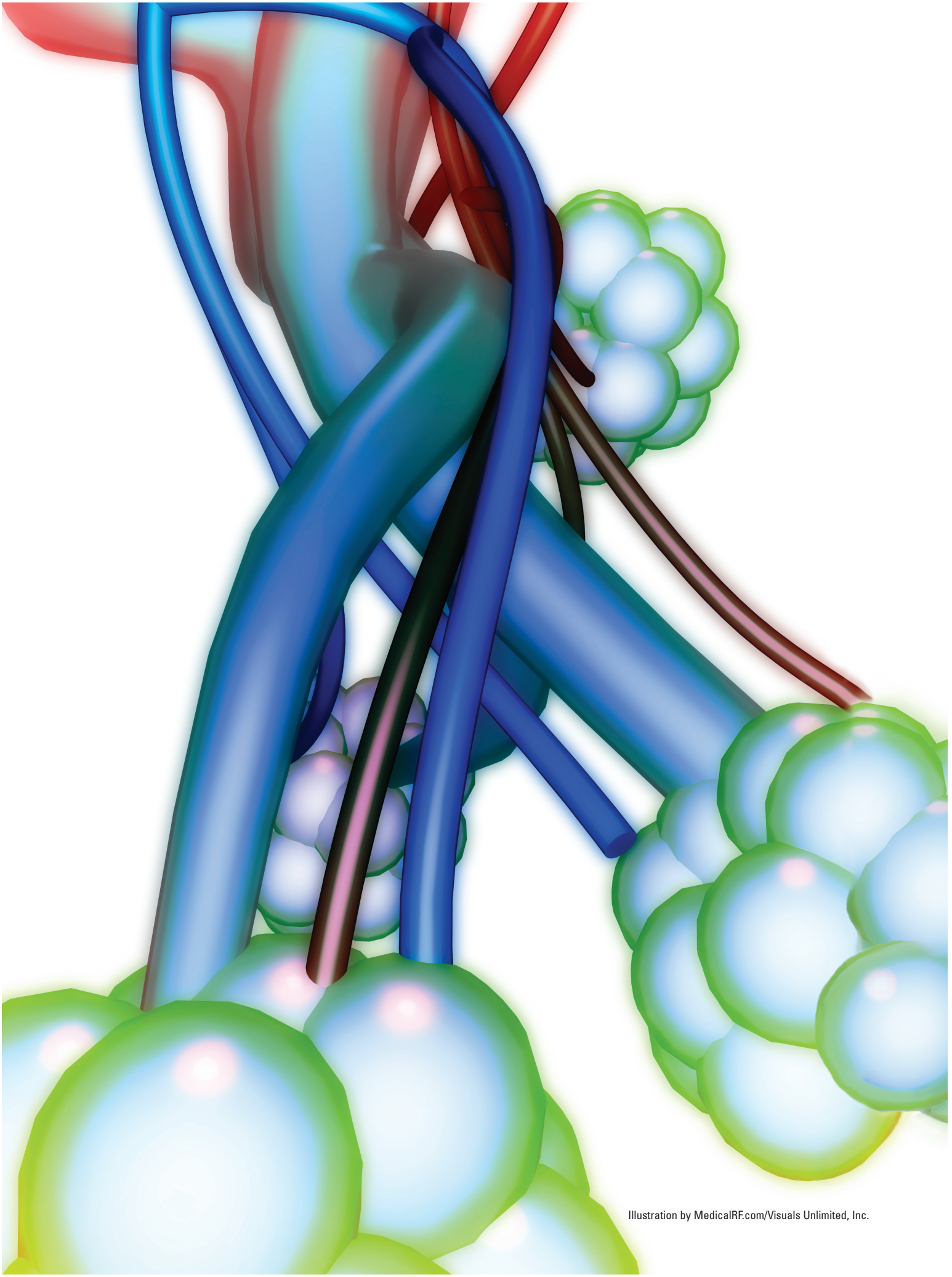

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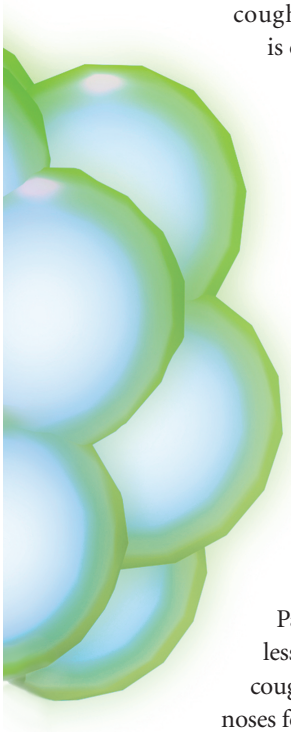
CE 2.5 CONTACT HOURS Rx 1.0 PHARMACOLOGY

Treatment strategies for cough illnesses in adults

By Ann Marie Hart, PhD, FNP-BC

Bronchitis is a symptomatic clinical condition caused by inflammation of the bronchi (see *Anatomy of the lung*). In recent years, the term "cough illness" has begun to replace bronchitis, with the exception of acute bronchitis associated with viral respiratory infections and chronic bronchitis associated with chronic obstructive pulmonary disease. There is also a growing trend to discontinue the term "acute bronchitis" and replace it with acute cough illness or chest cold as acute bronchitis is often associated with patient expectations for antibiotics.[1,2]



Cough illness can be further classified into acute, subacute, and chronic conditions, depending on the duration, with acute cough illnesses lasting less than 3 weeks, subacute cough illnesses lasting between 3 and 8 weeks, and chronic illnesses lasting longer than 8 weeks.[3] NPs in primary care settings often encounter patients with all types of cough illnesses, including acute, subacute, and chronic conditions;[4,5] however, the diagnosis and management of chronic cough illnesses are beyond the scope of this article.

Acute cough illness

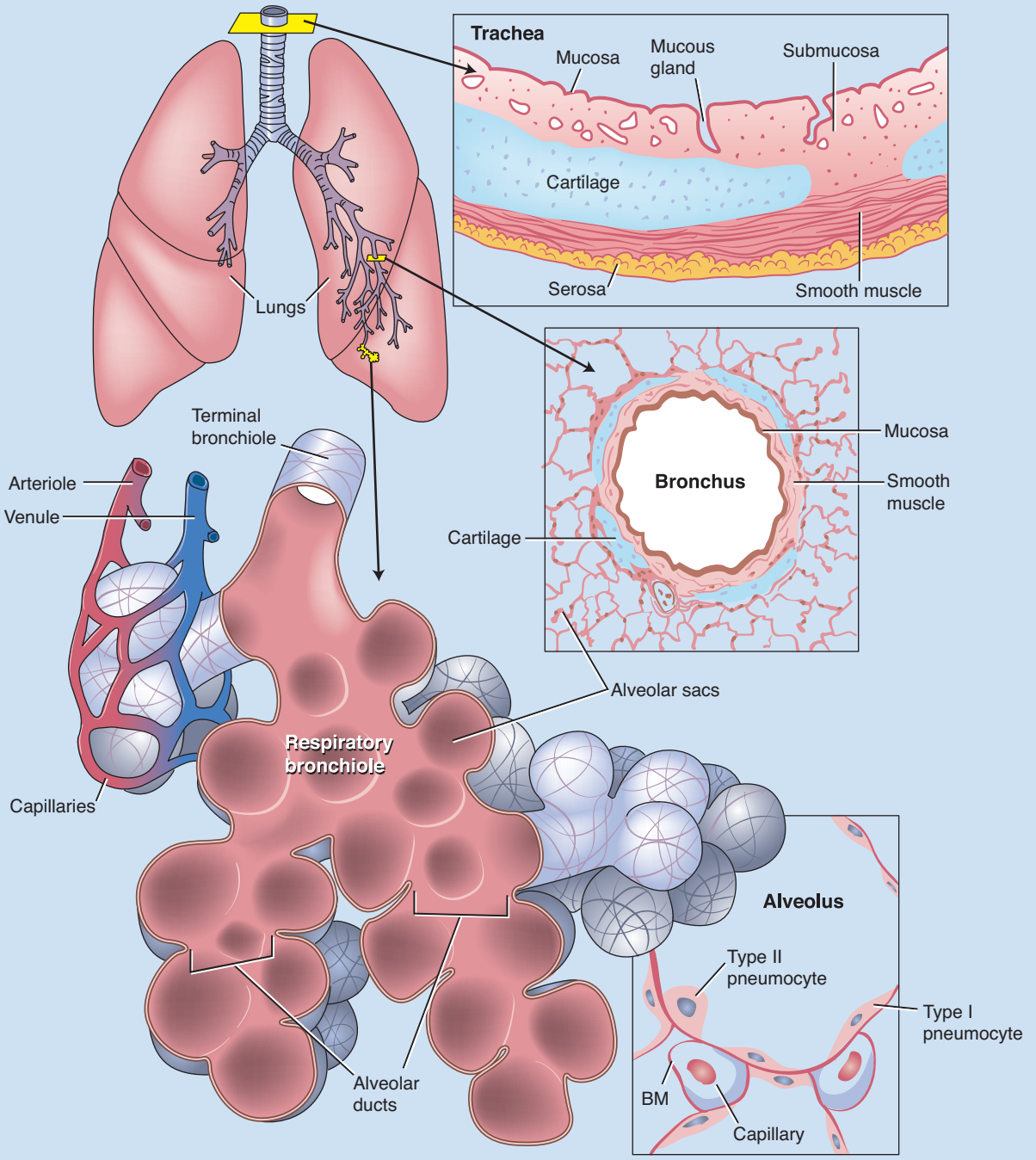
Patients presenting with a history of cough for less than 3 weeks should be evaluated for an acute cough illness. The most common differential diagnoses for acute cough illness include acute bronchitis, pneumonia, asthma, gastroesophageal reflux disease (GERD), angiotensin-converting enzyme (ACE) inhibitor-induced cough, infection with *Bordetella pertussis*, and upper airway cough syndrome (UACS).[3]

Acute bronchitis, or chest cold, is characterized by self-limited inflammation of the bronchi. Clinically, acute bronchitis presents with a cough and occasionally wheezing. The patient may also present with other respiratory symptoms such as rhinitis or pharyngitis; however, cough is always the predominant symptom. Purulent sputum production is common, but cannot be used to distinguish between bacterial and viral etiologies.[1,6] As with most acute respiratory infections, the etiology of acute bronchitis is usually viral, including influenza A and B, parainfluenza, coronavirus, rhinovirus, and respiratory syncytial virus. Bacterial etiologies are rare and include *Mycoplasma pneumoniae*, *Chlamydophila pneumoniae*, and *B. pertussis*. Complications from acute bronchitis are uncommon and occur most often with influenza or *B. pertussis*.[1]

The clinical diagnosis of acute bronchitis is based on exclusionary history and physical exam findings to eliminate the possibility of other acute illnesses (pneumonia and *B. pertussis* infections are the most critical to exclude). The main symptom reported by the patient is a productive or nonproductive cough, but patients may also experience wheezing, runny nose, or sore throat. The presence of fever, paroxysmal cough; pleuritic chest pain; nausea, vomiting, or diarrhea; or a subjective sense of shortness of breath may indicate a viral etiology and the diagnosis of pneumonia or infection with *B. pertussis*.[6]

There is no set of physical exam findings that is diagnostic for acute bronchitis. The physical exam in patients may be completely normal or may demonstrate low-grade fever (less than 101° F, [38.3° C]), mild lymphadenopathy,

Anatomy of the lung



BM = basement membrane

Source: Rubin R, Strayer D, eds. *Rubin's Pathology: Clinicopathologic Foundations of Medicine.* 5th ed. Philadelphia, PA: Wolters Kluwer/Lippincott Williams & Wilkins; 2008: 485.

runny nose, and other general signs of a respiratory infection. It is important to rule out the diagnosis of *B. pertussis* or pneumonia. Key findings that point toward the diagnosis of pneumonia include a temperature greater than 100.4° F (38° C), tachypnea (respiratory rate over 24 breaths/minute), tachycardia (heart rate over 100 beats/minute), and signs of consolidation on lung exam, such as crackles on auscultation, dullness to percussion, egophony, or fremitus.[3]

Summary of diagnostic considerations and management options for acute and subacute cough illnesses in adults

Illness	Diagnostic considerations	Management options
Acute bronchitis	• History of respiratory infection • Cough predominant symptom ± Bronchospasm ± Purulent sputum production ± Low-grade fever (less than 100.4° F) • Heart rate (less than 100 beats/min) and respiratory rate (less than 24 breaths/min) • Lung exam without signs of consolidation[6]	• Supportive • Antibiotics not helpful[19-21] • Dextromethorphan or codeine[6] • NSAIDs[17] • Honey[15] • Beta$_2$-agonists if wheezing[16]
UACS	• Subjective sensation of liquid in throat • Frequent throat clearing ± Cobblestone appearance to pharynx ± Presence of secretions in pharynx[22]	• Target treatment to specific etiology[22] • Antihistamine-decongestant combinations[23] • Ipratroprium nasal spray, nasal antihistamine, or glucocorticoid[24]
Postinfectious cough	• History of symptoms for more than 3 weeks after experiencing an acute respiratory infection[25] • Rule out other causes before making diagnosis[26]	• Inhaled ipratroprium[26] • Inhaled corticosteroid • Short course of oral corticosteroid[25]
Cough variant asthma	• May show reversible airway obstruction with spirometry • May show hyperresponsiveness with inhaled methacholine • Diagnosis based on response to treatment[27]	• Inhaled corticosteroids • Intermittent inhaled bronchodilators[27]
GERD-related cough	• May report heartburn and regurgitation • 75% don't have GI symptoms[29] • Diagnosis based on response to treatment[28]	• Acid suppression (such as proton pump inhibitor, H_2 receptor antagonist) • Lifestyle changes (for example, elevate head of bed, avoid eating 2 hours before retiring)[28]
ACE inhibitor-induced cough	• Occurs among 5%–35% of individuals taking ACE inhibitors • May occur within hours to months after starting ACE inhibitor therapy[30]	• Discontinue ACE inhibitor and consider angiotensin II receptor blocker • If not appropriate to discontinue ACE inhibitor, several pharmacologic agents can be tried (see article)[30] Repeat trial of same or different ACE inhibitor after discontinuation[7]
CAP	• Diagnosis based on history, physical exam, and chest X-ray (CXR) findings • Usual symptoms: cough, fever, pleuritic chest pain, difficulty breathing, and sputum production • Less common symptoms: nausea, vomiting, diarrhea, and mental status changes[9] • CAP more likely when cough is associated with fever (over 100° F [37.8° C]), tachycardia (over 100/min), and crackles on lung exam[10] • Obtain CXR when CAP is suspected. If negative but suspicion is high, repeat CXR in 24-48 h[39]	• See IDSA/ATS consensus guidelines[39]
B. pertussis infection	• Consider *B. pertussis* with history of cough for 2 weeks or more with paroxysmal coughing, posttussive vomiting, and/or an inspiratory whoop[25] • If coughing 2–4 weeks, obtain serum for antipertussis toxin IgG and nasopharygeal swab for *B. pertussis* PCR testing • If coughing over 4 weeks, only obtain serologic specimen for antipertussis toxin IgG[34]	Preferred treatment: erythromycin, azithromycin or clarithromycin Alternate treatment: Bactrim DS[38]

Cough may be acute or subacute in patients with pneumonia. Pneumonia is an infection of the lung parenchyma and is categorized into three groups according to where the patient may have acquired the infection: community-acquired pneumonia (CAP); hospital-acquired pneumonia; and healthcare-associated pneumonia, which refers to long-term care facilities, dialysis centers, surgery centers, and outpatient clinics.[7, 8] Although all types of pneumonia are considered serious and potentially fatal, CAP is routinely seen in primary care settings.

Adults with CAP typically present with cough, fever, pleuritic chest pain, difficulty breathing, and sputum production. Less common symptoms include nausea, vomiting, diarrhea, and mental status changes.[8] However, the diagnosis of CAP is not always straightforward. Chest X-ray is considered an "imperfect gold standard," yet is neither 100% sensitive or specific for CAP when compared with computed tomography and microbiological testing.[9] In particular, dehydration can result in chest X-rays that appear normal; however, repeat chest X-rays were later found to be consistent with CAP when patients were adequately hydrated.[10,11] A diagnosis of CAP should not be based on chest X-ray findings alone and should include history and physical exam findings.

In a systematic review regarding the diagnosis of CAP, one study found that in adult patients with normal vital signs, no single patient history item or physical exam finding could distinguish between CAP and other illnesses.[9] If the population is fairly healthy with a 5% baseline prevalence of CAP, a combination of four history and physical exam findings (cough, fever, tachycardia, crackles) increased the probability of a CAP diagnosis from 1% to 13% compared with individuals who only presented with cough from 18% to 42% for the combination of four items. In addition, assuming a sicker population of adult patients with 10% baseline CAP prevalence, the combination of cough, fever, tachycardia, and crackles on lung exam raised the likelihood of CAP diagnosis from 32% to 62%.

Given the lack of a highly sensitive and specific tool for the diagnosis of CAP, NPs should consider the consensus guidelines endorsed by the Infectious Diseases Society of America and the American Thoracic Society (IDSA/ATS).[12] These guidelines recommend that practitioners base the diagnosis on the presence of specific symptoms and physical exam findings, as well as the presence of an infiltrate on chest X-ray. The symptoms suggestive of CAP include cough, fever, sputum production, and pleuritic chest pain. The guidelines also recommend a repeat chest X-ray in 24 to 48 hours for patients who appear more toxic but initially have a normal chest X-ray.

Management of acute bronchitis

Patients diagnosed with acute bronchitis should understand that symptoms may last up to 3 weeks. They should seek care if symptoms do persist longer than that time period or are associated with high fever (101° F [38.3° C] or greater), shortness of breath, or difficulty breathing.

Unfortunately, studies regarding symptom management for acute bronchitis are relatively few. The management of patients with acute bronchitis is mainly supportive. Antitussive agents, such as dextromethorphan and codeine may be useful for short-term relief;[6] however, there are no research data that support the use of expectorants or mucolytics.[13]

In a small, randomized controlled trial of adults with experimentally induced rhinovirus, naproxen (Aleve, Anaprox) was superior to placebo in reducing cough.[14] Similar studies have not been reported for acute bronchitis or with other nonsteroidal anti-inflammatory drugs (NSAIDs). Interestingly, a small dose of buckwheat honey (half to two teaspoons depending on patient age) was shown to be more effective than dextromethorphan for cough control in a small study involving children between 2 and 18 years with respiratory infections.[15] Although no similar study has been reported with adults, a small dose (15 mL or less) of honey might be a reasonable option.

In addition, a Cochrane review regarding the use of $beta_2$-agonists (such as albuterol) for acute bronchitis demonstrated that $beta_2$-agonists were ineffective for acute bronchitis, unless airflow obstruction and wheezing were present.[16] Although patients who receive a diagnosis of acute bronchitis are treated with antibiotics between 59% and 97% of the time, multiple studies have shown that patients diagnosed with acute bronchitis receive no benefit from these drugs.[17-21] Practitioner use of the term chest cold instead of acute bronchitis may help decrease patients' desire for antibiotics[1,2] (see *Patient teaching tips to reduce antibiotic use*).

Subacute cough illnesses

Patients who present with a history of cough for more than 3 to 8 weeks should be evaluated for a subacute cough illness. The most common differential diagnoses for subacute cough illnesses include UACS, postinfectious cough, cough variant asthma, gastroesophageal or laryngpharyngeal reflux, pneumonia, *B. pertussis*, and ACE-inhibitor induced cough.[3]

UACS, previously known as postnasal drip syndrome, is the most common cause of a prolonged cough and is due to the presence of postnasal secretions in the posterior pharynx. These secretions may result from any form of rhinitis, nasopharyngitis, or rhinosinusitis, regardless of the underlying etiology, which can include allergy; presence of bacteria,

virus, or vasomotor rhinitis; or pregnancy. When secretions enter the upper airway, cough is induced by stimulation of cough receptors within the laryngeal mucosa. Common symptoms of postnasal drip include nasal discharge, a sensation of liquid in the throat, and frequent throat clearing. However, postnasal drip may be present without these symptoms, thus its absence does not exclude the possibility of UACS. Patients with postnasal drip may have a cobblestone appearance to their nasopharyngeal mucosa or the presence of secretions in the nasopharynx. However, there are no definitive criteria for the diagnosis of UACS, and, ultimately, the response to treatment validates the diagnosis. When an alternative specific cause for a subacute cough is not apparent, empiric therapy for postnasal drip should be attempted before pursuing an extensive diagnostic work-up for other etiologies.[22]

Whenever possible, the treatment for UACS should target the specific underlying etiology.[22] Nonspecific treatments include antihistamine-decongestant combinations using an older, nonprescription but sedating antihistamine (diphenhydramine [Benadryl]) or a newer, nonsedating agent (loratadine [Claritin], fexofenadine [Allegra]). However, the older, sedating antihistamines are often more effective than newer agents in treating cough secondary to the common cold.[23] Other treatments may include ipratropium bromide nasal spray, a nasal antihistamine, or a nasal glucocorticoid.[24]

Postinfectious cough should be considered in patients who complain of a persistent cough 3 or more weeks (but not more than 8 weeks) after experiencing symptoms of an acute respiratory infection when other symptoms have resolved. The etiology of postinfectious cough is from an extensive disruption of the epithelial integrity and widespread inflammation of the upper or lower airways.[25] The diagnosis of postinfectious cough should only be given when other causes, such as asthma, CAP, sinusitis, *B. pertussis*, or reflux, have been ruled out. The optimal treatment for postinfectious cough has not been determined; however, inhaled ipratropium may be of benefit.[26] If inhaled ipratropium is ineffective, an inhaled corticosteroid or a moderate dose of an oral corticosteroid for a defined period of time (prednisone 30 to 40 mg daily for 5 days) may be helpful.[25]

Cough variant asthma may only have one predominant symptom: the cough. Typical asthma presents with wheezing, dyspnea, and cough. Ideally, asthma is diagnosed from the presence of reversible airway obstruction on spirometry, or hyperresponsiveness on a bronchoprovocation test with inhaled methacholine. However, these tests may be normal in a patient with cough variant asthma and even abnormal test results cannot be used to diagnose cough variant asthma definitively. A definitive diagnosis of cough variant asthma should be reserved for someone whose cough responds to asthma treatment (inhaled corticosteroids with intermittent inhaled bronchodilators on an as-needed basis).[27] Asthma is one of the most common causes of prolonged cough in nonsmoking adults.[28]

Patient teaching tips to reduce antibiotic use

- Inform the patient that antibiotic use increases the risk of an antibiotic resistant infection.
- Identify and validate patient concerns about antibiotic therapy.
- Recommend specific therapy for management of symptoms.
- Respond to the patient's questions and concerns and offer a contingency plan if symptoms worsen.
- Provide patient education materials on antibiotic resistance. Contact your local health department for patient education materials or refer the patient to the CDC website, *Get Smart Know When Antibiotics Work,* at: http://www.cdc.gov/getsmart/antibiotic-use/anitbiotic-resistance-faqs.html.

Source: CDC. Acute cough illness (acute bronchitis). http://www.cdc.gov/getsmart/campaign-materials/info-sheets/adult-acute-cough-illness.pdf.

GERD is a common and challenging cause of prolonged cough and is believed to stem from stimulation of the esophageal-bronchial reflex. GERD should be strongly suspected in patients with a history of a cough for more than 3 weeks who also report heartburn and regurgitation; these individuals should be given a trial of acid suppression therapy (proton pump inhibitor).[28] However, 75% of the time, GERD-related cough occurs without gastrointestinal (GI) symptoms, thus the absence of them does not rule out GERD as a potential cause.[29] There are no diagnostic tests to positively identify a GERD-related cough, thus the American College of Chest Physicians recommends that GERD-related cough be strongly considered in individuals with prolonged cough, who have a normal chest radiograph, are not taking ACE-inhibitors, do not smoke, have no exposure to environmental irritants, and have had other differential diagnoses ruled out (asthma, sinusitis, or UACS). For individuals suspected of having GERD-related cough, a trial of empiric GERD treatment should be considered (such as dietary and lifestyle changes, a proton pump inhibitor, or H_2 receptor antagonist), however, it may take 2 to 3 months for improvement of symptoms, and the failure to see improvement with GERD treatment does not necessarily rule out GERD-related cough.[29]

ACE inhibitor-induced cough may occur in 5% to 35% of individuals who take ACE inhibitors. This prolonged cough is a well-known adverse reaction of the drug, and it is thought that ACE inhibitors cause cough by degrading protussive mediators, bradykinin, and substance P, which then accumulate

in the upper respiratory tract and lung. The timing of the occurrence varies considerably—some report a cough within a few hours of the first ACE inhibitor dose, and others report a cough several months after initiating ACE inhibitor treatment. Discontinuation of the ACE inhibitor is the most effective way to treat this cough; however, cough resolution may take from 1 to 4 weeks, and it can linger for up to 3 months. The angiotensin II receptor blockers have not been shown to cause cough and might be an option for patients who experience ACE inhibitor-induced cough.

For those who require an ACE inhibitor regimen, pharmacologic therapy with sodium cromoglycate, theophylline, sulindac (Clinoril), indomethacin (Indocin), amlodipine (Norvasc), nifedipine (Procardia), ferrous sulfate, or picotamide (not available in the United States) may help with cough suppression.[30] One small study demonstrated that 30% of individuals who experienced an ACE inhibitor-induced cough from lisinopril (Prinivil) did not experience cough when exposed to the drug a third time, thus a repeat of ACE inhibitor therapy either with the same or different ACE inhibitor might be reasonable.[7]

B. pertussis (whooping cough) is a highly contagious, bacterial microorganism spread by respiratory droplets. *B. pertussis* has been on the rise in adolescents and adults for the last 20 years primarily due to waning immunity that occurs 5 to 10 years after completion of the childhood vaccination series.[31] Complications of *B. pertussis* infection in adults from paroxysmal coughing are rare but serious and include rib fracture, hernia, back pain, and incontinence. In addition, *B. pertussis* infection may lead to angina symptoms in patients with underlying coronary artery disease.[32,33]

B. pertussis occurs in three phases. The initial or catarrhal phase lasts 7 to 10 days with symptoms such as runny nose, teary eyes, conjunctival injection, malaise, low-grade fever, sneezing, and a mild cough. The second or paroxysmal phase lasts between 1 and 6 weeks and is associated with numerous attacks of paroxysmal coughing, which are typically worse at night.[34] Immediately following these paroxysmal coughing episodes, there may be a long inspiratory gasp followed by a high-pitched "whoop" (about 20% to 50% of adults and adolescents experience a whoop).[31,35-37] The third or convalescent phase is a gradual decrease in paroxysmal coughing over a few weeks, with the average duration of coughing typically lasting around 7 weeks.[31,34]

The American College of Chest Physicians recommends that adults who experience a cough for 2 or more weeks along with paroxysmal coughing, posttussive vomiting, or an inspiratory whooping sound with no other likely etiology for the cough (such as asthma) should be evaluated and tested for *B. pertussis* infection.[25] Specific testing recommendations are based on cough duration. If cough has been present for 2 to 4 weeks, obtain both a serologic specimen for antipertussis toxin immunoglobulin G (IgG) and a nasopharyngeal swab for a polymerase chain reaction *B. pertussis* test. If the cough has been present for more than 4 weeks, obtain only a single serologic specimen for antipertussis toxin IgG.[34]

Patients with suspected or confirmed *B. pertussis* infection should be treated with a macrolide antibiotic (azithromycin, clarithromycin, or erythromycin) or trimethoprim/sulfamethoxazole (Bactrim) if a macrolide antibiotic is contraindicated.[38] A macrolide antibiotic is recommended for close contacts of those diagnosed with *B. pertussis* infection, as long as there are no contraindications. In addition, all cases of confirmed pertussis should be reported to officials at the applicable state health departments, who will then assist with tracing and identifying those who should receive prophylactic treatment.[25,34] NP

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Treatment strategies for cough illnesses in adults

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