

## Review

# Management of Acute Bronchitis in Adults: Recent Trends and Practices

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### Abstract

Acute bronchitis is a transient upper respiratory tract inflammation. It is one of the most commonly occurring illnesses in ambulatory care and the most frequently encountered diagnosis by primary care physicians. It is a self-limiting disease however it encompasses a wide range of symptoms pertaining to upper respiratory tract that last for at least 2 to 3 weeks. Acute bronchitis does not have a treatment regime and the symptoms are managed conservatively. The purpose of this review is to discuss the management of acute bronchitis, current trends and practices in daily practice. A robust literature search was done on various electronic databases and a wide variety of studies were retrieved which included a multitude of small and large scale randomized clinical, placebo-controlled trials, systematic reviews and clinical practice guidelines were retrieved. Some of the commonly used medicines for symptomatic management of acute bronchitis are antitussive agents, protussive agents, bronchodilator therapy and alternative therapy. Clinical practice guidelines state there is no significant role of antibiotics in acute bronchitis as it does not improve or reduce the duration of symptoms in patients. Furthermore, it is associated with a wide array of adverse effects, antibiotic resistance and leads to inflated health care costs. Despite strict recommendations, antibiotics are highly prescribed by physicians for acute bronchitis based on patient factors such as protracted symptoms, diagnostic uncertainty, possibility of ensuing pneumonia and to meet patient expectations. Physicians should play a key role in educating patients about the course of the disease, raising their awareness on the timeline of symptoms, offer reassurance, informing them on the lack of added benefits of antibiotics and suggesting alternative therapies thereby reducing unwarranted prescriptions in the best interests of the patient.

**Keywords:** acute, bronchitis, management, trends, practice

## Introduction

Acute bronchitis (AB) is an upper respiratory illness characterized by inflammation of small and large airways and their lining (1-5). It is usually a self-limiting disease with symptoms lasting about 2 to 3 weeks (6). It is one of the most commonly presenting illnesses among outpatients and frequent reasons of visit to primary care physicians (2, 3, 6). AB occurs at a rate of 10-44 per 1000 adults per year (4, 5, 7) which equates to 10 million visits to the doctor per year to seek treatment for this respiratory illness (3, 4). It is the fifth most common diagnosis that presents to primary care physicians in Australia and the ninth most common illness in the United States (4, 8). AB can occur in all age groups but is most common in children below 3 to 5 years of age (9) and has a genetic predisposition for males more than females. There is no evidence of racial predilection however it occurs predominantly in populations belonging to lower socioeconomic strata and residing in urban or industrialized areas (10).

AB is most often caused by infectious agents of which most common are viruses; however, bacterial pathogens have been identified in up to 10% of cases of bronchitis (11, 12). Some of the common viruses causing AB are influenza virus A and B, respiratory syncytial virus, adenovirus and adenovirus, while some of the common bacterial pathogens identified are *Mycoplasma pneumoniae*, *Streptococcus pneumoniae*, *Bordetella pertussis* and *Moraxella catarrhalis* (4, 8). Besides known etiological factors, commonly identified triggers and risk factors for AB are dust, allergens, polluted air, and irritants such as smoke (3) Furthermore, seasons such as winter and fall also lead to a higher incidence of bronchitis as compared to spring and summer seasons, with 82% of cases occurring in autumn and winter (5, 8).

The pathophysiology of AB involves irritation of the bronchial epithelium secondary to an infection or a trigger thus causing acute inflammation of the bronchial cells with thickening of the bronchial mucosa, desquamation of the epithelium and scaffolding of basement membrane. The mucous membranes become hyperemic and edematous leading to diminished mucociliary function of the bronchioles. As a result, the air passages become blocked by debris causing further irritation causing airway hyperreactivity and copious mucus secretion causing manifestation of symptoms (5, 9, 10, 13).

The primary symptom of bronchitis is cough which manifests within 2 days of infection in 85% of patients, among whom coughing subsides within two weeks for most of the patients, and 26% are still coughing after 2 weeks, whereas in some coughing does not subside for up to 8 weeks (12). Coughing may continue for a minimum of 10-14 days with a median of 18 days (3, 5, 12, 14) and may or not be accompanied with mucus production and an inability to expectorate (11). Additional upper respiratory tract symptoms such as difficulty breathing, chest pain, sore throat, nasal stuffiness, rhinorrhea, and constitutional symptoms such as headache, fever and tachycardia also occur. (7, 14). On respiratory examination, rales, rhonchi wheezing and egophony can be heard during auscultation, which improve or disappear with coughing (11, 14). The characteristic diagnostic feature is a cough in the absence of pneumonia (2).

Although AB is a self-limiting disease, symptoms of protracted coughing can significantly impair vitality, quality of life and social functioning, leading to approximately 40% absenteeism from work and 30% absenteeism school (10, 14). They also incur inflated health care costs for patients and providers. The management for AB is symptomatic with the aim to alleviate symptoms and offer supportive therapy (3, 10). Therapy consists of a combination of pharmacological and non-pharmacological treatment options (4, 10). Pharmacotherapy consists of antibiotics, anti-tussive and pro-tussive agents, beta-2 agonist bronchodilator therapy and other alternatives (4, 10, 12). In this review we will discuss the management of acute bronchitis, current trends and practice in treatment.

## Methods

An elaborate search was conducted from electronic databases such as PubMed, Medline Embase, Google Scholar and Cochrane Library. A manual search for papers was further conducted through Google Scholar to avoid missing potential studies. Studies and randomized controlled trials only with adult subjects were included in our review. Literature published within the last 10 years and papers in the English language were included.

## Discussion

According to the American College of Chest Physicians, AB does not have a treatment regime and can only be managed symptomatically (4). Some of the commonly prescribed medicines are antibiotics, antitussives

therapy, protussive therapy,  $\beta$ -2 agonists, and other alternative medications to alleviate symptoms.

### Antibiotics

The efficacy and advantages of antibiotics in AB have been proven to be very limited and marginal with proven with more than four decades of clinical trials (15, 16). Higher antibiotic resistance, high risk of side effects, higher cumulative health care costs (11, 17) with insignificant or next to none improvement in patient symptoms and outcomes are not beneficial in the treatment of AB. Despite a wide body of evidence against antibiotics for the treatment of AB and educating both patients and physicians on the lack of benefits, use of antibiotics is widely practiced and a significant reduction in the level of unnecessary prescriptions is yet to be observed. (17).

Antibiotics are still known to be prescribed in up to 90% of the cases of AB, despite the causative pathogen being a virus in majority of the cases (4). Aguilar et al. reports that in 2011, 262.5 million prescriptions for antibiotics were written, of which Azithromycin was the most commonly prescribed antibiotic accounting for 54.1 million prescriptions (18). According to an exploratory study analyzing the pattern of antibiotic prescriptions in AB conducted in South Africa. Out of 166,821 patients with AB, antibiotics were prescribed to 52.9% patients. When comparing patterns of antibiotic prescription, the rate of antibiotic prescriptions was significantly higher in viral AB with 59.2% as compared to bacterial AB with 53.6% (19).

Such unrestricted antibiotic prescriptions are yielding no added or significant benefits to the patient's condition, or curtailing symptoms due to AB (4). Wenzel et al. reported a meta-analysis with 9 randomized clinical trials of patients with AB treated with antibiotics. The patient's receiving antibiotics experienced 0.58 lesser days in their cough and their feeling of illness, and only 0.52 days lesser in productive cough. Thus, it was evident that usage of antibiotics in AB was not statistically significant (5). A Cochrane review in 2004 of nine randomized clinical trials reported a statistically significant reduction in the duration of cough due to antibiotics, however, the risk of adverse effects due to antibiotics diminished the overall modest beneficial impact of the antibiotic treatment (4, 12). A multicenter, prospective randomized controlled trial by Llor et al. evaluated the efficacy of oral antibiotics in comparison to a placebo group in patients with AB. Patients were randomized into separate arms of the antibiotic

Amoxicillin-clavulanic acid and a placebo group. Patients' symptoms ranged from cough, discolored sputum, lower respiratory tract symptoms such as wheeze, dyspnea, chest tightness or chest pain. The results revealed that patients receiving Amoxicillin-clavulanic acid experienced symptoms of cough for the same number of days as the placebo group, wherein the antibiotic arm had cough for 11 days with a mean range of 10-12 days whereas the placebo group had symptoms of cough for 11 days with a mean range of 8 to 14 days and no statistically significant differences were observed in both groups. Therefore, it was evident that treatment with antibiotics was not more effective as compared to placebo for shortening the days or duration of cough or discolored sputum (2). In the event of AB due to bacterial pathogens such as *Streptococcus pneumoniae*, *Moraxella Catarrhalis* and *Hemophilus influenzae*, organisms are only isolated in 30% of the cases (4). Commonly prescribed antibiotics for AB are Amoxicillin, erythromycin, doxycycline, and trimethoprim-sulfamethoxazole, however due to ever increasing resistance, physicians are now transitioning to prescribing second and third generation cephalosporins or macrolides (4)

Certain patient factors also lead to higher antibiotic prescriptions (11, 20). A retrospective chart review by Morley et al. reported patients with examination findings such as rales, and rhonchi on auscultation, percussion abnormalities and involvement of cervical lymphadenopathy as these findings raise suspicion of pneumonia. Rales and percussion abnormalities raised antibiotic prescriptions to 13-fold whereas rhonchi raised antibiotic prescriptions to 5-fold (20). Furthermore, worsening of symptoms, prolonged duration of illness, male gender, history of smoking are also known to influence higher antibiotic prescriptions (11, 19, 20). Some of the factors that drive over prescription of antibiotics are diagnostic uncertainty (20), the highly variable symptoms of AB and difficulty in differentiation between uncomplicated bronchitis and pneumonia, societal expectations of patients due to consumer-centric pharmacotherapy thereby undermining physician autonomy and patient dissatisfaction on lack of prescribing antibiotics. When visiting the doctor, patients rely on antibiotics as a last resort after exhausting all pharmacological and non-pharmacological measures, as they are under the false impression that antibiotics are a quick solution to help them recover from their symptoms immediately (1, 17). These findings only reiterate our current knowledge of the role of antibiotics in AB and should be exercised

during daily practice to reduce unnecessary antibiotic prescriptions.

### ***Antitussive Therapy***

Cough is the cardinal symptom of AB (5) and treatment focuses on prevention or controlling the cough reflex with antitussive agents (4, 11, 12). Antitussives are a class of therapeutic agents that disrupt the coughing reflex (21). They are categorized into centrally acting opioids and peripherally acting agents (11). The American College of Chest Physicians recommend a brief course of antitussives in patients experiencing severe coughing due to AB to reduce their symptoms, especially if it is causing discomfort, provided that suppressing the cough reflex and inhibiting clearance of airway secretion does not pose a hazard or delay healing (4, 12). However there is lack of concrete scientific evidence of any beneficial effects, and existing trials have shown conflicting results with success rates ranging from 68-98% (4, 12). Some commonly prescribed antitussive agents are Codeine which is a centrally acting weak opioid prescribed in severe cough, however it has addictive properties (3, 4, 11) Dextromethorphan, a synthetic derivative of morphine acting centrally is prescribed in milder more persistent cough (4, 11). Kinkade et al. reported that three placebo controlled trials proved that 30 mg of dextromethorphan decreased the cough count from 19% to 36% ( $P < .05$ ) in comparison to placebo, which is equivalent to 8 to 10 fewer bouts of coughing per 30 minutes (11). Benzonatate is a peripherally acting antitussive that suppresses the cough reflex by anesthetizing respiratory stretch receptors. A study has shown that benzonatate has proven to be show significant improvement in combination with a protussive agent called Guaifenesin but not as the sole antitussive agent (11). Types of antitussives are selected on the symptoms associated with cough. An antihistamine syrup is prescribed for cough with allergic rhinitis, a decongestant or antihistamine syrup would for cough associated with postnasal drainage, and a bronchodilator cough syrup for cough associated due to an asthma exacerbation (12).

### ***Protussive Therapy***

Cough can also be treated by clearing secretions and mucus from the airway by encouraging the coughing reflex with protussive agents also known as expectorants (4, 11, 12). Guaifenesin is a commonly prescribed protussive agent, which stimulates respiratory tract secretions increasing volume of respiratory fluid and decreasing the viscosity of mucus (4, 11). As reported by

Kinkade et al. a Cochrane review including three trials of guaifenesin as compared to placebo showed some benefit. In one trial, guaifenesin proved to decrease cough frequency and intensity by 75% at 72 hours compared with 31% in the placebo group (number needed to treat = 2) among patients. In the second trial cough frequency decreased in 100% of the guaifenesin group as compared to 94% of the placebo group; ( $P = 0.5$ ) and an improvement in the severity of cough with 100% of the guaifenesin group as compared to 91% of the placebo group; ( $P = .2$ ) at 36 hours, and reduced sputum thickness with 96% of the guaifenesin group as compared to 54% of the placebo group; ( $P = .001$ ). Lastly, a third trial used an extended-release formulation of guaifenesin which showed an improvement in the severity of symptoms at day 4 but no difference at day 7 (4, 11). However, the overall clinical effectiveness of Guaifenesin towards AB is debatable as trials have failed to prove any beneficial effect in improving symptoms, in which the amount of Guaifenesin evaluated was only 100-mg, whereas physicians commonly prescribe Guaifenesin in preparations of 600-1200 mg (4, 12). Other randomized, double blinded, placebo-controlled trials have evaluated protussive therapies which have proven to be effective in improving cough symptoms, however the cough was due to other illnesses and not AB (12).

### ***Beta-2-agonist Bronchodilators***

Patients with AB may experience bronchospasm and wheezing on auscultation due to bronchial hyperresponsiveness (4). Thus, treatment with a bronchodilator can help improve symptoms of AB and wheezing. Few studies have shown promising results in patients with AB with improved outcomes such as decrease in cough and earlier return to work after treatment with bronchodilators (4). Tackett et al. reported four randomized clinical trials to examine the effects of bronchodilators in AB. A bronchodilator Albuterol in a liquid preparation was prescribed to patients having cough due to AB, in comparison to erythromycin in adults. Fewer patients had productive cough at 7 days in the Albuterol group in comparison to the erythromycin group ( $P < .001$ ) however no difference was observed in missed days of work or daily activities, and similar results were observed for a metered dose inhaler for albuterol (4, 12). On the contrary a study was conducted by Littenberg et al. in 104 adults with cough for a duration of less than 4 weeks on patients taking albuterol orally for 7 days as compared to placebo. The results showed no significant difference between patients

receiving the albuterol as compared to placebo in terms of efficacy, and there were significantly more adverse effects in the group receiving the bronchodilator (4). Melbye et al. compared inhaled fenoterol, a short-acting beta-2-agonist to a placebo group in 80 patients with AB. Patients that presented with bronchial hyperresponsiveness, wheezes on auscultation, or a forced expiratory volume in 1 second less than 80% noticed an improvement in symptoms after receiving fenoterol, as compared to the same patient group with placebo, whereas patients with normal lung findings at the beginning the study did not improve with treatment (4). However, like previous therapies, there is also a lack of consensus on the use of bronchodilators in patients with AB. The use of bronchodilators on acute cough secondary to AB have not been widely acknowledged. Studies suggest that there high-dose, episodic inhaled corticosteroids will offer benefits but low-dose, preventive therapy of corticosteroids are not beneficial (6). Smaller randomized controlled trials on beta agonists as a remedy for cough due to AB have mixed findings. A 2015 Cochrane review of 5 trials by Becker et al. has shown no significant benefits on patients experiencing cough, however a smaller subset of patients with wheezing and obstruction of airflow at baseline has been identified (3, 6). Furthermore, it has been elucidated that bronchodilators should be avoided in patients in the absence of an underlying lung disease, wheezing or airway obstruction. Nevertheless, beta-2-agonists have shown to be beneficial in patients that presented with wheezing at the time of evaluation without a previous established diagnosis of asthma or chronic obstructive pulmonary disease. Due to a limitation in supportive evidence, the side effects and risks of these medications should be carefully considered (11).

### **Alternative Therapy**

Nonpharmacological alternative therapies are now gaining wide popularity in patients with AB, especially after not gaining any significant relief or improvement in symptoms. Herbal medicine such as *Pelargonium sidoides*, *echinacea*, and Chinese medicine are being used by patients (6, 11). Randomized trials have evaluated pelargonium as a therapy for bronchitis and which has shown to have modest benefits, primarily in improvement of symptom (6, 11). In a randomized trial, patients taking pelargonium for bronchitis were able to return to work on an average of two days earlier than those taking placebo however the quality of evidence is considered low (6, 11). Dark honey is also a popular alternative treatment to relieve symptoms of bronchitis.

A Cochrane review has conducted trials comparing honey to antitussives- dextromethorphan, diphenhydramine and placebo (6, 11). The results showed honey was better than no treatment in decreasing the frequency and severity of cough and improving quality of sleep. However, treatment with honey highlights the effects on children and is a reasonable alternative to antitussives especially as they are not recommended in children younger than 4 years of age (6, 11). Nevertheless, studies of the effects of honey on improvement of symptoms in adults should also be conducted.

### **Conclusion**

Acute bronchitis is a very common self-resolving upper respiratory illness mostly caused by viral pathogens. There is no treatment regime for acute bronchitis and its management centers on supportive treatment. Antitussive agents, protussive agents and bronchodilator therapy are commonly used to relieve symptoms. Although the role of antibiotics in acute bronchitis is highly limited due to insignificant improvement in symptoms with the added disadvantage of adverse effects and antibiotic resistance, it is still highly prescribed by physicians. Unnecessary prescriptions should be avoided by educating patients to increase their awareness, guiding them to set realistic expectations with a timeline of symptoms before they begin to improve.

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Data that support the findings of this study are embedded within the manuscript.

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All authors contributed equally to the drafting, writing, sourcing, article screening and final proofreading of the manuscript.

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