Uncomplicated Acute Bronchitis

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Acute bronchitis is an acute cough illness in otherwise healthy adults that usually lasts 1 to 3 weeks. This review describes the pathophysiology of the condition and provides a practical approach to the evaluation and treatment of adults with uncomplicated acute bronchitis. Practical points to be made are:

1. Respiratory viruses appear to cause the large majority of cases of uncomplicated acute bronchitis.

2. Pertussis infection is present in up to 10% to 20% of adults with cough illness of more than 2 to 3 weeks' duration. No clinical features distinguish pertussis from nonpertussis infection in adults who were immunized against pertussis as children.

3. Transient bronchial hyperresponsiveness appears to be the predominant mechanism of the bothersome cough of acute bronchitis.

4. Ruling out pneumonia is the primary objective in evaluating adults with acute cough illness in whom comorbid conditions and occult asthma are absent or unlikely. In the absence of abnormalities in vital signs (heart rate > 100 beats/min, respiratory rate > 24 breaths/min, and oral body temperature > 38 °C), the likelihood of pneumonia is very low.

5. Randomized, placebo-controlled trials do not support routine antibiotic treatment of uncomplicated acute bronchitis.

6. Randomized, placebo-controlled trials have shown that inhaled albuterol decreases the duration of cough in adults with uncomplicated acute bronchitis.

7. Intervention studies suggest that antibiotic treatment of acute bronchitis can be reduced by using a combination of patient and physician education. Decreased rates of antibiotic treatment are not associated with increased utilization, return visits, or dissatisfaction with care.

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The most frequent reason that persons in the U.S. visit ambulatory care physicians is "cough," after "general medical examination" and "progress visit." Bronchitis ("acute" or "not otherwise specified") is the most frequent diagnosis given to these patients (1). In 1997, an estimated 30 million ambulatory visits for cough led to more than 12 million diagnoses of bronchitis. For most of these illnesses, acute bronchitis is the most accurate diagnosis. It applies to otherwise healthy adults with an acute respiratory illness lasting 1 to 3 weeks with cough as the prominent feature and in whom pneumonia has been excluded. Throughout the developed world, the diagnosis of acute bronchitis has become synonymous with antibiotic treatment. On average, 70% to 90% of office visits for acute bronchitis result in treatment with antibiotics. Yet, evidence-based reviews and meta-analyses of randomized, controlled trials conclude that routine antibiotic treatment does not provide major clinical benefit in adults with acute bronchitis. Lack of antibiotic treatment benefit should be expected because most cases of acute bronchitis have a viral cause.

With the goal of improving the management of and curbing excess antibiotic use in adults with acute bronchitis, we describe recent developments in the pathophysiology, evaluation, and treatment of uncomplicated acute bronchitis and discuss the impact of efforts to reduce prescription of antibiotics for this illness.

METHODS

A substantial portion of the literature review, analysis, and interpretation for this review was done during development of "Principles of Appropriate Antibiotic Use for Adults with Acute Respiratory Tract Infections," a project supported in part by the Centers for Disease Control and Prevention. This paper provides a more expansive review of acute bronchitis in adults than do the Principles, which are intended primarily to be used as practice recommendations. The funding source had no role in collection, analysis, or interpretation of data or in the decision to submit this paper for publication.

Studies of diagnosis, etiology, and treatment of acute bronchitis were retrieved from MEDLINE by using Medical Subject Heading and keyword searches for *cough, bronchitis,* and *acute respiratory infection*. Studies dated back to 1966 and were limited to those done in adult humans. Bibliographies from appropriate articles and textbook chapters on acute bronchitis were also searched for relevant studies. Studies identified from formal literature reviews in recently published meta-analyses of antibiotic treatment of acute bronchitis formed the basis for reviewing the efficacy of antibiotic treat-

ment. Etiologic studies used to estimate incidence or prevalence of bacterial infections were excluded if they were conducted during known outbreaks or epidemics of that pathogen (for example, *Chlamydia pneumoniae* outbreaks in university settings) or in hospitalized persons, those referred to specialists for care, or those with chronic lung disease.

PATHOPHYSIOLOGY

Definition

The taxonomy currently used for diagnosis of acute respiratory infections is based primarily on the anatomic correlate of the predominant clinical feature of the illness (2). Hence, acute bronchitis is the acute or subacute onset of a cough illness lasting less than 2 to 3 weeks, with or without phlegm production, that is frequently accompanied by other upper respiratory tract and constitutional symptoms (2, 3). It has been proposed that cough persisting longer than 3 weeks be referred to as "persistent" or "chronic" cough but not "chronic bronchitis," since this term has been defined by the American Thoracic Society to refer to patients with daily cough and sputum production for at least 3 months, for 2 consecutive years, and in the absence of any other disease that might account for daily productive cough (4). Diagnostic considerations in adults with persistent cough differ greatly from those in adults with a cough illness lasting less than 3 weeks. Postnasal drip, asthma, and gastroesophageal reflux disease account for more than 75% of cases in adults with cough lasting at least 3 weeks and a negative chest radiograph (5).

This review focuses on uncomplicated acute bronchitis, as opposed to acute bronchitis in patients with underlying lung or heart disease, immunosuppression, or bacterial superinfection. Acute bronchitis in patients with documented emphysema or chronic bronchitis, for example, is usually considered a distinct clinical entity (acute exacerbation of chronic bronchitis) with unique etiologic and treatment issues. Because patients with heart disease (particularly congestive heart failure) or immunosuppression have been routinely excluded from pathophysiology and treatment studies of acute bronchitis, the generalizability of the findings to patients with these comorbid conditions is unknown. Bacterial superinfection after an acute viral respiratory infection (such as bacterial pneumonia or sepsis, particularly with influenza infection) should be considered when patients with acute bronchitis develop clinical signs of pneumonia. However, this complication is very uncommon in otherwise healthy adults. In a large study of pneumonia and influenza-associated deaths during influenza epidemics, 95% of deaths occurred in adults with a chronic medical condition (mostly chronic heart and lung disease), and 68% occurred in adults older than 65 years of age (6).

Etiology

Respiratory viruses, particularly influenza, appear to cause the large majority of cases of uncomplicated acute bronchitis in which an agent is identified by means of culture, antibody serology, or polymerase chain reaction (7–11). "No isolated pathogen" is also a frequent finding; it probably represents viral infections for which studies did not perform appropriate analyses. Under selected circumstances, noninfectious causes of uncomplicated acute bronchitis, such as cough-variant asthma or allergic or occupational exposures, should also be considered. The viruses most frequently associated with uncomplicated acute bronchitis are those that produce primarily lower respiratory tract disease (influenza B, influenza A, parainfluenza, and respiratory syncytial virus) and those that more commonly produce upper respiratory tract symptoms (coronavirus, adenovirus, and rhinoviruses).

Increased attention has been given to respiratory syncytial virus as a cause of uncomplicated acute bronchitis in adults, particularly elderly persons. Infection with respiratory syncytial virus among exposed adults is common (with attack rates approaching 50%), particularly in households with children infected with respiratory syncytial virus and in institutional settings (12). Most young and middle-aged adults infected with respiratory syncytial virus develop asymptomatic or mildly symptomatic disease, including bronchitis, although respiratory syncytial virus can be associated with more severe clinical disease in otherwise healthy adults.

In contrast to young adults, respiratory syncytial virus infection in elderly persons (age $>$ 60 years) more frequently leads to symptomatic lower respiratory tract disease. For example, a report of an outbreak of respiratory syncytial virus on a geriatrics ward found that 96% of persons reported intense coughing and fever, 64% developed a productive cough, and 40% had evidence of

bronchopneumonia (13). Whether bronchopneumonia was actually due to respiratory syncytial virus or to bacterial superinfection was not examined.

When microbiological studies are performed in unselected patients with uncomplicated acute bronchitis in nonoutbreak settings, fewer than 10% will have evidence of acute bacterial infection. To date, only *Bordetella pertussis, Mycoplasma pneumoniae*, and *Chlamydia pneumoniae* have been clearly established as causes of acute bronchitis. There is no evidence that *Streptococcus pneumoniae*, *Haemophilus influenzae*, or *Moraxella catarrhalis* cause acute bronchitis in adults without underlying lung disease; studies that found an association between these encapsulated bacteria and acute bronchitis failed to distinguish between colonization and acute infection (14). However, these bacteria are important causes of superinfections after acute viral respiratory illnesses (15).

The discovery that *C. pneumoniae* infection can cause acute bronchitis is relatively new (16). This discovery rejuvenated speculation that a bacterial pathogen, and therefore antibiotic treatment, may in fact play a significant role in uncomplicated acute bronchitis. Several reports of outbreaks of *C. pneumoniae* cited attack rates exceeding 50% among families (17, 18) and 25% among students (19). However, surveillance studies have reported a much lower range of incidence rates, reflecting the seasonal, geographic, and epidemic nature of *C. pneumoniae* infection (20–25).

Evidence that *B. pertussis* and *B. parapertussis* cause uncomplicated acute bronchitis in previously immunized adults is also fairly new. Although immunity after natural infection with pertussis appears to be lifelong (26), immunity conferred by childhood immunization begins to wane after as little as 3 years and is usually absent after 10 to 12 years. Attack rates as high as 100% have been reported among adult and adolescent household contacts of infected children (27). Infection in previously immunized adults appears to take a more benign course (28).

Mechanism of Disease Manifestations

Synthesis of the literature suggests that the clinical features of uncomplicated acute bronchitis develop in sequential phases. The acute phase of infection results from direct inoculation of the tracheobronchial epithelium by the infectious virus, leading to cytokine release and inflammatory cell activation. This phase is characterized by variable constitutional symptoms, such as fever, myalgias, and malaise, that last 1 to 5 days depending on the infectious agent. For example, uncomplicated acute bronchitis due to rhinovirus may present with little or no constitutional symptoms, whereas constitutional symptoms due to influenza or parainfluenza are often more severe and typically last 3 to 5 days.

The protracted phase of uncomplicated acute bronchitis results from hypersensitivity of the tracheobronchial epithelium and airway receptors (bronchial hyperresponsiveness). This phase is characterized primarily by cough, is often accompanied by phlegm production and wheezing, and usually lasts 1 to 3 weeks. Abnormalities on pulmonary function tests peak 1 or more weeks after infection and do not appear to be related to acute cytopathic effects of the infection or the type of infection (viral vs. bacterial) (24, 29–32). Respiratory epithelial cell function plays an important role in airway inflammation (33), and vagal-mediated airway hyperresponsiveness has been shown to coincide with repair of the bronchial epithelial surface. Other mechanisms of bronchial hyperresponsiveness may also be present, such as adrenergic–cholinergic tone imbalance and IgE-mediated histamine release.

Pulmonary function test findings consistent with bronchial hyperresponsiveness in uncomplicated acute bronchitis are common and usually transient (7, 32, 34). An FEV_1 less than 80% at the initial visit was present in 40% of adults from the midwestern United States with acute bronchitis and no history of underlying lung disease (34). Thirty-seven percent of similar adults in England had a positive histamine challenge test 6 weeks after diagnosis of uncomplicated acute bronchitis (7). Hallett and Jacobs (35) evaluated adults with recurrent acute bronchitis (defined as at least two similar episodes during the preceding 5 years) at the time of a current acute bronchitis illness by using spirometry and methacholine challenge. They found that 65% of these patients fulfilled criteria for reactive airways disease (35). On the basis of these studies, the true prevalence of bronchial hyperresponsiveness due to acute bronchitis is still not clear, since none accounted for baseline asymptomatic bronchial hyperresponsiveness (which has been reported to be as high as 28% among Dutch adolescents) (36).

It is safe to surmise that in most patients with uncomplicated acute bronchitis, bronchial hyperresponsiveness is related to the acute infection and will resolve spontaneously. This must be the case, given the contrast between the annual incidence of acute bronchitis (50 to 60 cases per 1000 person-years, based on office visits) (37) and the annual incidence of adult-onset asthma (1 to 5 cases per 1000 person-years) (38). Nonetheless, it has been speculated that in a small fraction of patients, uncomplicated acute bronchitis may predispose or lead to chronic asthma. One study reported that patients with lower respiratory tract disease and positive *C. pneumoniae* titers ($n = 20$; 80% with diagnosis of bronchitis) were more likely to receive a diagnosis of asthmatic bronchitis and asthma during 6 months of follow-up (24). Large prospective studies are needed to firmly establish or reject a causal link between uncomplicated acute bronchitis and asthma and to identify specific risk factors (such as microbial infection, atopic history, or sex) for development of subsequent asthma.

Clinical Presentation and Evaluation

Uncomplicated acute bronchitis is usually distinguished from other acute upper respiratory tract infections on the basis of the predominance of cough and accompanying clinical features, such as phlegm production and wheezing (2, 3, 39). Although undiagnosed asthma is a consideration in patients presenting with an acute cough illness, this diagnosis is difficult to establish because many patients with acute bronchitis have transient bronchial hyperresponsiveness and abnormal spirometry results. The diagnosis of cough-variant asthma is reserved for patients with persistent cough (>2 to 3 weeks' duration), lack of wheezing, and, usually, normal results on pulmonary function tests (40, 41). Cough-variant asthma should be suspected in adults with cough that is worse at night or that develops after exposure to cold or exercise; the diagnosis relies on improvement in pulmonary function test results with bronchodilator treatment or a positive methacholine challenge test. Therefore, in the absence of profound airflow obstruction, suspicion and work-up for cough-variant or previously undiagnosed asthma should be reserved for patients with cough lasting longer than 3 weeks, (5).

Excluding pneumonia is the primary objective in evaluating adults with acute cough illness when comorbid conditions and occult asthma are absent or unlikely. Four prospective studies (1966 to 1995) (42–45) evaluated the accuracy of patient history and physical examination findings in diagnosing radiographic pneumonia in adults with acute respiratory illness. In a validation study by an independent group of investigators, the specificity (67%) but not the sensitivity (75%) of these rules for detecting radiographic pneumonia exceeded that of physician judgment (specificity, 58%; sensitivity, about 75%) (46). The authors of a recent evidence- and quality-based review (47) concluded that lack of abnormalities in vital signs (heart rate > 100 beats/min, respiratory rate > 24 breaths/min, and oral body temperature > 38 °C) and chest examination (focal consolidation, such as rales, egophony, or fremitus) sufficiently reduces the likelihood of pneumonia so that further diagnostic testing is usually not necessary.

Although all of the studies on which this recommendation is based included elderly persons and patients with chronic lung disease, a high index of suspicion for pneumonia is still prudent in such persons, given the increased likelihood of atypical manifestation of disease (48, 49). Conversely, when one of these findings is present, the decision to proceed to radiography must take into account specific patient and environmental characteristics. For example, when vital sign abnormalities are detected in the absence of chest auscultatory findings, chest radiography may not be indicated in patients with other clinical features suggestive of viral illness (such as influenza, parainfluenza, or respiratory syncytial virus), particularly during documented outbreaks of influenza or other viral infections. Alternatively, during influenza season, vital sign abnormalities may indicate bacterial superinfection (such as pneumonia or sepsis), particularly among elderly adults with comorbid conditions.

Purulence of secretions is frequently cited as a reason for prescribing antibiotics for acute cough illness. However, multiple studies have shown that purulence of secretions is a poor predictor of bacterial infection. With regard to acute bronchitis, a single study found that purulent sputum was weakly associated with radiographic pneumonia (relative risk for pneumonia, 2.0 [CIs not reported]; $P = 0.05$) on bivariate analysis and was not associated with pneumonia in the multivariate model. In addition, purulent sputum was present in 65% of patients with pneumonia but also in 48% of

those without pneumonia. Since the prevalence of pneumonia in the ambulatory setting is only about 5% among adults with suspected acute bronchitis, 9 out of 10 patients with purulent phlegm will *not* have pneumonia.

Several groups from Europe have promoted measurement of serum C-reactive protein levels to help exclude bacterial infection and pneumonia in adults with acute bronchitis (11, 50–52). C-reactive protein is an acute-phase reactant primarily synthesized by the liver (53, 54), and levels of C-reactive protein increase acutely during serious bacterial infections. With the notable exceptions of adenovirus and Epstein–Barr virus, most viral infections are not associated with increases in C-reactive protein levels. Inflammatory diseases, such as rheumatoid arthritis, tissue trauma, burns, and malignant tumors, have also been shown to stimulate C-reactive protein production; elevated levels must therefore be interpreted on a patient-by-patient basis. Most studies to date demonstrate high sensitivity (80% to 100%) but only moderate specificity (60% to 70%) for elevated C-reactive protein levels in distinguishing bacterial pneumonia (11, 50, 55–57). Compared with clinician judgment and the decision rules described above, use of C-reactive protein levels does not seem advantageous in deciding which patients should undergo chest radiography to rule out pneumonia. However, further study of whether adults with uncomplicated acute bronchitis and elevated C-reactive protein levels have worse clinical outcomes or benefit from antibiotic treatment might yield useful findings.

Although this review focuses on acute bronchitis defined as a cough illness lasting less than 3 weeks, it is prudent to mention that *B. pertussis* infection should be considered in adults with prolonged cough. Up to 20% of adults with prolonged or persistent cough show serologic evidence of infection with *B. pertussis* (average duration of cough, 4 to 6 weeks). Except for a history of exposure to someone infected with pertussis, no clinical features seem to distinguish pertussis from nonpertussis infection in adults with prolonged cough. Adults with and those without pertussis did not differ in duration of cough or frequency of paroxysmal cough, nocturnal cough, sputum production, history of fever, history of upper respiratory tract infection before the cough illness, leukocyte count, or lymphocyte count (58). This is primarily because the clinical syndrome of *B. pertussis* infection in previously immunized adults (which represents most adults born in the United States) does not include the classic features of whooping cough and posttussive emesis seen during primary infection in children (58). Appropriate diagnostic tests (culture or polymerase chain reaction), in consultation with the local public health department, should be performed in all patients with suspected pertussis.

With the unusual exception of suspected pertussis, no further evaluation is indicated in adults with the clinical diagnosis of uncomplicated acute bronchitis.

TREATMENT

Antimicrobial Treatment

Antibiotics

Because uncomplicated acute bronchitis is primarily a viral illness, it should not be surprising that nine randomized, placebo-controlled trials conducted in the past 25 years have failed to support a role for antibiotic treatment in uncomplicated acute bronchitis (59–67). By the mid-1990s, published reviews of randomized, placebo-controlled trials (68, 69) had concluded that routine antibiotic treatment of acute bronchitis does not consistently reduce duration or severity of illness. Since then, three meta-analyses have yielded conflicting results but similar conclusions (70–72). These meta-analyses are plagued by the lack of uniformity in outcome measures in each of the randomized, placebo-controlled trials and by inclusion of poor-quality studies.

In the meta-analysis by Smucny and colleagues (71), the mean duration of cough was calculated to be 6.3 days in the antibiotic-treated group and 7.2 days in the placebo group; the weighted-mean difference between groups was not statistically significant (−0.94 day [95% CI, −2.1 to 0.2 day]). However, when cough was treated as a dichotomous variable (proportion of patients with cough at the 7- to 10-day follow-up visit), the groups differed significantly (relative risk, 0.69 [CI, 0.49 to 0.98]). Bent and associates (72) transformed heterogenous outcome measures to calculate a "standardized summary effect size"; they reported that antibiotics decreased cough and sputum duration by 0.5 day over a 7-day period. Fahey and coworkers (70) excluded three trials that had been included in the previous meta-analyses on the basis of poor quality (66) or lack of information on loss to follow-up (64, 67). They reported no

benefit of antibiotic treatment on duration of cough. All three meta-analyses reported no impact of antibiotic treatment on duration of illness, limitation of activities, or loss of work, and all concluded that routine antibiotic treatment in adults with acute bronchitis is not justified. Consistent with (and before) these conclusions, the U.S. Food and Drug Administration also reviewed the literature on "secondary bacterial infections of acute bronchitis" (that is, acute bronchitis) and concluded that future randomized, placebo-controlled trials of antibiotic treatment for uncomplicated acute bronchitis are not warranted.

Several epidemiologic biases that apply to this literature bias in favor of finding an apparent treatment benefit. Published placebo-controlled trials sponsored by pharmaceutical companies are lacking, although they are likely to have been performed (publication bias), especially in light of the tremendous potential market for antibiotic treatment for these conditions. Second, misclassification bias may have occurred, since most randomized, placebo-controlled trials did not perform chest radiography in all patients and enrollment of even a small number of persons with pneumonia would favor an apparent benefit of antibiotic treatment. One can expect that up to 5% of patients in whom acute bronchitis is diagnosed on clinical grounds will have radiographic evidence of pneumonia, even though no significant morbidity was associated with the placebo groups of the trials. In an intervention study in which antibiotic treatment of uncomplicated acute bronchitis was decreased by 50%, rates of pneumonia did not increase (73). Third, the chances of unmasking during randomized, placebo-controlled trials (in which patients figure out which treatment group they have been assigned to) is increased by the well-known gastrointestinal side effects of macrolides. For example, in one study, 26% of erythromycin-treated patients reported gastrointestinal upset, compared with 5% of placebo recipients (60). This phenomenon would bias in favor of an apparent antibiotic benefit mediated through a placebo effect. No randomized, placebo-controlled trial reported what proportion of patients could predict whether they were given study drug or placebo, as has been recommended for high-quality randomized, placebo-controlled trials (74).

The one uncommon circumstance in which antibiotic treatment of uncomplicated acute bronchitis is appropriate is suspicion of pertussis. As discussed above, no reliable clinical features distinguish pertussis from nonpertussis infection in adults with prolonged cough illness. Therefore, it is prudent to reserve antibiotic treatment for adults who report exposure to a person with documented or suspicious pertussis or for those with acute bronchitis during a documented pertussis epidemic. Appropriate diagnostic testing should be performed before initiating empirical antibiotic treatment. Because adult pertussis most typically comes to medical attention after the illness has been present for a prolonged period, antibiotic treatment is recommended primarily to decrease shedding of the pathogen and spread of disease and is unlikely to alter the clinical course of the illness (27, 75, 76).

Influenza

Because influenza is the most common pathogen isolated in patients with uncomplicated acute bronchitis, it is worthwhile to discuss recent advances in influenza diagnosis and therapy. Although amantadine and rimantadine have been available for over 30 years (77, 78), the recent development and direct-to-consumer marketing of neuraminidase inhibitor therapy have generated renewed public and physician interest in pharmacologic treatment of influenza. A Cochrane-sponsored systematic review of neuraminidase inhibitors in prophylaxis and treatment of influenza in healthy adults was recently performed (79). Both inhaled (zanamivir) and oral formulations of neuraminidase inhibitors have demonstrated efficacy in preventing and reducing illness duration in adults with naturally acquired influenza A and B (80–84). The major clinical advantage of neuraminidase inhibitor therapy is its activity against both influenza A and influenza B; in contrast, amantadine and rimantadine have activity against influenza A only, which causes about 70% of influenza cases in most years. A 5-day course of any of these agents appears to have similar impact on influenzal illness: about 1 day shorter duration of illness and about one-half day quicker return to normal activities. On the basis of the Cochrane review calculations, adverse effects of rimantadine (which occur in about 32% of patients) occur only slightly more frequently than with oral neuraminidase inhibitor therapy (about 24% of patients) or placebo (about 19% of patients). The adverse effects of rimantadine primarily affect the central nervous system,

whereas those of neuraminidase inhibitor are primarily gastrointestinal.

Because therapy with neuraminidase inhibitors, amantadine, or rimantadine must be initiated within 48 hours (preferably less than 30 hours) of symptom onset to be effective, rapid diagnosis is required. During documented influenza outbreaks, the positive predictive value of clinical diagnosis appears to be good and precludes use of rapid diagnostic tests. The Management of Influenza in the Southern Hemisphere Trialists Study Group, which evaluated neuraminidase treatment of community-acquired influenza, reported that clinical suspicion (not otherwise defined) of influenza was correct approximately 70% of the time during documented influenza outbreaks (84). The sensitivity of rapid influenza tests reported in industry-sponsored studies is 65% to 80%.

Symptomatic Treatment

Bronchodilators

In contrast to findings of randomized, placebo-controlled trials evaluating the benefit of antibiotic therapy for uncomplicated acute bronchitis, three randomized, controlled trials of the efficacy of bronchodilator treatment in uncomplicated acute bronchitis demonstrated a consistent benefit of treatment. One study randomly assigned 34 adults with productive cough lasting less than 30 days to oral albuterol or oral erythromycin, both given as syrup (85). The investigators observed fewer patients with productive cough at 7 days in the albuterol group than the erythromycin group (41% and 82%, respectively; $P < 0.001$) but no change in return to work or daily activities. The same investigators conducted a placebo-controlled trial of inhaled albuterol in 46 adults; they again found statistically significant improvement in the proportion of patients with cough at 7 days in the albuterol group compared with the placebo group (61% and 91%, respectively; $P = 0.02$) (86). The benefit of albuterol treatment persisted after adjustment for lung examination abnormalities at the initial office visit, smoking status, and antibiotic treatment. Melbye and colleagues (87) compared inhaled fenoterol and placebo in 80 adults presenting with acute bronchitis. They observed a clinically significant increase in mean FEV_1 among adults assigned to fenoterol treatment (5.1%) but not those assigned to placebo (0.5%). In that trial, fenoterol-treated patients with bronchial hyperresponsiveness, wheezes on auscultation, or an FEV_1 less than 80% demonstrated improved total symptom scores compared with placebo-treated patients. Patients with normal lung findings at the initial office visit did not improve with fenoterol treatment.

Therefore, consistent data support bronchodilator (β-agonist) treatment to reduce the duration of cough in adults with uncomplicated acute bronchitis. Until more studies are conducted, reserving β-agonist treatment for patients with troublesome cough and evidence of bronchial hyperresponsiveness seems prudent. Although not formally studied in adults with acute bronchitis, use of an aerochamber for maximizing delivery of inhaled medication is supported by evidence from studies in patients with chronic obstructive airways disease and should be considered when inhaled medication are prescribed for acute bronchitis. Whether anticholinergic bronchodilator treatment is effective in patients with acute bronchitis is not known. No studies have been published on inhaled corticosteroid therapy, although the delay in onset of action of this therapy (usually 1 to 2 weeks) precludes finding a major benefit for uncomplicated acute bronchitis.

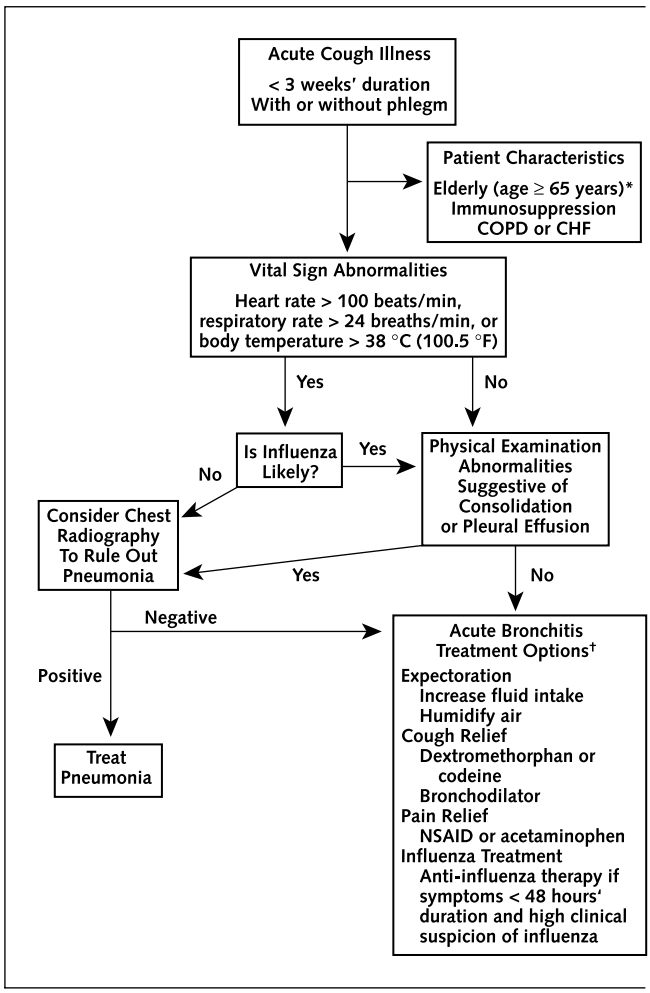
Antitussive Agents

The literature on antitussive treatments is problematic because efficacy of these agents appears to depend on the cause of the cough. Acute or early cough due to colds or other viral upper respiratory tract infections does not appear to respond to dextromethorphan or codeine, whereas chronic cough (>3 weeks' duration), cough associated with underlying lung disease, or experimentally induced cough appears to respond to these two agents. For patients with uncomplicated acute bronchitis (for whom the average duration of cough is 2 to 3 weeks), cough preparations containing dextromethorphan or codeine probably have a modest effect on cough severity and duration during the protracted phase of illness.

Other Therapy

Although evidence from randomized, controlled trials is lacking, low-cost and low-risk actions, such as elimination of environmental cough triggers (for example, dust or dander) and vaporized air treatments (par-

Figure. **Proposed algorithm for evaluation and management of adults with acute cough illness.**



*Pneumonia in elderly persons, those with immunosuppression, and those with chronic obstructive pulmonary disease (*COPD*) or congestive heart failure (*CHF*) often presents atypically. A high index of suspicion is warranted when evaluating cough illness in these patients, even when vital signs and chest examination appear normal. †Consider pertussis treatment if the patient has known exposure to pertussis. Follow local health department testing guidelines; pending results, treat with erythromycin for 14 days. NSAID = nonsteroidal anti-inflammatory drug.

ticularly in environments with low humidity) are reasonable treatment options.

SUMMARY

The common practice of treating acute bronchitis with antibiotics undoubtedly emerged without clinical evidence of effectiveness and probably under the misconceptions that common bacteria cause bronchitis and that failure to treat with antibiotics might lead to more serious complications, such as pneumonia. These misconceptions emerged before the epidemic of antibiotic-resistant bacteria reached the medical and public consciousness. The evidence is indisputable that not prescribing antibiotics to patients with uncomplicated acute bronchitis is safe and does not result in excess morbidity. The results from a recent clinician and patient educational intervention should further empower physicians to refrain from prescribing antibiotics for uncomplicated acute bronchitis. In a practice setting in which the rate of antibiotic prescription for uncomplicated acute bronchitis was decreased by almost 50%, no associated increase was seen in return visits, duration of illness, or dissatisfaction with care (73). It is clearly time to vigorously attack and, it is hoped, stop this practice.

On the basis of the available evidence, the following practice recommendations can be made (**Figure**):

1. Vital signs should be measured in all patients with acute cough illness. In most otherwise healthy, nonelderly adults, normal vital signs and chest examination exclude pneumonia.

2. Routine antibiotic treatment of uncomplicated acute bronchitis is not recommended. Patients should be ensured adequate access to health care, with follow-up for those who do not get better. Patients should be instructed about what symptoms are suggestive of bacterial infection (such as new fever and shortness of breath), even though these complications are uncommon.

3. In patients who wheeze or have troublesome cough, inhaled bronchodilator therapy for 1 to 2 weeks should be considered.

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No greater opportunity, responsibility or obligation can fall to the lot of a human being than to become a physician. In the care of the suffering, he needs technical skill, scientific knowledge and human understanding. He who uses these with courage, with humility and with wisdom will provide a unique service for his fellow man and will build an enduring edifice of character within himself. The physician should ask of his destiny no more than this; he should be content with no less.

E.A. Stead Jr.
What This Patient Needs Is a Doctor
Durham, NC: Carolina Academic Pr; 1978:142

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