

Smith Seminars
Online Continuing Education
AARC-Approved for 2 CRCE
Respiratory Problems of the Aging Patient

Objectives

List the age-related respiratory changes
Identify the clinical factors of chronic cough
List history, symptoms, physical examinations, diagnosis of diseases of the aging patient
Review the treatment for bronchitis, COPD, pneumonia, asthma, influenza, common cold, sinusitis, and allergic rhinitis

There is a gradual age-related decline in pulmonary function beginning at about age 40. The elastic recoil of the lungs decreases, owing to changes in elastin and collagen. The lung weight is decreased by approximately one fifth, the bronchi harden, and the bronchial epithelium and mucous glands degenerate. The alveolar ducts and bronchioles enlarge, with an accompanying decrease in the depth of the alveolar sacs. The alveoli decrease in number, and the cilia become less active. With inhalation, the lung bases of the elderly do not inflate well, and secretions are not expelled. There is a greater resistance to airflow, owing to narrowing of the bronchioles. The vital capacity decreases, and the residual volume increases because of loss of elastic recoil.

Age-related respiratory system changes in the elderly also include the thoracic muscles of inspiration and expiration grow weaker, leading to incomplete lung expansion and decreased elastic recoil. Pulmonary function test changes are reduced respiratory function, reduced vital capacity, reduced breathing capacity, and increased residual lung volume. Poor ciliary function, reduced cough reflex, and decreased T-cell immunity develop. The number of functioning alveoli decreases. The number of beta receptors decreases.

Arterial blood gases (ABGs), PaO₂ decreases with age; PaO₂ corrected for age equals 102 minus 1/3 of the patient's age so the PaO₂ in an 90-year old is 72 mm Hg. PaCO₂ and pH may be outside the normal range, and the response to change may be blunted. There is decreased oxygen uptake by cells. The incidence of sleep apnea and sleep disorders increases. The anteroposterior chest diameter increases, the thoracic transverse measurement decreases, and kyphosis may be present. Costal cartilage calcifies, and the ribs become less mobile.

The clinical implications of the age-related changes are as barrel-shaped chest or senile emphysema, bibasilar crackles at baseline, increased risk for respiratory muscle fatigue, increased risk for pneumonia and aspiration, increased risk for reactivation of tuberculosis, decreased reserve (patients are more prone to disease), and decreased response to beta agonists. There may be possible normal hypercapnia, therefore oxygen should be titrated cautiously to prevent impairment of hypercapnia-driven respiration. Other age-related changes may be delayed symptoms of hypoxemia and hypercapnia, and decreased response to exercise, stress, and disease. There is an increased risk for

nocturnal hypoxemia. The elderly population may present with a number of clinical entities in the primary care setting.

Chronic Cough

Cough is the host defense mechanism to clear the airway of secretions and inhaled particles. A chronic cough is one that lasts at least 3 weeks. In adults, chronic bronchitis due to cigarette smoking or inhaled irritants and postnasal drip from chronic sinusitis or allergic rhinitis may be contributors. Additional illnesses causing chronic cough include viral infections, bacterial infections, asthma, gastroesophageal reflux disease, foreign body aspiration, tuberculosis, medications such as beta blockers or angiotensin converting enzyme (ACE) inhibitors, and psychogenic factors. Worrisome causes of chronic cough include mediastinal masses and chronic lymphadenopathy.

Conditions of a chronic cough may be:

Chronic bronchitis with a dry hacking cough is present and is worse in the morning. Postnasal drip because 41 % of patients with a chronic cough complain of a clear nasal discharge, nasal congestion, and frequent throat clearing. Asthma may be a condition in individuals that have a cough at bedtime, after exercise, laughing, or exposure to cold air. A cough is seasonal in occurrence with a strong family history. A cough may be nonproductive or productive but not purulent. Associated symptoms may include wheezing and intercostals retraction; but a cough may be the sole manifestation. In individuals that describe a history of heartburn, dysphagia, or a sour taste in the mouth, which may be relieved by sitting up, gastroesophageal reflux disease may be the problem. With a viral infection, symptoms occur in the winter, with a non-productive cough, rhinitis, and nasal congestion. With bacterial infections, the cough may be productive or purulent, accompanied by fever or respiratory distress, or both. Aspiration of a foreign body may be the problem when the cough persists for weeks or months and there is a fixed, localized wheezing on auscultation that suggests a distinct affected area. For patient with TB, initially individuals describe minimal production of yellow-green mucus on arising, but with progressive disease the cough becomes more productive. Associated symptoms include fever, night sweats, dyspnea, and hemoptysis. Tumors of the airway may cause a cough and the characteristic of the cough depends on the location of the primary tumor. With psychogenic factors, the cough disappears during sleep, it is worse when attention is brought to it, it is worse under stress, and it lacks associated symptoms.

Bronchitis

Bronchitis is an inflammatory condition of the tracheobronchial tree characterized by hyperemic, edematous bronchi, heightened bronchial secretions, impaired mucociliary activity, and destruction of the epithelium. Bronchitis may be acute or chronic in nature and may result from infections with rhinoviruses, pneumococci, Mycoplasma, Chlamydia, or Moraxella catarrhalis. There may be a secondary bacterial infection resulting from Streptococcus pneumoniae or Haemophilus influenzae.

When taking a history of the patient you will want to ask the onset and duration of symptoms, associated symptoms such as fever, pharyngitis, dyspnea, and chest pain. Find out if other household members have an infectious illness. What is the past medical history of respiratory illnesses, past and current smoking history, quality and nature of

sputum production, drug or environmental allergies. Also ask current medications, including over-the-counter drugs.

Symptoms

Cough is the hallmark symptom, fever (unless infected with rhinovirus or coronavirus), chest pain, or bronchospasm with wheezing (uncommon in nonsmokers).

Physical Examination

The physical examination should include vital signs, mental status, EENT, lymph nodes, and a heart and lung examination. Attention should be paid to fever, edematous turbinates or pharynx, enlarged lymph nodes, wheezing, and tachycardia. Acute bronchitis and pneumonia are extremely difficult to differentiate. Patients with pneumonia often have high fever, rigors, pleuritic chest pain, rusty or bloody sputum, focal crackles, and x-ray abnormalities. However, the elderly may present atypically, without evidence of high fever or with less severe constitutional symptoms.

Diagnostic Tests

Bronchitis is a diagnosis of exclusion. A complete blood cell count (CBC) with differential, sputum culture, and chest x-ray examination are necessary only if the patient has worsening symptoms despite management. Consider a PPD test if the patient is at risk for tuberculosis.

Treatment

Because most cases are viral in origin, antibiotics are generally not needed. Increase fluids and rest and discontinue cigarettes. Cough suppressants, antihistamines, and sedatives should be used sparingly, based on the severity of symptoms. Expectorants have not proven helpful. Clearance of secretions should be promoted with postural drainage and therapeutic doses of bronchodilators. If a bacterial infection complicates the viral infection, treat with antibiotics. In patients with coexisting COPD, treat with antibiotics when there is a change in the color, consistency, and amount of sputum production.

Education

Teach the patient to avoid individuals with upper respiratory infections. Increase fluid intake and rest. Monitor temperature daily. Notify health care provider if symptoms do not improve within 3 days. Take medications as instructed.

Chronic Obstructive Pulmonary Disease

COPD is a complex syndrome of airway obstruction or airflow limitation. There are two components of COPD: emphysema and chronic bronchitis. Emphysema is a pathologic diagnosis based on a permanent, abnormal dilation and obstruction of alveolar ducts and air spaces distal to the terminal bronchioles. Emphysema is characterized by airway obstruction, hyperinflation, loss of elastic recoil, and destruction of alveolar-capillary interface, which impairs gas exchange. Chronic bronchitis is a clinical diagnosis based on the presence of cough and sputum production that occurs on most days of a 3-month period during 2 consecutive years. It is characterized by thickened bronchial walls,

hyperplasia and hypertrophied mucous glands, and mucosal inflammation in the bronchial walls, large central airways, and later, smaller airways. Sequelae of emphysema or chronic bronchitis may be chronic hypoxemia, which causes pulmonary hypertension, and cor pulmonale, conditions associated with poor survival if untreated.

When taking a history of the patient you will want to ask the onset and duration of symptoms, occupational and environmental exposures to dusts (e.g., grain, wood, cotton, mineral, or polyurethane) and chemical fumes. Ask the cigarette smoking history (number of packs times number of years equals pack-year smoking history) and the number of attempts to quit smoking and duration of cigarette-free time. Ask the patient about shortness of breath, trouble keeping up with peers, doing routine activities such as walking, sports, or work activities. More advanced dyspnea is roughly quantified by distance walked or flights of stairs walked before stopping. Ask about the quantity and characteristics of sputum production, drug or environmental allergies, current medications, including over-the-counter drugs.

Alpha 1 antitrypsin deficiency is an uncommon genetic disorder, found in about 1 in 2500 whites, in which the circulating levels of antiproteases are less than 10% of normal. A DNA-base substitution causes an amino acid substitution that prevents secretion of antiproteases from liver cells. Serum levels are less than 15% of normal, which leads to development of premature emphysema in deficient individuals. Although affected people present for medical care with severe emphysema in the third and fourth decades, many individuals with Alpha 1 antitrypsin deficiency have normal or only mildly abnormal lung function if they do not smoke.

Symptoms of COPD include chronic cough, wheezing, weight changes, recurrent respiratory infections, progressive exertion dyspnea, lack of libido, tachypnea, sputum production, fatigue, insomnia, and limitation of activities of daily living from shortness of breath.

The physical examination should include vital signs, be alert for fever, tachypnea, tachycardia, and irregular pulse. Check for increase in resting chest anteroposterior diameter, flattening of the angle of the clavicle and trapezius, widening of the xiphocostal angle, and increase in the intercostal spaces. Check for diminished muscle mass in the thighs and legs. The characteristics of seating posture, leaning forward with both hands on the knees to elevate the shoulders, purse-lipped breathing, and prolonged time of expiration should be noted. Cyanosis and clubbing of the nails, tobacco staining of the fingers should be noted. Chest percussion reveals increased resonance and a low diaphragm. Auscultation shows diminished transmission of breath sounds and early inspiratory crackles. Wheezing may be elicited with forced expiration. Systemic findings include neck vein distention, peripheral edema, hepatomegaly, tricuspid regurgitation, and a ventricular heave.

Diagnostic Tests

Chest x-ray film is abnormal only in advanced disease. There is hyperinflation with flattening of the diaphragm, increased retrosternal air space on the lateral view, narrow

cardiac silhouette, and a paucity and tapering of peripheral blood vessels. The EKG shows a vertical or indeterminate heart axis and low voltage. Enlarged P waves, right axis deviation, or right ventricular hypertrophy is present with cor pulmonale. A PPD and CBC with differential and chemistries, in particular, liver function tests may be obtained. A Gram stain and culture of sputum may be done if infection is suspected.

Spirometry

As a general rule, forced expiratory volume at 1 second (FEV1) greater than 2 liters indicate mild obstruction; 1 to 2 L, moderate obstruction; and less than 1 L, severe obstruction. Bronchodilator testing can reveal reversible bronchospasm, and the postbronchodilator measure of FEV1 is the best overall predictor of life expectancy in COPD. The carbon monoxide diffusing capacity test is a test to evaluate the amount of functioning pulmonary capillary bed in contact with functioning alveoli. It is helpful in distinguishing emphysema from asthma. Cigarette smokers without emphysema have mild reductions in diffusing capacity because of the accumulation of carbon monoxide in the blood, which is only partially reversible with smoking cessation. A diffusing capacity below 70% of the predicted value is present with emphysema but may also be found with interstitial fibrosis and pulmonary vascular diseases. In chronic asthmatic bronchitis the diffusing capacity tends to be preserved. Consider ABGs and pulse oximetry as conditions warrant.

Treatment

According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) published in 2006, bronchodilators therapy should be used with increasing doses and/or frequency, combined Beta2-agonists and anticholinergics, and use of spacers or air-driven nebulizers. Also add intravenous methylxanthines, if needed. Add oral or intravenous glucocorticosteroids, consider antibiotics (oral or occasionally intravenous) when signs of bacterial infection.

Oxygen Therapy

Oxygen therapy prolongs survival and improves physical and psychologic functioning in hypoxemic patients with COPD. Indications for continuous oxygen therapy include the following: PaO₂ 55mmHg or O₂ saturation 88% while in usual state of health or PaO₂ 60mmHg or O₂ saturation 89% with evidence of chronic hypoxemia, such as erythrocytosis, ankle edema, venous engorgement, or psychologic impairment. Oxygen should be prescribed at the lowest level necessary to maintain arterial oxygen saturation at or above 90%, usually 1 to 4 L/min via nasal cannula for a minimum duration of 18 hr/day. Portable liquid oxygen systems allow mobility out of the home and should be used whenever possible. Stress the danger of smoking in the presence of oxygen. According to GOLD, during COPD exacerbations, administer controlled oxygen therapy and repeat arterial blood gas measurement after 30-60 minutes, consider noninvasive mechanical ventilation.

Education

Educate the patient regarding the disease process, prevention of disease progression, treatment of complications, drug treatment to maximize lung function, and rehabilitation

to optimize activity levels. The patient should be given realistic expectations about the long-term progressive course of the disease, tempered by the understanding that temporary worsening is treatable. Achievement of maximum social and physical functioning may be assisted by simple measures such as special parking areas for the disabled, use of wheelchairs and motorized carts in shopping malls, and portable oxygen and oxygen supplementation during air travel. Patients and their families should understand that the dyspnea that occurs with exertion is not harmful to the lung and that, with the appropriate pacing of activities, a certain level of dyspnea is actually desirable to achieve and maintain functioning. Inquiries about sexual functioning should be encouraged. Education of the patient's bed partner about proper techniques and the use of prophylactic bronchodilators and oxygen can establish more normal sexual functioning, even with severe disease. Discuss with the patient and family issues surrounding advance directives and mechanical ventilation as treatments for acute respiratory failure. Educate the patient about smoking cessation, to include cigarettes, cigars, marijuana, and cocaine. Avoid respiratory irritants. Pneumonia vaccination is recommended every 5 years. Influenza vaccination is recommended annually. Instruct the patient to contact health care providers at the onset of upper respiratory tract infection symptoms. Encourage the patient to become involved in a pulmonary rehabilitation program and support group. If a bacterial infection ensues, they should be treated with antibiotics.

Pneumonia

Pneumonia is a lower respiratory tract infection accompanied by systemic symptoms and evidence of consolidation on chest x-ray film. Bronchitis and pneumonia represent a continuum of lower respiratory infection. Aspirated pathogens, including bacteria, Mycoplasma, and viruses, invade the bronchial epithelium, causing inflammation, edema, and leukocyte infiltration. X-ray examination findings depend on the extent of involvement of adjacent lung parenchyma. It may take 24 hours or longer to visualize x-ray film changes that support clinical findings. One reason for these changes may be that the elderly tend to be dehydrated at the time of presentation, and rehydration causes the infiltrate to appear. There may be a 24-hour lag time between the clinical presentation and x-ray changes. Patients seen early and those with emphysema may fail to show any infiltrate or may show a patchy infiltrate on their chest films despite considerable inflammation. The clinical distinction between acute bronchitis and acute pneumonia is often an arbitrary radiological distinction.

Pneumonia is increasingly common among elderly patients and those with coexisting illnesses. Patients over age 65 are at increased risk for mortality from bacterial pneumonia. The most commonly cultured organisms in people 65 and older are gram-negative bacilli. In the absence of laboratory analysis and documentation of a the organism, consideration should be given to where the patient lives. If the patient is living at home, consider the most common pathogens in community-acquired pneumonia. If the patient resides in a long-term care facility or was recently hospitalized, care should be taken to find the causative organisms.

When taking a history of the patient you will want to ask history of previous pneumonia, frequency of upper respiratory infections, fever, and shortness of breath. Also ask about

the quality and nature of sputum production, and cough. Inquire about wheezing, rhinorrhea, weight changes, rigors, and nausea or diarrhea. Ask about the smoking history, alcohol intake, TB history and recent exposure, recent travel and co-morbid illness, such as, diabetes, hypertension, cancer or chronic illnesses such as rheumatoid arthritis or lupus, asthma, COPD, emphysema.

Symptoms

Bacterial pneumonias are commonly preceded by viral-like symptoms of headache, myalgias, and malaise. Also, there may be abrupt onset of shaking chills, a fever, pleuritic chest pain, cough productive of purulent or rusty sputum.

Non-bacterial pneumonias (atypical pneumonia) are distinguished by a headache and myalgia before the respiratory symptoms. The onset is a flu-like illness includes fever, headache, sore throat, myalgia and malaise. There may be a nonproductive hacking cough at onset or several days later with substernal chest pain, dyspnea and respiratory distress.

When caring for the elderly, a health care provider must be alert for subtle changes in behavior. Two common indicators of illness in this age group are tachycardia and tachypnea. People who live at home are more likely to present with classic symptoms, whereas residents of long-term care facilities may exhibit mental status changes, falls, anorexia, and new behavioral problems. Early recognition of subtle changes in this population, can lead to early interventions and decreases morbidity and mortality.

Physical Examination

Check vital signs and consider weight if patient has coexisting illness. Inspect and observe respiratory rate, ability to speak in sentences, use of pursed-lip breathing, jugular venous distention, use of accessory muscles, positioning to relieve shortness of breath, cyanosis, tachypnea, grunting, nasal flaring, and mental status changes. Crackles may be an age-related change. Crackles that do not clear with cough are suggestive of pneumonia of either type. Signs of consolidation (bronchial breath sounds, dullness to percussion, and egophony) are more common in bacterial pneumonia. In early stages of pneumonia the examination may be normal, despite an infiltrate on x-ray film. However, crackles and rhonchi may indicate pneumonia before the appearance of an infiltrate. Palpation and percussion may show tactile fremitus and dullness over the area of consolidation.

Diagnostic Tests

In a patient with classic symptoms, diagnostic studies serve only to confirm the diagnosis. In an elderly patient with an atypical presentation, a broader workup may be required to determine an etiology and therefore better focus case management. An appropriate diagnostic workup should be focused and cost effective. Chest x-ray examination is helpful in the differential diagnosis of cough, shortness of breath, or chest pain. It may also be helpful in revealing other underlying conditions such as cardiomegaly, lung abscess, TB, obstruction, tumor, and multilobar involvement. Although the x-ray is essential for the firm diagnosis of pneumonia, a normal x-ray does

not necessarily rule out pneumonia, and subsequent films may actually reveal a progression of pulmonary infiltrates.

Other diagnostic tests may include sputum microbiology, consider pulse oximetry if available, consider blood gases if O₂ saturation is less than 90%. The O₂ saturation and ABGs should be used to assist in determining the severity of illness. Severe hypoxemia is an indicator of poor outcome and may require admission to an intensive care unit. Spirometry changes are FEV₁ decreased and ECG shows atrial changes. A blood chemistry and CBC with differential are appropriate if the patient is older than 60 or has coexisting illnesses. In a classic scenario the CBC reveals a marked leukocytosis with a left shift. This phenomenon can be absent or delayed in the elderly patient. Consider PPD and get sputum (acid-fast bacilli) if history indicates, also blood cultures if bacteremia is suspected.

Treatment

Hospitalization or outpatient management is based on a number of factors, including physical parameters, social support, insurance issues, and the ease of treatment for the probable causative organism. Hospitalization should be strongly considered for patients with multiple risk factors. Provide antipyretics for general comfort. Consider guaifenesin for tenacious secretions. Avoid dextromethorphan, which suppresses cough reflex. Outpatient treatment for patients 60 years or older is based on the presumptive diagnosis from the signs and symptoms exhibited. Antimicrobial therapy in the elderly should provide broad-spectrum activity. Issues to consider in selecting an antimicrobial agent are cost-benefit ratio, dosage schedule, patient tolerability, and site of administration such as at home or long-term care facility.

Education

Encourage the patient to stop smoking and take 10 deep breaths each hour, increase hydration and nutritional intake. Educate about the importance of antibiotic therapy. The patient should finish all medication. Avoid other individuals with upper respiratory infections. Patient and family members should practice good hand-washing techniques. Instruct the patient to schedule activities with rest periods. Establish practice mechanisms to ensure that elderly patients receive pneumonia vaccines every 5 years and influenza vaccine yearly.

Asthma

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

Individuals older than 55 years, have the highest rate of asthma-related deaths. The prevalence, severity, and death rate have increased in the past decade, particularly in blacks and Hispanics. There are an estimated 15 million patients with asthma.

When obtaining a history determine if symptoms worsen in association with the following specific factors: airborne chemicals or dust, animals with fur or feathers, changes in weather, exercise, mold, pollen, and house dust mites in mattresses, upholstered furniture, and carpets. Ask if symptom worsen at nighttime, around smoke, either tobacco or wood, during strong emotional expression like laughing or crying hard. Also ask about when the patient is exposed to viral infections, or medications such as ASA, ACE inhibitors, NSAIDs, or beta blockers. Ask about the family history, impact of disease, previous therapies and responses, drug and environmental allergies, and current medications, including over-the-counter medications.

Symptoms

Symptoms may include cough, especially nocturnal, recurrent wheezing, recurrent dyspnea, and chest tightness. Occupational asthma should be considered in all patients with adult-onset asthma and in patients with asthma that worsens in adulthood. Roughly 250 chemicals have been implicated in occupational asthma. The total duration of exposure, duration of symptoms, and the severity of symptoms at the time of diagnosis are important determinants of outcome. Early diagnosis and early withdrawal from exposures to offending chemicals are the keys to recovery.

Physical Examination

Check vital signs and observe general appearance, noting distress or decreased responsiveness. Note accessory muscle use, retraction, posture, nasal flaring, diaphoresis, and cyanosis. Check skin for eczema and atopy. EENT examination may include nasal discharge, allergic shiners, nasal polyps, postnasal drip, frontal tenderness. Pulmonary examination may note adventitious sounds, particularly prolonged expiratory phase and wheezing. Unilateral wheezing suggests an aspirated foreign body.

Diagnostic Tests

Consider chest x-ray film or CBC with differential if infection is suspected. Consider pulse oximetry or ABGs as the patient's condition warrants. Perform peak expiratory flow with a peak flowmeter. Consider spirometry evaluation. In patients with persistent asthma, despite taking appropriate daily medication, identify allergen exposure, assess sensitivity to seasonal allergies with a thorough history, and assess sensitivity to perennial indoor allergens with skin or in vitro testing.

Treatment

The goals of asthma therapy include prevent chronic and troublesome symptoms, such as coughing or breathlessness at night, in the morning, or after exertion. Maintain nearly normal pulmonary function, maintain normal activity levels (including exercise), prevent recurrent exacerbations and minimize the need for emergency care and hospitalization, and provide optimal pharmacotherapy with minimal or no adverse effects. Meet the patient's and family's expectations of and satisfaction with asthma care.

The goals can be met by using daily anti-inflammatory therapy to provide the most effective control. The stepped-care approach by initiating therapy at higher levels and stepping down as stability is achieved. Peak expiratory flow rate and FEV₁ (forced expiratory volume in one second) can be performed office-based assessment at intervals ranging from 1 to 6 months. Consider the use of an asthma specialist when control of asthma cannot be maintained.

Pharmacologic Therapy

The most effective medications continue to be those with anti-inflammatory actions, inhaled steroids, mast cell stabilizers, and leukotriene modifiers. The next step includes medications that provide relief from acute symptoms, such as short-acting beta adrenergics, anticholinergics, and systemic glucocorticoids. Asthma treatment is based on a stepped approach. Guidelines for treatment should be initiated at higher levels or steps rather than higher doses of medications.

Medications for asthma are categorized into two general classes: long-term control medications used to achieve and maintain control of persistent asthma and quick-relief medications used to treat acute symptoms and exacerbations.

Long-term control medications

Corticosteroids: Block late-phase reaction to allergen, reduce airway hyper-responsiveness, and inhibit inflammatory cell migration and activation. They are the most potent and effective anti-inflammatory medication currently available. Inhaled corticosteroids (ICSs) are used in the long-term control of asthma. Short courses of oral systemic corticosteroids are often used to gain prompt control of the disease when initiating long-term therapy; long-term oral systemic corticosteroid is used for severe persistent asthma.

Cromolyn sodium and nedocromil: Stabilize mast cells and interfere with chloride channel function. They are used as alternative, but not preferred, medication for the treatment of mild persistent asthma. They can also be used as preventive treatment prior to exercise or unavoidable exposure to known allergens.

Immunomodulators: Omalizumab (anti-IgE) is a monoclonal antibody that prevents binding of IgE to the high-affinity receptors on basophils and mast cells. Omalizumab is used as adjunctive therapy for patients ≥ 12 years of age who have allergies and severe persistent asthma.

Leukotriene modifiers: Include Leukotriene Receptor Antagonists (LTRAs) and a 5-lipoxygenase inhibitor. Two LTRAs are available—montelukast (for patients >1 year of age) and zafirlukast (for patients ≥ 7 years of age). The 5-lipoxygenase pathway inhibitor zileuton is available for patients ≥ 12 years of age; liver function monitoring is essential.

LTRAs are alternative, but not preferred, therapy for the treatment of mild persistent asthma. LTRAs can also be used as adjunctive therapy with ICSs, but for youths ≥ 12 years of age and adults they are not the preferred adjunctive therapy compared to the addition of LABAs.

Zileuton can be used as alternative but not preferred adjunctive therapy in adults.

Long-Acting Beta₂-Agonists (LABAs): Salmeterol and formoterol are bronchodilators that have duration of bronchodilation of at least 12 hours after a single dose. LABAs are

not to be used as monotherapy for long-term control of asthma. LABAs are used in combination with ICSs for long-term control and prevention of symptoms in moderate or severe persistent asthma.

Methylxanthines: Sustained-release theophylline is a mild to moderate bronchodilator used as alternative, not preferred, adjunctive therapy with ICS. Theophylline may have mild anti-inflammatory effects. Monitoring of serum theophylline concentration is essential.

Quick-relief medications

Anticholinergics: Inhibit muscarinic cholinergic receptors and reduce intrinsic vagal tone of the airway. Ipratropium bromide provides additive benefit to Short-Acting Beta2-Agonists (SABA) in moderate-to-severe asthma exacerbations. It may be used as an alternative bronchodilator for patients who do not tolerate SABA.

SABAs: Albuterol, levalbuterol, and pirbuterol are bronchodilators that relax smooth muscle. It is the therapy of choice for relief of acute symptoms and prevention of exercise-induced bronchospasm (EIB).

Systemic corticosteroids: Although not short acting, oral systemic corticosteroids are used for moderate and severe exacerbations as adjunct to SABAs to speed recovery and prevent recurrence of exacerbations.

Management of upper respiratory tract symptoms is an integral component of asthma management. Coexisting rhinitis, sinusitis, and GERD require treatment.

Education

Patient education is the key in the management of chronic asthma and acute exacerbations. Education is a partnership between patients and health care providers. The asthma education program should include five components:

1. Basic asthma facts: Review pathophysiology.
2. Roles of asthma medications.
3. Skills for use of inhaler, spacer, and peak flowmeter.
4. Office spirometry should be performed at the initial assessment and diagnosis of asthma, then after the patient's condition has stabilized following initiation of therapy, and at least every 1 to 2 years thereafter.
5. Peak expiratory flow rates (PEFR) should be recorded by patients two to four times daily for 2 to 3 weeks during initial medication therapy. Average the morning and afternoon scores, after removing the two high results and two low results. These values show the patient's personal best before medication (morning value) and after medication therapy (afternoon value). After maximum medical therapy has occurred and the patient's medical condition has stabilized, have patient perform PEFRs in the early afternoon. Patients should contact their health care provider if the PEFR falls to less than 80% of their personal best. Because predicted values vary across racial and ethnic populations, the personal best PEFR is a better choice for individual monitoring than population-based normative values.

Environmental Control and Avoidance Measures

Avoid exposure to tobacco smoke and allergens to which the patient is sensitive. Avoid pets. If pets cannot be removed from the home, have designated pet-free living areas. Close bedroom doors, use air filters, and remove carpets or upholstery from pet-free areas. Avoid exertion when pollution levels are high. Avoid foods and beverages containing sulfites, including wine. Avoid nonselective beta blockers in patients with cardiovascular disease, ophthalmologic indications, migraines, or stage fright. Mattresses and pillows should be encased in allergen-free cases. Sheets and blankets should be washed weekly in water hotter than 140° F. Consider allergy testing and immunotherapy when the connection between symptoms and exposure to allergens is unavoidable. Skin or in vitro testing may also be considered when patients are perennially exposed to indoor allergens.

When and How to Take Rescue Steps

Provide written signs and symptoms, in appropriate language, of acute exacerbations and treatment plan changes (such as when to use short-acting bronchodilators). Educate patients to recognize symptoms and changes in symptom patterns that indicates diminished asthma control and the need for stepping up the therapy.

Influenza

Influenza is an infection of the respiratory tract caused by the influenza virus. There are three types of virus, labeled A, B, and C. The proteins that coat the flu virus change constantly, making it difficult for the immune system to recognize and fight new strains. The virus is mainly spread by airborne transmission or direct contact, as in the common cold. Therefore people with lung disease, the elderly, or those with weakened immunity are prone to severe and possibly fatal complications from the flu. During flu epidemics, up to 40% of people in a given community may develop flu symptoms during the time span of a few weeks. Flu season is usually November through February. Illness is severe for 3 to 14 days, and convalescence lasts for 1 to 4 weeks.

When obtaining a history determine if there was an abrupt onset of systemic symptoms, headache and myalgias that involves the back, arms, legs, and occasionally the eyes are the predominant symptom. Fever may rise up to 106° F for 3 days and may persist for 5 to 7 days. Respiratory symptoms such as cough, nasal discharge, hoarseness, and sore throat appear as systemic symptoms wane. Cough and weakness usually subside after 2 weeks but may persist longer. Ask the patient about drug or environmental allergies and the current medications, including over-the-counter.

Symptoms

Sudden onset of fevers, chills, muscle aches, malaise, cough, and sore throat. The symptoms are usually self-limiting.

Physical Examination

Check vital signs, they usually appear constitutionally ill with a flushed face, hot skin, watery red eyes, clear nasal discharge, tender cervical lymph nodes, and occasionally localized crackles in the chest. There is anorexia, nausea, vomiting, and diarrhea. White

cell count and differential count usually demonstrate mild neutropenia and relative lymphocytosis because of absolute granulocytopenia.

Treatment

Treatment is entirely symptomatic. Give acetaminophen or NSAIDs for aches and fever. Use combination products with decongestants, such as pseudoephedrine or phenylephrine, for congestion, cough, and nasal discharge. Do not use nasal sprays longer than 3 days to decrease the chance of rebound nasal congestion. Other medications that can be used are antihistamines such as diphenhydramine, chlorpheniramine, or clemastine or cough suppressants such as dextromethorphan.

Antiviral medications are an adjunct to vaccination and are effective when administered as treatment and when used for chemoprophylaxis after an exposure to influenza virus. Oseltamivir and zanamivir are the only antiviral medications currently recommended for use in the United States. Resistance to oseltamivir or zanamivir remains rare. Amantadine or rimantidine should not be used for the treatment or prevention of influenza in the United States until evidence of susceptibility to these antiviral medications has been reestablished among circulating influenza A viruses.

Education

Advise the patients that if they develop dyspnea, hemoptysis, wheezing, purulent sputum, fever persisting more than 7 days, dark urine, or severe muscle pain or tenderness, prompt medical attention is needed. Encourage bedrest. Return to full activity should be delayed until symptoms are gone. Supportive measures, including increased nutrition, are important, and symptoms should be managed as previously discussed with combination products.

Influenza Vaccine

Lower post-vaccination anti-influenza antibody concentrations have been reported among certain older persons compared with younger adults. A randomized trial among non-institutionalized persons aged >60 years reported a vaccine efficacy of 58% against influenza respiratory illness but indicated that efficacy might be lower among those aged >70 years. Among elderly persons not living in nursing homes or similar chronic-care facilities, influenza vaccine is 30%-70% effective in preventing hospitalization for pneumonia and influenza. Influenza vaccination reduces the frequency of secondary complications and reduces the risk for influenza-related hospitalization and death among adults aged ≥ 65 years with and without high-risk medical conditions (e.g., heart disease and diabetes). Influenza vaccine effectiveness in preventing medically attended acute respiratory illness among the elderly in nursing homes has been estimated at 20%-40%, but vaccination can be as much as 80% effective in preventing influenza-related death. Elderly persons typically have a diminished immune response to influenza vaccination compared with young healthy adults, suggesting that immunity might be of shorter duration and less likely to extend to a second season. Infections among the vaccinated elderly might be related to an age-related reduction in ability to respond to vaccination rather than reduced duration of immunity.

For maximum protection, patients should receive the vaccine between the beginning of October and mid-November. However, the vaccine should be administered at any time there are symptoms in the community. People age 65 and older should also receive the pneumonia vaccine every 5 years. Both vaccines may be given at the same time without increasing the risk of vaccine side effects. Elderly people and certain patients with chronic disease may develop lower post-vaccination titers and remain susceptible to infection. Vaccinated individuals develop antibody titers that are protective against illnesses caused by strains similar to those in the vaccine. Related variants may emerge during outbreak periods. Individuals who are allergic to eggs should never be vaccinated. Individuals who have an acute illness with fever should not be vaccinated until the illness has subsided.

Common Cold

The common cold is a minor infection of the nose and throat that causes symptoms that last from a few days to a few weeks. There are five different families of viruses that cause colds. Rhinoviruses are the etiologic agent in 25%-30% of colds, with seasonal peaks in the early fall and mid to late spring. Nearly 100 strains of rhinovirus have been found to date. Coronaviruses account for another 10%-15% of annual colds, with a seasonal peak in midwinter. Multiple cases occur in family, work, and school settings. The virus is commonly spread via hand-to-hand contact and infrequently via droplet infection. Infectious material can survive on the hand for as long as 4 hours. Adults average two to four colds per year.

When taking the history ask the patient about the presence of facial, ear, throat, or chest pain, the number and seasonal patterns of colds for the previous year, exposure to others with similar symptoms. Drug or environmental allergies, current medications, including over-the-counter drugs should be noted.

Symptoms

Symptoms develop 1 to 3 days after the virus enters the body. Illness is characterized by one or more of the following symptoms: general malaise, low-grade or no fever, nasal discharge, obstruction, or congestion. There also may be sneezing, coughing, sore throat, and hoarseness. Also the conjunctivae may be watery and inflamed. Patients can readily make the correct diagnosis of the common cold. The challenge for health care providers is to identify patients with complicating secondary bacterial sinusitis and otitis media, for whom antibiotic therapy will be beneficial.

Physical Examination

Check vital signs. Physical examination should include the pharynx, nasal cavity, ears, and sinuses. Watery red eyes and clear nasal discharge may be the only objective signs unless bacterial infection complicates the clinical picture.

Diagnostic Tests

Consider CBC with differential if bacterial infection is suspected. Generally, diagnostic tests are not indicated.

Treatment

Treatment is entirely symptomatic. Give acetaminophen or NSAIDs for aches and fever. Use combination products with decongestants, such as pseudoephedrine or phenylephrine, for congestion, cough, and nasal discharge. However, caution is recommended when using decongestants in hypertensive patients. Do not use nasal sprays for more than 3 days to decrease the chance of rebound nasal congestion. Other medications that can be used are antihistamines such as diphenhydramine, chlorpheniramine, and clemastine, and cough suppressants such as dextromethorphan. Advise patients about the side effects of all these drugs.

Education

Supportive measures are important, including increased nutrition and symptom management. Because transmission of colds occurs chiefly by physical contact, it is reasonable to counsel patients, and those around them, that transmission can be minimized by handwashing, reduced finger-to-nose contact, and reduced exposure to the cold sufferer. The prophylactic and therapeutic properties of large doses of vitamin C have been examined in a number of trials, and no consistent beneficial effect has been found.

Sinusitis

Sinusitis is inflammation of the mucosal lining of the paranasal sinuses, which leads to stasis, obstruction, and subsequent infection. Factors that may induce a response include allergens and environmental irritants such as nicotine or other air pollutants. The sinuses are air-filled bony cavities that produce and drain up to 2 pints of mucus every day. Self-cleaning occurs by movement of the mucus, propelled by cilia, through the ostia, which are located behind the turbinates. Acute sinusitis is a bacterial infection of one or more paranasal sinuses, which occurs when the normal drainage is impaired because of blockage of one or more ostia. Up to 10% of cases of acute sinusitis are extensions of dental abscess. Nursing home or homebound patients with nasogastric tubes occasionally have occult sinusitis as a cause of persistent fever.

Sinusitis is subdivided by duration into acute sinusitis, with symptoms lasting up to 3 weeks; subacute sinusitis, with symptoms lasting from 3 weeks to 3 months; and chronic sinusitis, with symptoms occurring longer than 3 months. Allergy is the most common underlying cause of chronic sinusitis. Colds are the most common cause of acute sinusitis.

When obtaining a history ask the patient about recent URI, allergies, recent swimming or diving, history of nasal polyps, dental abscesses, adenoidal hypertrophy, foreign body, and immune deficiency.

Symptoms of Acute Sinusitis

Dull pain over maxillary sinuses that becomes throbbing pain in later stages, fever, congestion, green nasal discharge, postnasal drip, cough, fatigue, congested ears or nose unresponsive to oral decongestants, headache, toothache, or facial fullness. Coughing, dependency, and percussion over the involved sinus exacerbate the pain. And there may be early morning periorbital swelling.

Symptoms of Chronic Sinusitis

There may be nasal discharge, nasal congestion, or cough lasting more than 30 days. The hallmark sign is dull ache or pressure across midface or headache. There may be thick postnasal drip, popping ears, eye pain, halitosis, and fatigue.

Physical Examination

Check vital signs. The examination should include the pharynx, nose, and ears. Auscultate the heart and lungs.

Diagnostic Tests

Radiologic examination of the sinuses is not necessary in patients with typical signs and symptoms. Acute sinusitis can be treated without culture. Nasopharyngeal swabs are usually contaminated with normal flora and are of no use. Consider CBC with differential if patient exhibits constitutional signs.

Treatment

If an acute infection is present, treatment with antibiotics is used. For treatment of chronic sinusitis, the same antibiotics are used although extended for a total of 3 to 4 weeks. Topical decongestants, oral decongestants, and topical corticosteroids can be used. Nasal sinus irrigation with saline solution can relieve congestion. Pain relief is important, and codeine may be required.

Education

Instruct patient to return for further evaluation if symptoms are not improved within 48 hours. Increase fluids intake. Steam inhalation and warm compresses may relieve pressure. Avoid allergens and excessively dry heat. Avoid swimming and diving during acute sinusitis. Avoid the use of antihistamines, which slow the movements of secretions out of the sinuses. Encourage smoking cessation. Avoid air travel during an acute phase. Tender periorbital swelling, associated with proptosis (downward or outward displacement of the eyes) and chemosis (scleral edema), represent orbital cellulitis and require immediate referral to an EENT specialist.

Allergic Rhinitis

Allergic rhinitis, the most common of all allergic disorders, is inflammation of the mucous membranes of the nose, usually accompanied by edema of the nasal mucosa and nasal discharge. It is estimated that 17% of Americans suffer from acute and chronic conditions generally considered to be allergic in origin. Allergic rhinitis alone accounts for 7% of common allergic conditions in the general population. The majority of office visits to health care providers are for conditions known to be mediated by antibodies of the immunoglobulin E (IgE) class or for conditions that resemble IgE-mediated allergy. The most common form of allergic rhinitis is seasonal and caused by ragweed pollen. The perennial form of allergic rhinitis occurs year round and is usually related to house dust mites, mold, cockroaches, and animal dander. This form of rhinitis is more difficult to diagnose and treat. The onset of symptoms is most common between the ages of 10 and 20 and rarely begins before age 4 or after age 40.

Atrophic or geriatric rhinitis is a perennial non-allergic rhinitis resulting from progressive degeneration and atrophy of nasal mucous membranes and bones of the nose.

When taking the patient's history as the age of onset of symptoms, recent use of nasal decongestants, history of allergies, history of nasal polyps or deviated septum and seasonal versus perennial symptoms.

Symptoms

Triad of symptoms is nasal congestion, sneezing, and clear rhinorrhea. Cough, sore throat, pruritic, edematous eyelids, and obstructed airflow.

Physical Examination

Check vital signs. Palpate lymph nodes. Assess allergic shiners or dark discoloration beneath both eyes. Verify that nasal mucosa is pale and boggy, with thin, clear secretions. Turbinates are enlarged, and the edematous membranes may be difficult to differentiate from nasal polyps, which may resemble peeled green grapes in the nasal cavity. There is cobblestone appearance of conjunctiva due to concurrent allergic conjunctivitis. There is transverse nasal crease due to chronic upward wiping of the nose. Tonsils and adenoids are enlarged. Speech is nasal speech or breathing is through the mouth. Examine heart and lungs.

Treatment

Antihistamines or H1-receptor antagonists are the primary sources of symptomatic relief. It may be necessary to try several antihistamines before an effective one is found. Also, it may be necessary to switch medications occasionally to avoid tolerance. Oral decongestants, topical corticosteroids, and nasal sinus irrigation with saline solution may be used.

Environmental Control and Avoidance Measures

Avoid exposure to tobacco smoke and allergens to which patients are sensitive. Avoid pets. If pets cannot be removed from the home, have designated pet-free living areas. Close bedroom doors, use air filters, and remove carpets or upholstery from pet-free areas. Avoid exertion when pollution levels are high. Avoid foods and beverages containing known allergy triggers. Mattresses and pillows should be encased in allergen-free cases. Sheets and blankets should be washed weekly in water hotter than 140° F. Consider allergy testing and immunotherapy when the connection between symptoms and exposure to allergens is unavoidable. Skin testing or in vitro testing may also be considered when patients are perennially exposed to indoor allergens. Reduce humidity in the home. Stay inside with closed doors and windows while running the air conditioner during times of peak pollen exposure.

Summary

Age-related changes in the respiratory system are significant, as are the number of potential acute and chronic diseases of the lungs and airways. The practitioner must be able to distinguish between acute, self-limiting, life-threatening, and chronic lung diseases and to treat each appropriately to minimize discomfort and loss of function. It is

important to know the risk factors for lung disease so that prevention and appropriate screening can be started early. This point is important whether the concern is COPD, cancer of the lung, or infectious concerns.

References

1. Primary Care of the Older Adult: A Multidisciplinary Approach. Contributors: Mary M. Burke - author, Joy A. Laramie - author. Publisher: Mosby. Place of Publication: St. Louis, MO. Publication Year: 2000
2. American Lung Association www.lungusa.org
3. New York Online Access to Health (NOAH), COPD Website, <http://www.noah.cuny.edu>
4. National Coalition for Adult Immunization, <http://www.nfid.org/ncai>
5. Abramowicz M, editor: Sparfloxacin and levofloxacin, *Med Lett Drugs Ther* 39:41-43, 1997.
6. American Lung Association: Guidelines for the prevention and treatment of influenza and the common cold for the general public, Atlanta, 1997, the Association.
7. American Thoracic Society: Guidelines for the initial management of adults with community acquired pneumonia: diagnosis, assessment of severity, and initial antimicrobial therapy, *American Review of Respiratory Disease* 148:1418-1426, 1993.
8. Barker LR, Burton JR, Zieve PD: Ambulatory medicine, ed 4, Baltimore, 1995, Williams & Wilkins.
9. Burke MM, Walsh MB: Gerontologic nursing: wholistic care of the older adult, ed 2, St Louis, 1997, Mosby.
10. Fischbach F: A manual of laboratory & diagnostic tests, ed 4, Philadelphia, 1992, JB Lippincott.
11. French M: Pneumonia in the elderly, *Adv Nurse Pract* 3:40-44, 1995.
12. Miller CA: Nursing care of older adults: theory and practice, ed 2, Philadelphia, 1995, JB Lippincott.
13. Richman E: Asthma diagnosis and management: new severity classifications and therapy alternatives, *Clin Rev* 7:76-112, 1997.
14. Stanley M, Beare PG: Gerontological nursing, Philadelphia, 1995, FA Davis.
15. Uphold CR, Graham MV: Clinical guidelines in adult health, Gainesville, Fla, 1994, Barmarrae.
16. US Department of Health and Human Services: The clinician's handbook of preventive services, McLean, VA, 1994, International Medical.
17. US Department of Health and Human Services: Core curriculum on tuberculosis: what every clinician should know, ed 3, Atlanta, 1999, Centers for Disease Control and Prevention.
18. Witta KM: COPD in the elderly: controlling symptoms and improving quality of life, *Adv Nurse Pract* 5:18-27, 72, 1997.