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Acute bronchitis

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ABSTRACT

Acute bronchitis is a transient inflammation of the lower airways, most often caused by viral infections, and typically presents with a persistent cough lasting two to three weeks. This review outlines the main aspects of its etiology, clinical presentation, diagnosis, and treatment, while addressing current challenges in its management. Although most cases resolve without specific therapy, antibiotics continue to be widely prescribed despite limited supporting evidence. Environmental factors, particularly air pollution, are increasingly recognized as contributing to both the onset and severity of the condition. In immunocompetent adults, diagnosis is clinical and rarely requires additional testing. Management should focus on symptom relief—especially cough—while avoiding overmedication and unnecessary interventions. The prognosis is generally favorable, though cough may persist even after other symptoms have resolved. Overprescription of antibiotics and misdiagnosis of alternative conditions remain common issues, underlining the need for better adherence to clinical guidelines and patient education. Looking ahead, research should prioritize the development of more effective symptomatic treatments, especially for prolonged cough, and further explore the role of environmental exposures in disease pathogenesis.

Keywords: Acute bronchitis. Respiratory infections. Viral etiology. Antibiotic stewardship. Air pollution. Symptomatic treatment.

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INTRODUCTION

Acute bronchitis is an acute inflammation of the trachea and lower airways, typically caused by infection, that manifests primarily as cough and other symptoms and signs of lower respiratory tract infection such as sputum production, wheezing, dyspnoea and chest pain. It is characterized by the absence of underlying chronic respiratory diseases, which helps differentiate it from acute exacerbations of conditions such as asthma or chronic obstructive pulmonary disease (COPD)[1]. The whole process usually lasts for two to three weeks; persistence of symptoms beyond this timeframe should prompt further evaluation for alternative or underlying diagnoses[2].

Given that cough is the predominant symptom, acute bronchitis is one of the most frequent reasons for outpatient medical consultations, accounting for 5.97 million emergency department visits annually in the United States[3].

ETIOLOGY

The primary cause of acute bronchitis is viral infection (75%) compared to bacterial origin (26%). The most frequently implicated viruses include rhinovirus, enterovirus, influenza A and B, parainfluenza, coronavirus, metapneumovirus, and respiratory syncytial virus[4,5]. Among these, RSV has gained particular attention due to its association with severe lower respiratory tract infections. However, in most cases, RSV causes mild illnesses such as acute bronchitis. By the age of two, the majority of children (97%) have been infected. As a result, adults in close contact with young children are at higher risk of exposure. Seasonal outbreaks of RSV tipically coincide with those of influenza—peaking during the winter months, from November to February[6,7].

Since the COVID-19 pandemic in 2020, the SARS-CoV-2 virus has also become one of the endemic community-acquired pathogens causing respiratory infections. Its role in bronchial infections depends on the patient's immune status, which may lead to more severe conditions such as pneumonia[8].

Although less common, bacterial pathogens can also be involved. The most frequently isolated bacterium is *Streptococcus pneumoniae*, followed by *Haemophilus influenzae* and *Moraxella catarrhalis*[4]. Atypical bacteria, such as *Mycoplasma pneumoniae, Chlamydophila pneumoniae* and *Bordetella pertussis* are rare causes of acute bronchitis but may be relevant in specific clinical scenarios[5].

Air pollution

Air pollution is increasingly recognized as a critical global health issue, directly impacting human health and quality of life. Exposure to air pollutants has been implicated in triggering inflammatory responses[9], increasing the risk of acute upper and lower respiratory tract infections[10] and related with the severity of the disease[11]. Zhang et al.[12] assessed the relationship between air pollution and exacerbations in patients with chronic bronchitis, demonstrating a linear correlation between exposure to fine particulate matter (PM2.5 and PM10) and sulfur dioxide, and the frequency of exacerbations. In a subsequent

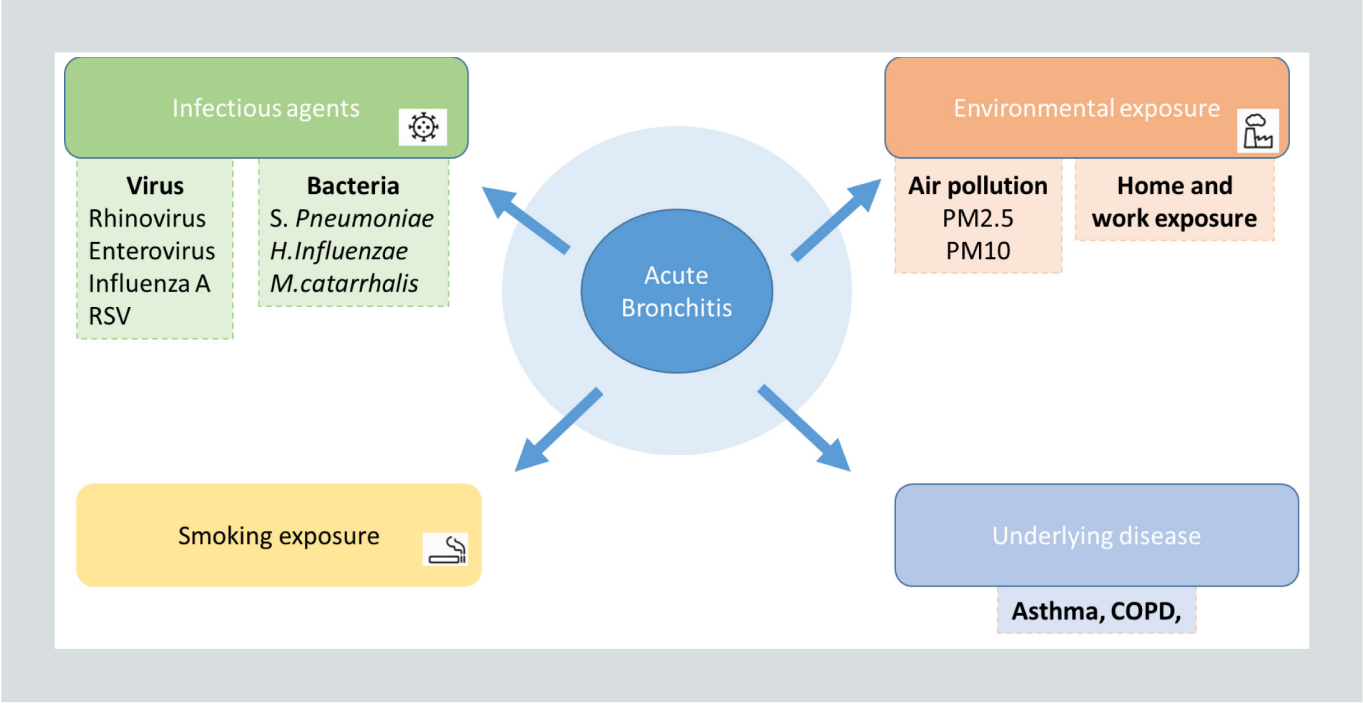

Figure 1. Causes of acute bronchitis.

study, the same group found that short-term exposure to ambient air pollutants was associated with increased hospital admissions for acute bronchitis and COPD, even after adjusting for temperature and relative humidity[13].

In summary, growing evidence suggests that air pollution is a significant contributing factor in the onset and exacerbation of acute bronchitis, highlighting the need for preventive strategies in high-exposure populations. The aetiology of acute bronchitis is shown in Figure 1.

CLINICAL FEATURES

Cough is the predominant symptom of acute bronchitis, with a median duration of approximately 18 days[5,14]. The condition may be accompanied by a number of other signs and symptoms, including dyspnoea, nasal congestion, headache, fever, expectoration, and chest pain related to cough. A physical examination may reveal the presence of wheezing and rhonchi, which may either improve or disappear when the patient is coughing[5].

It is important to consider the possibility of pneumonia, particularly in patients who present with high fever, hypoxaemia, and lung consolidation on chest X-ray[5].

When *Bordetella pertussis* is the causative agent, the infection usually manifests with a catarrhal illness lasting 1-2 weeks, followed by a severe cough that may be accompanied by cyanosis, salivation, lacrimation, inspiratory stridor and often vomiting[5].

DIAGNOSIS

The diagnosis of acute bronchitis is primarily clinical, based on a thorough patient history

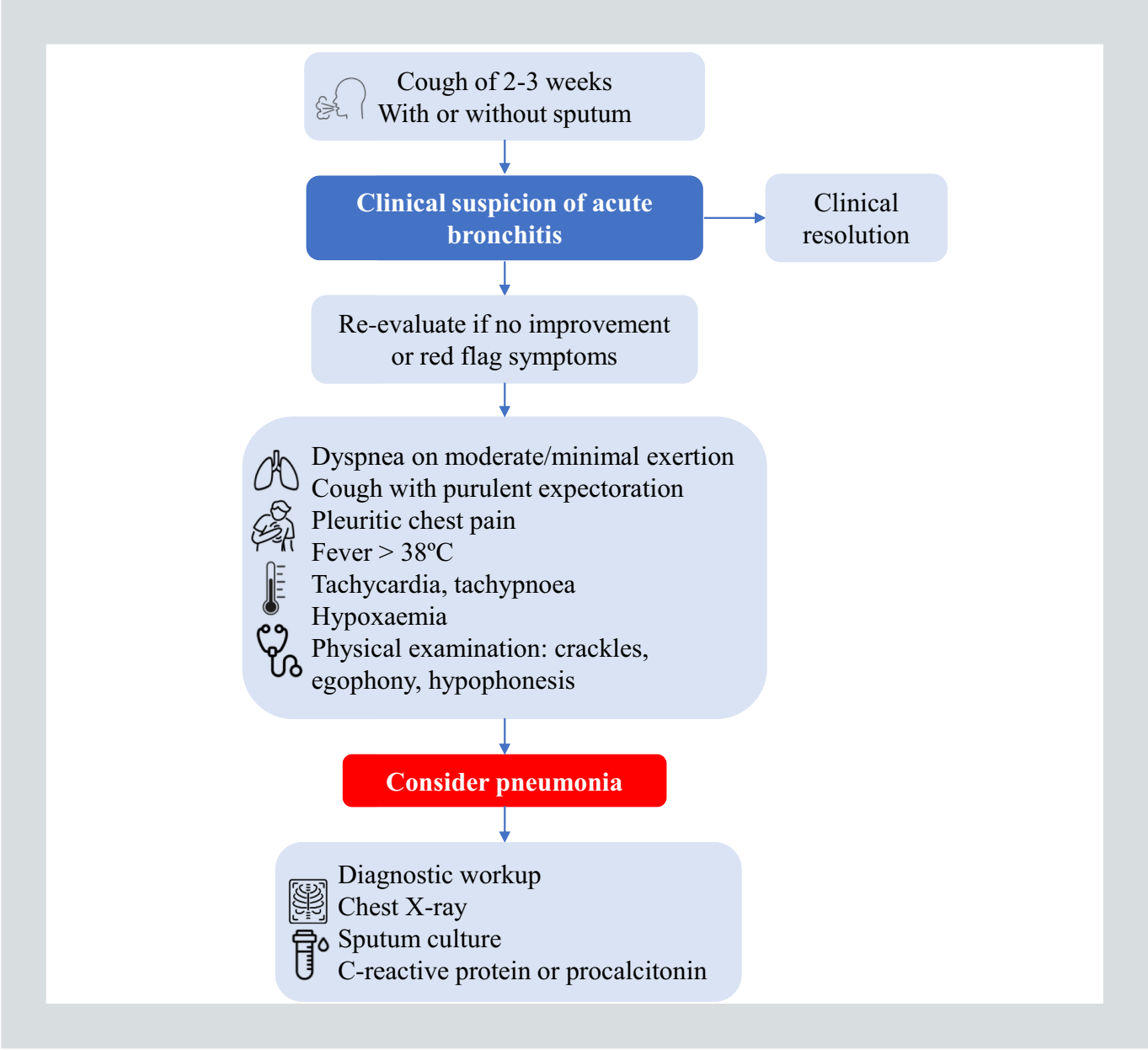

Figure 2. Diagnostic algorithm of acute bronchitis.

and physical examination (Figure 2). Acute bronchitis is characterized by the presence of persistent cough lasting at least two to three weeks, often preceded by symptoms of an upper respiratory tract infection within the previous 10 days. Associated symptoms might include sputum, nasal congestion, rhinorrhoea or wheezing.

Although viral infections account for approximately 90% of acute bronchitis cases, the specific pathogen is identified in only about 30% of them[2]. The presence of purulent secretions is a poor predictor of bacterial infection[2].

Routine chest X-ray is not indicated in most patients. It may reveal non-specific findings

Table 1. Differential diagnosis of acute bronchitis

Condition	Key features	Distinguishing clues
Pneumonia	Fever, cough, sputum production, tachycardia, tachypnoea	Focal findings on auscultation, consolidation on chest X-ray
Allergic rhinitis	Clear rhinorrhoea, nasal itching, sneezing	Seasonal pattern, environmental triggers, history of atopy
Asthma	Dyspnoea, cough, wheezing	Episodic symptoms, triggers (allergens, infections, exertion), reversible obstruction
COPD	Chronic cough, sputum production, dyspnoea	History of smoking, non-reversible airflow obstruction on spirometry
Common cold	Nasal congestion, sore throat, mild cough, fatigue	Self-limited, resolves within 7-10 days
Heart failure	Dyspnoea (exertional and nocturnal), orthopnoea, peripheral oedema	Crackles, jugular venous distension, cardiomegaly
GERD	Chronic cough, esophageal burning, dysphagia	Worsens after meals or in supine position
Pulmonary embolism	Sudden-onset dyspnoea, pleuritic chest pain, tachypnoea, tachycardia	Risk factors (immobilization, surgery), D-dimer, imaging (CTPA)
Lung malignancy	Persistent cough, hemoptysis, weight loss, dyspnoea	Abnormal chest imaging (mass, nodules), smoking history
Pharmacologic	Dry cough	Temporal relationship with medication initiation

such as bronchial wall thickening and is only recommended when there is no clinical improvement after 2-3 weeks or when pneumonia is suspected (i.e., in the presence of high fever, oxygen requirement, or other alarm signs or symptoms).

Laboratory testing is generally not recommended. However, the measurement of C-reactive protein or procalcitonin levels may be useful when pneumonia is suspected.

Routine serologic testing is not advised in cases of acute bronchitis. During peak influenza season, testing is often unnecessary due to the high pre-test probability of infection.

If *Bordetella pertussis* is suspected, serologic testing should be considered in unvaccinated individuals, those with paroxysmal or whooping cough, those exposed to pertussis, or those with a cough lasting more than three weeks.

The most common infectious etiologies of acute bronchitis are viral and bacterial[15]. Viral agents include *adenovirus*, *coronavirus*, *influenza A* and *B*, *metapneumovirus*, *parainfluenza virus*, *respiratory syncytial virus*, and *rhinovirus*. Bacterial causes include *Bordetella pertussis*, *Chlamydia pneumoniae*, and *Mycoplasma pneumoniae*.

In patients with suspected pneumonia, routine sputum culture is unlikely to yield an etiologic diagnosis in most cases[1]. In the outpatient setting, sputum culture is reserved for selected cases depending on factors such as ease of specimen collection, severity of pneumonia, pre-test probability of uncommon pathogens, and the presence of structural lung disease[1].

In summary, no additional diagnostic testing is required in adults with a clinical diagnosis of uncomplicated acute bronchitis[16].

DIFFERENTIAL DIAGNOSIS

A number of conditions can mimic the presentation of acute bronchitis and should be considered in the differential diagnosis, particularly when symptoms are atypical, prolonged or unresponsive to standard management. Pneumonia must be ruled out in patients with high fever, tachypnoea or focal findings on chest examination and imaging. Asthma and COPD may present with overlapping features such as cough and wheezing, especially in individuals with a history of smoking or atopy. Other respiratory conditions, including the common cold and allergic rhinitis, are usually distinguished by their upper airway predominance and self-limited nature. Non-respiratory causes of cough, such as congestive heart failure, gastroesophageal reflux disease (GERD) and medication-related effects (e.g. ACE inhibitors), should also be considered. In more severe or persistent cases, pulmonary embolism or malignancy may need to be excluded, particularly in the presence of red flag symptoms such as hemoptysis, weight loss or sudden-onset dyspnoea. A careful clinical assessment is essential to guide appropriate evaluation and avoid misdiagnosis. The differential diagnosis is shown in Table 1.

TREATMENT

The management of acute bronchitis is primarily symptomatic[17,18], as the most common aetiology is viral and symptoms are usually self-limiting, resolving within 1-3 weeks. Patient education is essential, particularly regarding the expected duration of symptoms such as cough, which can persist for 2-3 weeks[18].

In immunocompetent adult patients managed on an outpatient basis, the use of antibiotics, antivirals, antitussives, oral corticosteroids, non-steroidal anti-inflammatory drugs (NSAID), beta-agonists and inhaled anticholinergic therapy is not routinely recommended. These therapies have not demonstrated efficacy in reducing the severity or duration of cough[18-21].

Cough treatment

The effectiveness of cough suppressants, such as dextromethorphan and codeine, is limited, although some studies have suggested that these medications may reduce the severity and duration of cough[19,22]. Therefore, their use should be assessed on an individual basis, taking into account possible adverse effects.

Regarding non-pharmacological therapies, there is an absence of robust evidence supporting the use of throat lozenges, honey, or medicinal plants such as *Plantago major* or *Hedera helix*. Nonetheless, these interventions may provide symptomatic relief and are commonly used in clinical practice, especially in patients seeking alternative therapies[22-24].

Antibiotic and antiviral treatment

Although acute bronchitis is predominantly viral in origin, antibiotics are still frequently prescribed despite limited supporting evidence. A Cochrane review reported a modest reduction in the duration of cough and other symptoms, although this was associated with increased side effects and risk of antibiotic resistance[25].

Some authors suggest that antibiotics may have some benefit in frail older adults with comorbidities, although this population has not been adequately represented in clinical trials to date[17]. Importantly, antibiotic therapy is clearly indicated when pneumonia is suspected[17,25].

With regard to antiviral therapy, such as *oseltamivir* for seasonal influenza or *remdesivir* for coronavirus infection, it is usually recommended in hospitalized patients or in those at high risk of complications, such as immunocompromised individuals[26,27].

In infections caused by *Bordetella pertussis*, treatment with a macrolide antibiotic—such as *azithromycin*, *clarithromycin* or *erythromycin*—is recommended, particularly for patients with a cough of less than three weeks' duration[28]. Early treatment may reduce transmission, although it does not necessarily shorten the course of symptoms.

Infections due to *Mycoplasma pneumoniae* and *Chlamydia pneumoniae* are typically managed in the context of pneumonia. In such cases, antibiotics including *doxycycline*, *levofloxacin* and *azithromycin* may be used[29].

Inhaler therapy

The use of short-acting β_2-agonist bronchodilators (such as *salbutamol*) is generally not indicated in routine cases of acute bronchitis. However, they may be considered in patients who present with significant bronchospasm, wheezing or a history of reactive airway disease. This includes individuals with underlying asthma or COPD, where transient airway hyperresponsiveness may exacerbate respiratory symptoms during an acute episode[21].

In such cases, short-acting bronchodilators can offer temporary symptomatic relief by improving airflow and reducing the sensation of dyspnoea. Nevertheless, the clinical benefit should be assessed individually, as evidence supporting their routine use in otherwise healthy patients with acute bronchitis remains limited. Overuse may lead to unnecessary side effects such as tachycardia, tremor and anxiety, particularly in older adults.

PROGNOSIS AND COMPLICATIONS

Acute bronchitis is typically a self-limited condition with a favourable prognosis in immunocompetent individuals. Most cases resolve spontaneously within 1 to 3 weeks, although the cough may persist for up to three weeks or longer in some patients, even after the resolution of other symptoms[30]. This prolonged cough is related to transient airway hyperresponsiveness and does not necessarily indicate bacterial infection or treatment failure.

Serious complications are rare. However, certain populations—such as older adults, smokers, or individuals with chronic respiratory or cardiovascular comorbidities—may be at increased risk of clinical deterioration or progression to lower respiratory tract infections, including pneumonia[31].

While acute bronchitis does not typically lead to long-term sequelae, inappropriate use of antibiotics in its management contributes to antimicrobial resistance, adverse drug

reactions and unnecessary healthcare costs[21]. Another potential complication is the misdiagnosis of other conditions that initially present with cough, such as pertussis, asthma or even early malignancy. Hence, persistent or atypical symptoms should prompt re-evaluation and further diagnostic work-up.

FUTURE DIRECTIONS

Future research on acute bronchitis must address several critical gaps. First, most incidence and prevalence estimates rely on emergency department coding, which—while accessible—may be affected by diagnostic inaccuracy and variability in clinical coding practices. This limitation underscores the need for more robust, clinically validated epidemiological data. Additionally, environmental pollution has become an emerging challenge. Although associations between air pollutants and respiratory morbidity are well documented, the specific impact of pollutants on the onset and course of acute bronchitis remains insufficiently explored and should be a priority in future studies.

Moreover, despite clear guidelines, antibiotic overprescription and unnecessary diagnostic testing persist, contributing to antimicrobial resistance and increased healthcare costs. Raising awareness within the medical community through targeted educational initiatives is essential to align practice with evidence-based recommendations. Lastly, the condition lacks effective treatment options. Cough—often prolonged and distressing—is poorly addressed by current therapies. Research should focus on developing and assessing safe, targeted treatments to relieve cough without promoting overmedicalization. Together, these directions can enhance clinical care, reduce unnecessary interventions and improve outcomes for patients with acute bronchitis.

CONCLUSION

Acute bronchitis is defined as an acute inflammation of the trachea and lower airways, with a typical duration of two to three weeks[1,2]. The primary cause of acute bronchitis is viral infection[6,7]. In adult patients who are immunocompetent, the treatment is generally symptomatic. Resolution of symptoms is typically observed within a period of 1 to 3 weeks[17,18].

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CONFLICTS OF INTEREST

M. Barrecheguren has received consulting fees from GSK, Chiesi, CSL Behring, Bial, Grifols and speaker fees from Grifols, Menarini, CSL Behring, GSK, Astra Zeneca, Sanofi, Chiesi. M. Andreu, P. Barquero and S. Salvador have nothing to disclose.

ETHICAL CONSIDERATIONS

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The study does not involve patient personal data nor requires ethical approval. The SAGER guidelines do not apply.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

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