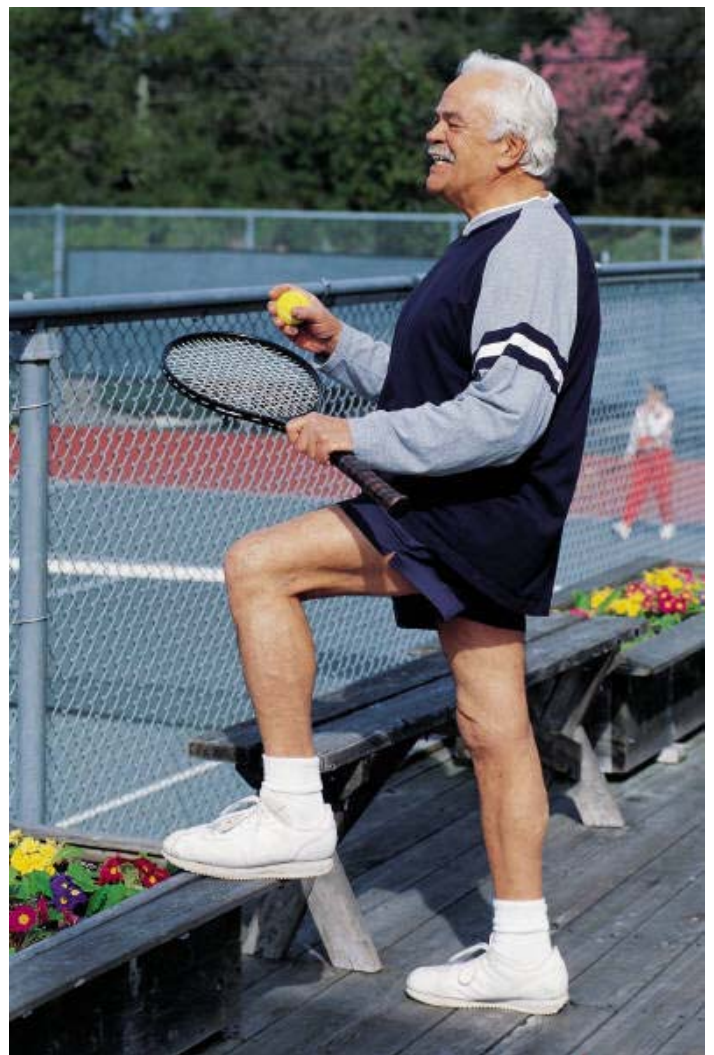


Pulmonary Issues in ElderCare



Part of the
ElderCare: Healthcare for the Aging Series

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Introduction/Purpose Statement

One of the body systems hardest hit by aging is the pulmonary system. Changes in anatomy and physiology, environmental exposure, genetics, nutrition, and altered immunity can cause or exacerbate pulmonary disease in the elder. You will learn about the normal changes we see in the aging person's pulmonary status; the "usual" abnormal changes; and the assessment and management of the elder experiencing pulmonary disease.

The purpose of this home study is to look at common and changes that occur in the pulmonary system with aging and review the assessment and management of the elderly patient with pulmonary disease.

Target Audience

This home study was designed for health care professionals with little to no familiarity with caring for elderly patients with pulmonary problems.

Content Objectives

1. Describe common changes and pathophysiology of the pulmonary system related to aging.
2. Formulate a plan for assessing and managing the elderly patient with pulmonary disease.

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In order to successfully complete this activity you must read the home study, complete the post-test and evaluation, and submit them for processing.

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Contact Hour Information

<p>For completing this Home Study and evaluation, you are eligible to receive:</p>	<p>1.0 MN Board of Nursing contact hours / 0.83 ANCC contact hours</p> <p><i>Criteria for successful completion:</i> You must read the home study packet, complete the post-test and evaluation and submit them to TCHP for processing.</p> <p>The Twin Cities Health Professionals Education Consortium is an approved provider of continuing nursing education by the Wisconsin Nurses Association, an accredited approver by the American Nurses Credentialing Center’s Commission on Accreditation.</p>
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Please see the last page of the packet before the post-test for information on submitting your post-test and evaluation for contact hours.

Normal Changes of Aging

There are certain changes that are expected in a non-smoking, healthy elder. Without additional insults, these changes do not in themselves cause the person to have pulmonary problems.

The ability of the lungs, muscles, and chest wall to expand is called compliance. After the age of 55, the chest wall becomes stiffer and moves less easily. At the same time, the respiratory muscles, including the diaphragm, weaken. This will cause compliance to be decreased. This is counterbalanced, however, by the loss of recoil in the lung, which increases compliance.

Airflow into and out of the lung decreases with age, as the smaller airways are more prone to collapse.

The ability of the lung to transfer gases between the alveoli and the blood is called diffusing capacity. This peaks in the mid-20's, and slowly decreases with age because of destruction of alveoli, thickening of alveolar walls, and the closure of small airways.

It is also normal for the pressure of oxygen in the blood (PaO₂) to decline with age. The normal 20 year-old will have a PaO₂ of 100; the healthy 75 year-old will have a PaO₂ of 75-83.

How the breathing is controlled also changes with age. The receptors sensitive to hypoxia and hypercapnia do not function as well as when they were younger.

Finally, along with the normal decreases in cellular immunity, the lung may be less able to fight off infections because the mucociliary escalator (the combination of mucous and cilia beating foreign bodies up to be coughed out) slows down.

Usual Pulmonary Changes of Aging

Although there are elders who have lived a healthy lifestyle without smoking or environmental exposure to pollutants and have a healthy diet, the chances of seeing those elders who have had less healthy lifestyles is more common.

Smoking

Smoking is by far and away the largest contributor to pulmonary disease. Smoking has been implicated as a risk factor in pulmonary embolism, chronic obstructive disease, interstitial lung disease, and lung cancer. The

American Lung Association estimates that close to 13 million Americans who are over the age of 50 smoke¹.

So what does smoking do physiologically to the lung? Smoking a cigarette introduces 43 carcinogens into the lung with each inhalation, along with smoke, carbon monoxide, and tar. Over time, the airways become inflamed and sometimes have excess mucous production. This inflammation causes the release of inflammatory mediators and elastases that break down the lung tissue. These effects lead to airway obstruction, which end in chronic obstructive pulmonary disease. The carcinogens inhaled lead directly to one of four types of lung cancer.

Environmental Exposure

There are many pollutants that can lead to lung disease, including:

- Asbestos
- Chemicals
- Pesticides/herbicides
- Air pollution
- Insect or animal dander or droppings
- Second-hand smoke

Immunosuppression

As people age, they normally lose some immune function. Diabetes, malnutrition, and steroid use all contribute to a further decrease in the ability of the body to fight off infection.

Pulmonary Diseases

The most common pulmonary diseases among the elderly (> 65 years of age) are:

<i>Disease</i>	<i>Number affected</i>
Pneumonia	1 in every 25 people contract community acquired annually 1 in four to 1 in ten people contract annually in long term care
COPD	16 million Americans with 120,000 deaths annually (337 per day) ²
Interstitial Lung Disease	1 in every 3,000 Americans
Pulmonary Embolism	110,000 hospitalizations/year in patients > 65 years
Lung Cancer	1 in every 200 Americans > 65; 183,000 new cases and 161,000 deaths in 2002

Pneumonia

Pneumonia is certainly one of the first pulmonary diseases that comes to mind when thinking about the geriatric patient. It is the fourth leading cause of death in the elderly.

Repeated antibiotic courses, smoking, malnutrition, sedentary life, and H₂-blocker use all predispose the elder to the colonization of pathogenic bacteria in the airway. Elders are also more prone to silently aspirating because of neurological disorders, use of sedatives and/or narcotics, and esophageal disorders. Both of these factors, as well as exposure in a weakened immune system, can cause pneumonia.

The most common pneumonia is the community-acquired *Streptococcus pneumoniae* form. This is the bacteria that the “pneumonia shot” immunizes against.

Other bacteria that may cause pneumonia include *Klebsiella*, *Pseudomonas*, *Enterobacter*, *Proteus*, *Escherichia coli*. Elderly people in institutions are more susceptible to pneumonias related to these and other organisms.

Diagnosis

Signs and symptoms that are typical for a younger person are not always seen in the geriatric patient. SOB, cough, fever, sputum, and elevated WBC count. Symptoms that are more typical for geriatric patient are acute confusion, tachycardia, and tachypnea.

Diagnostics for suspected pneumonia start with a patient history. A biphasic illness – having symptoms of the “flu”, followed by 3-5 days of feeling better, then becoming sick again – is fairly common in the elderly. A chest x-ray should be done to confirm pneumonia. It is helpful to have a good quality sputum sample to determine the microorganism that is causing the pneumonia (the culture), as well as what antimicrobial will kill it (the sensitivity).

Management

Dosing with antimicrobials is one of the key issues in working with an elder. The geriatric patient has decreased lean body mass, increased body fat, diminished first pass metabolism (for some drugs), and decreased renal clearance. These factors make it very important to adjust the dose (either up or down) and the number of times the antimicrobial is given per day.³

Other issues related to the management of pneumonia involve fluid and electrolyte replacement. Many geriatric patients enter the health care system being dehydrated from the pneumonia. Rehydration needs to be done carefully to avoid fluid overload and congestive heart failure. The tendency toward renal insufficiency should concern the practitioner in terms of replacing electrolytes such as potassium.

Chronic Obstructive Pulmonary Disease

“The disease of the smoker,” is how COPD is sometimes defined. Eighty to 90% of people with COPD either have been or currently are smoking. COPD can also result from exposure over time to particulate matter (asbestos, silicates, molds, air pollution), and as a result of an alpha-anti-trypsin deficiency.

Because the damage to the lungs that leads to COPD occurs over time, the occurrence of symptoms and diagnosis are usually made after the person is over 55 years of age.

Diagnosis

Diagnosis of COPD is based on a history of dyspnea, coughing, sputum production, and pulmonary function testing.

Management

First and foremost, the person diagnosed with COPD should be counseled to quit smoking! The elder requires the same types of cessation interventions as the younger adult.

Bronchodilator therapy can be very helpful in improving exercise tolerance, although not in altering the progression of COPD. Bronchodilators that may be used include beta-2 agonists (albuterol), anticholinergics (ipratropium), and methylxanthines (theophylline). Of these, the beta-2 agonists and anticholinergic drugs are most common.

There are several considerations when using bronchodilator therapy in the elderly. Beta-2 agonists also cause tachycardia, which may cause angina or even a myocardial infarction in the elder with compromised cardiac status. Some older patients have a difficult time actuating inhalers, so benefit from repeated education on use of the inhaler. If the elder is not able to deliver an

appropriate dose, a drug powder inhaler may work more efficiently.

Methylxanthines have many theoretical benefits, but have a very narrow therapeutic range, which may lead to toxicity. The use of methylxanthines has diminished over the last decade.

Corticosteroids are often used for acute exacerbations of COPD to decrease the inflammation which further obstructs the airway. Chronic use of steroids, however, remains somewhat controversial because of the serious adverse effects of oral steroids.

Oxygen is certainly a mainstay of therapy for the COPD'er. While it is true that the impetus to breathe is related to the oxygen level of a patient who "retains CO₂," people still need an adequate level of oxygen to stay alive. The idea of "never going above 2 L per n.c." is dated; the patient needs to have as much oxygen as required to have an adequate PaO₂. That being said, people with COPD may stop breathing if extra amounts of oxygen are given, and should have a designated "intubate" or "do not intubate" status.

One oxygen modality that is gaining more popularity is BiPAP – bilevel positive airway pressure. BiPAP has been shown to improve gas exchange in the COPD patient such that functional capacity may be improved and mechanical ventilation is avoided. Home non-invasive positive pressure ventilation for persons older than 75 years was evaluated in a small study and was found to be helpful and safe for older persons.⁴

Special attention should also be paid to the elder's nutritional status, sleep, and living environment in terms of stairs and assistance. Dietary and social service consultations can be very helpful in planning discharge.

Pulmonary rehabilitation is a program similar to cardiac rehabilitation. The goals are to lessen airflow limitations, help prevent and treat complications, improve quality of life, and decrease COPD symptoms. Several studies have shown that pulmonary rehab is helpful in improving walking ability and health status, besides decreasing physician visits, ER use, and hospitalizations. Many insurance companies and Medicare will cover the cost of pulmonary rehab if ordered by a physician.

Interstitial Lung Disease

Interstitial lung disease (ILD) is not as common as other pulmonary pathologies, but remains a killer nonetheless. There are more than one hundred different problems associated with the development of ILD, including infection, drugs, radiation, and mineral dusts, and autoimmune disorders.

Idiopathic pulmonary fibrosis

The most common form of ILD among the elder is "*Idiopathic Pulmonary Fibrosis*" or IPF. IPF is thought to be related to either to an autoimmune process or to an infection, possibly viral. Mortality for IPF is 50% at 5 years.

The patient with IPF has gradually increasing shortness of breath accompanied by resting hypoxemia. The fingers show clubbing --another sign of tissue hypoxemia. On x-ray, there are opacities in the mid and lower lung fields. Treatment for IPF is limited. Immunosuppressive agents may be tried; corticosteroids are often used. The patient will eventually need to go to home oxygen therapy.

Idiopathic bronchiolitis obliterans with organizing pneumonia (BOOP)

BOOP is a syndrome that is also known as cryptogenic organizing pneumonia. There are two processes at work in BOOP: the bronchioles become so inflamed that they close to incoming air and there is evidence of a pneumonia in the alveoli at the distal end of the bronchioles.

Initially, patients will present with flu-like symptoms, such as fever, cough, and fatigue. With antibiotics, the symptoms decrease. Within a short time, however, symptoms return, and may be accompanied by shortness of breath and hypoxemia. The second course of antibiotics is not helpful. Diagnosis of BOOP is made on patient symptoms, course, chest x-rays showing patchy infiltrates, and CT scan. Corticosteroid treatment using prednisone is helpful in managing BOOP.

Drug induced ILD

This disease can present either as an acute, fulminant injury to a subtle, progressive process that mimics IPF. Treatment is based on removing whatever agent is causing the pulmonary dysfunction (e.g. amiodarone) and administering corticosteroids.

Silicosis

As the name implies, silicosis is caused by exposure to silicate dust for more than five years. Dyspnea and a chronic cough from bronchitis are present in the patient's symptoms. They will also have low ANA titers. There is no treatment for this form of ILD.

Asbestosis

Asbestos is another mineral dust that, when inhaled over a longer period of time, causes ILD. Symptoms include shortness of breath, a nonproductive cough, and clubbing of the fingers from chronic hypoxia. There is no treatment for asbestosis either.

Hypersensitivity pneumonitis

Exposure to certain antigens, such as domestic caged birds, organic dusts, chemicals, or fungal spores can result in an inflammation of the lungs. Symptoms resemble those of IPF, but also include inflammatory response symptoms – fever, chills, dyspnea. A cough is also common. The treatment of choice is to limit exposure to the things that are causing the hypersensitivity reaction. An in-home or in-work evaluation may be necessary to identify what antigen is causing the problem.

ILD associated with connective tissue disorders

In the elderly, rheumatoid arthritis is the disorder that is most associated with ILD. Other disorders are scleroderma, systemic lupus erythmatosus, and Sjögren's syndrome can result in ILD, which is pathologically indistinguishable from IPF. As with IPF, immunosuppressant drugs are the treatment.

Chronic aspiration pneumonitis

Older people are at risk for pneumonitis because of gastroesophageal dysfunction, neurologic disease, and sedative use. Chronic aspiration of food is certainly a cause, as is the use of mineral oil at bedtime to prevent constipation or Vaseline products to lubricate nasal passages. Patient education regarding use of mineral oil or petroleum-based products is very important, as is consideration of safety of eating. A feeding tube may be the best option in this situation.

Pulmonary Embolism

A pulmonary embolism occurs when a pulmonary artery is obstructed by material that is foreign to the lung. The most common cause of pulmonary emboli is a blood clot, although air, fat, foreign bodies, and tumor cells can also embolize.

Approximately 90% of pulmonary emboli (pulmonary emboli) arising from the deep veins in the legs. The elderly are at high risk for developing a p.e. because of the higher incidence of inactivity, obesity, heart disease, smoking, estrogen use, and increased coagulation in the aging population.

The most common symptoms in the elderly are:

- Shortness of breath and rapid respiratory rate
- Chest pain
- Anxiety
- Leg pain and/or swelling (only in 33%)
- Syncope with hypotension indicates a massive embolism

On exam, patients are found to be tachypneic, tachycardic, and may have hypoxemia. Various diagnostic tests may be used, including the Ventilation-Perfusion (VQ) Scan or a spiral CT scan. Pulmonary angiography or ultrasound may be done as well.

The mortality of patients over 65 years is 21% if the p.e. is the only disease process. In the setting of other problems, such as heart disease, cancer, COPD, the mortality rises to greater than 31%.

Treatment for the elderly is not changed from the younger p.e. patient; supplemental oxygen to keep the SaO₂ greater than 92%, heparinization, and anti-embolism stockings or sequentials. Thrombolytic therapy may be considered if the p.e. was diagnosed within three-four hours and is known to be blood clot. Thrombolytics are especially effective for multiple blood clots. Any active or recent bleeding may be a contraindication for thrombolytic therapy.

In the long term, a filter such as the Greenfield filter may be placed in the vena cava to "catch" emboli as they ascend through the veins. Patients with multiple cases of p.e. or who cannot receive anticoagulation may have this filter surgically placed.

Lung Cancer

An estimated 163,510 deaths from lung cancer will occur in the US during 2005 according to the American Lung association. (www.lungusa.org)

Unfortunately, there are few signs of lung cancer in its early and most curable stage. Later signs include:

- Chronic cough
- Hoarseness
- Coughing up blood
- Weight loss & loss of appetite
- Shortness of breath
- Fever without a known reason
- Wheezing
- Repeated bouts of bronchitis or pneumonia
- Chest pain⁵

In elderly patients, the most frequent symptoms are fatigue, cough, night urination, difficulty breathing, pain, and weakness.⁶

It is estimated that 90% of lung cancer in men and 80% of lung cancer in women is directly related to smoking. There are four types of lung cancer:

1. Squamous cell carcinoma – most common in people above 65 years
2. Adenocarcinoma – accounts for 30-35% of cancers in the elderly
3. Small cell (oat cell) carcinoma – 25% of cancers in the elderly
4. Large cell carcinoma

Treatment for lung cancer depends on what stage the cancer has been placed in. Surgical resection, chemotherapy, and radiation are all possible treatment options. Surgical excision is the only therapy that offers a “cure.” Chemotherapy cure is rare, and radiation is often used for palliative care or pain control. Unfortunately, unless caught early, lung cancer is often fatal.

Issues that need to be addressed in the elder with lung cancer include:

- Cessation of smoking if applicable
- Decisions about the end-of-life, including decisions about hospice or home care, life-support, feeding, and hydration
- Nutrition
- Pain control
- Social support

Respiratory Failure

All of the respiratory diseases that have been discussed in this home study can lead to respiratory failure. Respiratory failure is when:

- The PaO₂ (the amount of O₂ in the blood) is <60 mm Hg and/or...
- The PaCO₂ (the amount of CO₂ in the blood) is > 45 mm Hg

Hypoxemia, or decreased amount of oxygen in the blood, can result from a number of problems. In the elderly, pneumonia and COPD are the two most common reasons for hypoxemia.

Inadequate ventilation can also be a big part of respiratory failure. In the geriatric patient, drug toxicity, sedation, pre-existing pulmonary disease, and inadequate respiratory muscle strength lead to a decreased ability to ventilate (excrete CO₂) adequately.

Management

Management of the patient in respiratory failure starts with the least invasive treatments first. Initiation of corticosteroids, antimicrobials, and supplemental oxygen is the first line response. If the patient continues to deteriorate, moving into a non-invasive ventilation may be the next step. CPAP or BiPAP ventilation, as briefly described in the COPD section, may be very helpful for patients experiencing ventilatory or oxygenation failure.

Contrary to usual practice in the younger patient, it is helpful to know the wishes of the elderly patient in regards to extraordinary measures before invasive therapies are begun. It is more difficult to wean the elderly patient, particularly one with long-standing pulmonary disease, from the ventilator⁷. Many ventilator dependent patients are elderly.

If it is applicable to the patient, intubation and mechanical ventilation is the next course of action. There are special considerations for geriatric patients related to this. Elders are more likely to have loose or fragile teeth than younger patients, so care should be taken during the intubation procedure to not break teeth. If the patient has dentures, the anesthesiologist may elect to remove or retain the dentures during intubation.

Hypotension after intubation and the start of mechanical ventilation is fairly common. This is related to medications that the patient received during the intubation

or while being ventilated; pressure on the heart which limits stretch and contractility; and pressure on the vena cava, which decreases the amount of blood returning from the peripheral circulation. Fluid balance is a key element in maintaining blood pressure during this time. Positive inotropic medications, such as dopamine or dobutamine, may be indicated to help the aging heart pump more effectively.

Having an endotracheal tube in place puts patients at more risk for aspiration. It is believed that up to 70% of geriatric patients aspirate, causing pneumonitis and pneumonia.

The settings for the mechanical ventilator will be much the same as for a younger person. The amount of air pushed into the lungs with each breath (tidal volume), is likely to be decreased (6-7 ml/kg rather than 10-12 ml/kg) because of the fragility of older lung tissue. A decreased tidal volume will not put so much pressure on the alveoli, so pneumothoraces are not as much of a risk. Oxygen delivered through the ventilator should be at the lowest possible therapeutic level to prevent oxygen-related injury to the alveoli (oxygen toxicity).

Elders are more likely than younger patients to develop disorientation, delirium, and agitation when mechanically ventilated. Safety and comfort must be addressed early. Side rails should be up and restraints, such as mittens or wrist restraints, should be applied to limit the possibility of self-extubation. Medications such as benzodiazepines, morphine, and propofol may be considered both for comfort and safety. Remember that drug metabolism is very different in the elder than in the younger patient. For this reason, short acting drugs such as midazolam or propofol are preferred.

Probably the biggest issues confronting health care professionals in respiratory failure in the elder is weaning from the ventilator. All ventilator patients go through a process of "weaning," which is removing the breaths delivered by the ventilator for a short period of time and watching the vital signs and comfort of the patient. If the patient "passes the weaning trial," it indicates that the endotracheal tube and mechanical ventilation may be removed completely. Many older patients have a more difficult time tolerating weaning, and may require many weaning trials before extubation can occur.

If the weaning process is taking a long time, a tracheostomy may be considered. In general, a tracheostomy is placed when the patient has been

intubated for longer than two weeks, although this varies. Finally, long-term ventilator management is often continued in a non-acute care hospital setting.

Summary

Respiratory problems are second only to cardiac disease in the elderly in terms of morbidity and mortality. In this home study, you learned about the normal changes of aging in the pulmonary system; the diseases that affect more of the elderly population; and the differences in the assessment and management of the elder experiencing pulmonary disease.

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Recommended Reading

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To obtain a certificate of completion for this home study program, please complete the post-test and evaluation on the next few pages. The date on your certificate of completion will be the date that your home study is received. **Any materials received with a postmark after the expiration will be discarded.**

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Pulmonary Issues in ElderCare Post-Test

Please print all information clearly and sign the verification statement:

Name _____
(please print legal name above)

Birth date (required)

Format: 01/03/1999

M	M	D	D	Y	Y	Y	Y

For HealthEast, HCMC, or MVAMC, employees only:

Hospital _____ Unit _____

Personal verification of successful completion of this educational activity (required):

I verify that I have read this home study and have completed the post-test and evaluation.

Signature

- 1) Unless there are additional insults, the normal lung changes that occur with age do not cause problems
 - a) True
 - b) False
- 2) The normal PaO₂ of a 75 year old patient is:
 - a) 95-100
 - b) 90-95
 - c) 85-90
 - d) 75-83
- 3) What is the most common microorganism that causes pneumonia?
 - a) Klebsiella
 - b) Pseudomonas
 - c) Streptococcus
 - d) Aspergillus
- 4) Typical symptoms of pneumonia for the elder include:
 - a) Confusion, tachypnea, tachycardia
 - b) Lethargy, bradycardia, SOB
 - c) Delirium, tachypnea, hypertension
 - d) None of the above
- 5) COPD is known as the “disease of the smoker.”
 - a) True
 - b) False
- 6) Idiopathic pulmonary fibrosis has a mortality of what at five years?

- a) 25%
 - b) 50%
 - c) 75%
 - d) 100%
- 7) Over 90% of all pulmonary emboli are made up of what substance?
 - a) Blood
 - b) Air
 - c) Amniotic fluid
 - d) Fat
 - 8) Symptoms of lung cancer occur early, so lung cancer is usually treatable.
 - a) True
 - b) False
 - 9) A primary issue related to respiratory failure is:
 - a) Nutrition
 - b) Ability to wean from the ventilator
 - c) Emotional stability
 - d) Communication

Expiration date: The last day that post tests will be accepted for this edition is **December 31, 2017**—your envelope must be postmarked on or before that day.

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Evaluation: Pulmonary Issues in ElderCare

Please complete the evaluation form below by placing an "X" in the box that best fits your evaluation of this educational activity. Completion of this form is required to successfully complete the activity and be awarded contact hours.

At the end of this home study program, I am able to:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Describe common changes and pathophysiology of the pulmonary system related to aging.					
2. Formulate a plan for assessing and managing the elderly patient with pulmonary disease.					
3. The teaching / learning resources were effective. <i>If not, please comment:</i>					

The following were disclosed in writing prior to, or at the start of, this educational activity (please refer to the first 2 pages of the booklet).

	Yes	No
4. Notice of requirements for successful completion, including purpose and objectives		
5. Conflict of interest		
6. Disclosure of relevant financial relationships and mechanism to identify and resolve conflicts of interest		
7. Sponsorship or commercial support		
8. Non-endorsement of products		
9. Off-label use		
10. Expiration Date for Awarding Contact Hours		
11. Did you, as a participant, notice any bias in this educational activity that was not previously disclosed? <i>If yes, please describe the nature of the bias:</i>		

12. How long did it take you to read this home study and complete the post test and evaluation:

_____ hours and _____ minutes.

13. Did you feel that the number of contact hours offered for this educational activity was appropriate for the amount of time you spent on it?

___ Yes

___ No, more contact hours should have been offered

___ No, fewer contact hours should have been offered.

Expiration date: December 31, 2017
