

Management of a chesty cough

Cough is a common complaint in both paediatric and adult populations and carries significant morbidity. Although many patients do not seek medical advice for a self-limiting cough, acute and chronic cough is the most common cause of new presentations to GPs.

A cough is primarily an airway defence mechanism. It is a forced expulsive manoeuvre capable of expelling solid or liquid materials from the airway. The ability to cough is crucial to airway protection. When the ability to cough is

diminished, such as following sedation and anaesthesia or in neurological and neuromuscular diseases, severe, recurrent or life-threatening respiratory compromise can result. Conversely, cough can be excessive and persistent, in response

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IN SUMMARY

- Cough is the most common reason for new presentations of patients to GPs.
- Acute cough is most commonly caused by viral infection.
- Acute cough is usually self-limiting and does not generally require further investigation.
- Unusual but serious causes of acute cough should be considered.
- Pertussis should be considered as a cause of prolonged cough.
- Chronic cough is usually due to asthma, gastro-oesophageal reflux disease or postnasal drip, and sometimes these in combination.
- A trial of treatment can help make the diagnosis.

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to altered cough reflex sensitivity. This may be caused by a variety of conditions and, although not life-threatening, creates a major burden of symptoms and affects quality of life. The most frequent cough, however, is a short-term cough usually associated with viral infection of the upper respiratory tract.

The challenge in the management of a patient with a cough is the recognition of the cause. This allows a decision to be made about whether the patient with a cough can be treated with reassurance and simple supportive therapy or whether more specific investigation and treatment is required.

The first step in attempting to identify the likely cause of cough is to ascertain its duration. Acute cough is defined as being present for less than three weeks, whereas chronic cough is defined as being present for more than eight weeks. Although acute cough is most frequently related to a viral infection, diagnosing a cause of chronic cough can be more difficult and may require empirical treatments to confirm causation. An intermediate period may exist in which cough may persist for a duration of between three to eight weeks and this is often termed a post-infectious cough.

'Chesty cough' is a term often used by patients to describe their symptoms. This does not necessarily mean that the cough is productive but more that it is a moist-sounding cough associated with discomfort or other respiratory symptoms. However, this description alone is not particularly helpful in determining the aetiology of the cough.

Acute cough

The most common cause of acute cough is viral infection, particularly the common cold, which may affect both the upper and lower respiratory tracts. Acute respiratory tract infections account for almost 5% of presentations to GPs in Australia. In otherwise healthy adults, the usual presentation includes cough, nasal congestion, sore throat, fever and possibly acute bronchitis, which may be accompanied by sputum production. Acute bronchitis is an acute lower respiratory tract infection manifested by cough with or without sputum production lasting three weeks or less. Patients with acute bronchitis have a normal chest x-ray.

Table 1. Distinguishing features of acute cough

Cause	Distinguishing features
Viral URTI	Coryza, fever
Aspiration	Cough after solids or liquids, swallowing difficulties, focal chest signs, fever, shortness of breath
Cardiac failure	Cardiac history, orthopnoea, exertional limitation, bibasal crepitations, displaced apex beat
Pneumothorax	Sudden onset, chest pain, shortness of breath, cough
Inhaled foreign body	History of event, acute onset following oral intake
Bacterial pneumonia	Fever, productive cough, focal chest signs, shortness of breath, lethargy, malaise
Pleural effusion	Chest pain, shortness of breath, reduced breath sounds, stoney dull percussion
Pulmonary embolism	Pleuritic chest pain, sudden onset, haemoptysis, risk factors for pulmonary embolism, limb symptoms
New onset of chronic condition (e.g. malignancy)	See Table 3

ABBREVIATION: URTI = upper respiratory tract infection.

Respiratory viruses isolated in patients with common colds include rhinovirus, coronavirus, influenza virus, parainfluenza virus, respiratory syncytial virus, human metapneumovirus, adenovirus and enterovirus. However, in 20 to 30% of cases no isolates are identified. Bacteria infrequently cause acute bronchitis and their presence is confirmed in less than 10% of patients. Therefore, antibiotics are rarely required to treat a patient with acute bronchitis.

It is not clearly understood how viral illness causes acute cough but the process may involve:¹

- increased production of inflammatory mediators
- altered expression of neural receptors
- increased airway mucus production.

Beyond the common cold, the differential diagnosis for a patient with an acute cough becomes very broad (Table 1). It is important to evaluate any environmental factors to which the patient may have been exposed, to consider exacerbations of existing conditions and then to consider novel processes as an explanation for cough. The most

important environmental factor is exposure to cigarette smoke. All too frequently the significance of persistent smoking is downplayed because of the therapeutic difficulty of tackling this problem. Smoking cessation is of key importance and must be the primary objective for all individuals presenting with either upper or lower respiratory tract symptoms.²

The suspicion of lung cancer in a patient with cough always demands prompt investigation and if necessary referral of the patient to a specialist to enable early diagnosis and treatment. Symptoms of lung cancer that may be associated with cough include lethargy, functional debility, haemoptysis, weight loss and chest pain.

In patients with significant respiratory disease, such as chronic obstructive pulmonary disease (COPD), bronchiectasis and sarcoidosis, increased or new cough can be an important symptom indicating an exacerbation of the condition. Exacerbations of COPD are frequently due to viral infections. Antibiotics are only recommended when there are at least two of the following three symptoms present:^{3,4}

- increased sputum purulence
- increased sputum volume
- increased shortness of breath.

Asthma can cause either an acute or a chronic cough. Features suggesting asthma as a cause of cough include chest tightness, wheeze and nocturnal cough. Such emerging symptoms should prompt a review of asthma control and adherence, as well as consideration of usual asthma triggers such as viral infections and allergen exposure.

A past history of cardiac disease in patients older than 65 years should raise the possibility of cardiac failure as the cause of cough and shortness of breath. There are likely to be associated signs and symptoms that also favour this diagnosis, such as orthopnoea, bibasal crepitations and/or a displaced apex beat. In these cases, a chest x-ray is reasonable

to confirm the diagnosis. Appropriate treatment can then be instigated and the underlying cause further investigated, if necessary.

Occasionally, patients with pulmonary embolism can present with acute cough with or without pleuritic chest pain. The symptom of cough in these cases can be difficult to distinguish from an acute lower respiratory tract infection. However, other features, including risk factors for venous thromboembolism such as prolonged immobility, malignancy, previous venous thrombosis or family history, may increase the likelihood of a pulmonary embolus being present. In addition, signs suggesting the presence of a deep vein thrombosis, haemoptysis, exertional limitation or tachycardia can be associated with pulmonary embolism. The absence of these signs or risk factors would make pulmonary embolism a less likely diagnosis.⁵

Other potential causes of acute cough include pneumothorax and pleural effusions. Patients with these conditions usually present with symptoms that are unrelenting and progressive and have localising signs evident in their history and on clinical examination.

Although uncommon, an inhaled foreign body is an important cause of acute cough. If the patient's history is suggestive of this then an urgent referral to a specialist is required. A chest x-ray may be helpful to assess the patient for postobstructive collapse or potentially to localise the foreign body if it is radio-opaque.

The onset of an acute cough may be a prelude to the development of a chronic cough, and potential causes of chronic cough should be considered. Importantly, as many as 90% of cases of chronic cough will be due to asthma, sinusitis, allergic rhinitis, postnasal drip and gastro-oesophageal reflux disease (GORD). It is always useful to remember that among this group, 10 to 20% may have two or more conditions contributing to cough.

Investigations

In most cases no investigations are required in patients presenting with cough of less than three weeks' duration. This is particularly true when associated symptoms point to an acute infection as the cause of the cough. In otherwise healthy individuals with an acute viral cough, an infectious isolate is identified in only about half of cases, and in these patients peak expiratory flow, spirometric indices and chest x-ray remain normal. Most patients diagnosed with lower respiratory tract infections will have bronchitis or tracheitis, with only about 5 to 10% having a more serious diagnosis of pneumonia. Suspicion of pneumonia should be aroused in patients who:

- have new focal chest sounds (such as crepitations)
- have an increased respiratory rate
- have a significant shortness of breath
- have a fever for more than four days
- are systemically unwell.

In these circumstances it is recommended that patients have a chest x-ray to assess for evidence of pneumonia.⁶ It is generally not recommended that specific microbiological tests, such as atypical pneumonia serology, or tests for pneumococcal or legionella antigens be ordered in the primary care setting.⁷

If a diagnosis of acute viral infection is made, patients should be advised to return to their GP if symptoms have not resolved in three weeks. Other warning signs that should prompt further investigation into cough include haemoptysis, chest pain, significant shortness of breath and weight loss. Referral of the patient to a specialist will be necessary if the cause of these symptoms is not obvious from basic investigations.

Treatment

Treatment of the patient can be considered for both the causative illness and the symptom of cough. Acute viral upper or lower respiratory tract infections do not

require specific treatment and the cough is likely to be self-limiting. Antibiotics, bronchodilators and inhaled corticosteroids are of no benefit in otherwise well individuals. Reassurance and supportive treatments such as rest, hydration and analgesia remain the most important parts of the consultation.

The effectiveness of symptomatic treatments in cough is variable and inconsistent. Opioid cough suppressants may provide some benefit for patients with nonproductive coughs although side effects can be problematic. Dextromethorphan and pholcodine are associated with fewer side effects than other opioid cough suppressants.⁸ Menthol lozenges are anecdotally, if inconsistently, effective.

Other cough treatments include expectorants such as guaifenesin and mucolytics such as bromhexine. The aim of expectorants and mucolytics is to improve sputum characteristics by decreasing the viscosity and stickiness of lung secretions, enabling the clearance of mucus. These treatments can be very effective in patients with established lung disease and bronchorrhoea; however, there is little evidence of their effectiveness in otherwise healthy individuals with acute cough. Combination products contain a mixture of paracetamol, a cough suppressant (e.g. dextromethorphan), an antihistamine, a mucolytic (e.g. bromhexine) and/or a decongestant. The use of such combinations needs to be considered carefully; for example, the aim of mucolytic agents is to improve sputum clearance, which may be counteracted by the simultaneous use of a cough suppressant.

There is limited evidence to suggest that nasal saline irrigation or spray can reduce the duration of viral upper respiratory tract infections.⁹ Trials to date have involved small numbers of patients and therefore recommendations cannot be generalised. Similarly, there is little evidence to support the use of saline sprays to improve nasal symptoms and they

may cause some irritation of the nasal passages.¹⁰

Antiviral treatment should be considered when the presentation of the patient is typical of influenza and the onset of symptoms is less than 48 hours before. Typical symptoms include fever (above 38°C), myalgia or other systemic symptoms and at least one respiratory symptom such as cough. When these criteria are met during influenza season, there is a high chance of patients having this infection. Treatment of a patient with the antiviral therapies oseltamivir or zanamivir can shorten the duration of illness by one day if commenced within 48 hours of symptom onset. This may be associated with reduced complications. Recommendations on treatment from the Department of Health and Ageing may vary during each influenza season depending on the severity and spread of the influenza virus.

Postinfectious cough

Prolonged cough following a respiratory tract infection is likely to be due to a number of mechanisms. These include postnasal drip, airway inflammation and increased sensitivity of airway nerves. Often a diagnosis of postinfectious cough is suggested by the history of a preceding viral infection. A patient with postinfectious cough frequently presents with bouts of cough triggered by innocuous stimuli such as hot drinks or strong smells.

Patients with postviral cough may respond to an antihistamine–decongestant combination and there is some evidence to support the use of short-term inhaled ipratropium or corticosteroids.^{11,12} A high rate of spontaneous resolution, generally within eight weeks, is the usual course of the condition. Patients with a clear history of a preceding viral upper respiratory tract infection and no other clinical signs can be monitored without specific investigation or treatment. However, patients with a cough that persists

beyond eight weeks or is associated with other clinical signs or symptoms should be investigated further.¹³

Pertussis

Bordetella pertussis is responsible for the highly contagious condition whooping cough. Although vaccination against pertussis is routine in Australia, there has recently been a resurgence in reported cases both nationally and globally. This resurgence may in part be due to waning immunity but is also due to genetic and antigenic variations in virulence factors. It is likely that the number of cases of pertussis is underestimated because of atypical presentations, limitations in practitioner awareness and a low sensitivity of diagnostic tests.

Individuals most at risk of complications of pertussis are young infants. Early identification, isolation and treatment are important to reduce complications in this group.

In general, patients will be infective during the early catarrhal phase and this wanes over about three weeks to a negligible infectious risk. Pertussis should be considered as a differential diagnosis in patients with paroxysms of coughing of more than two weeks' duration associated with an inspiratory whoop or posttussive vomiting. In addition, contact with a confirmed case should increase clinical suspicion. Although this is the classic presentation of pertussis infection, older children and adults may present with less specific symptoms. In some, the cough may be predominantly nocturnal whereas adults are more likely to present late in the course of the illness. The mean duration of cough in adults with pertussis infection is 36 to 48 days.¹⁴

Diagnosis and treatment

Successful testing for pertussis requires consideration of the:¹⁵

- possibility of pertussis
- time in evolution of the illness
- type of test to be used.

continued

Table 2. Tests to confirm the diagnosis of pertussis*

Test	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	Comments
Culture [†]	15 [†]	100	100	88	Time consuming and rarely offered
Polymerase chain reaction	94	97	84	99	Rapid confirmation of diagnosis; expensive; not affected by antibiotic therapy
Serology (IgA/IgM antibody)	Variable [‡]	Variable	–	–	No single test is universally accepted or standardised nationally. [§] May remain negative in infants

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[†] Discussion with a pathology service provider is advisable before a specimen collection.

[‡] Higher in children.

[§] Performance characteristics vary significantly between different serological assays, but attempts to standardise interpretation are underway.

Evidence of recent local diagnoses, recent contact with a confirmed case of pertussis and consistent clinical features all increase the likelihood of a person having a pertussis infection.

B. pertussis is fastidious, difficult to grow in the laboratory and particularly difficult to isolate from previously immunised persons. The sensitivity of nasopharyngeal swabs for culture is therefore low (Table 2),¹⁵ and it decreases further with time from symptom onset. Polymerase chain reaction (PCR) from nasopharyngeal or throat swabs provides rapid confirmation of *B. pertussis* with high sensitivity and specificity early in the illness, yet is not available from all pathology providers because of the high cost. The demonstration of a single raised level of immunoglobulin (Ig) A or IgG to *B. pertussis* is a frequent means of diagnosing pertussis, particularly later in the course of the illness when PCR and culture are likely to be negative (see the flowchart on page 44).¹⁵ False-positive results can occur after vaccination and negative results cannot exclude pertussis infection.¹⁶

A diagnosis of pertussis early in the illness should be treated promptly with macrolide antibiotics (e.g. clarithromycin

500 mg twice daily for seven days or azithromycin 500 mg once daily on day one then 250 mg once daily for four days) to ensure eradication from the nasopharynx and shorten the duration of illness. However, from three weeks after contracting the condition, antibiotics have no benefit and are not recommended. Achieving a diagnosis of pertussis provides reassurance to patient and practitioner, and identifying confirmed cases enables isolation from contacts and prevention of transmission to potentially susceptible individuals.

Chronic cough

Cough is described as chronic when it is present for more than eight weeks. The first steps in the consideration of the patient with chronic cough are the identification and treatment of the usual causes of cough including smoking, COPD, bronchiectasis and interstitial lung diseases. Once these have been considered, then treated or excluded, most (more than 90%) chronic coughs can be attributed to one or more of the following three conditions:¹⁷

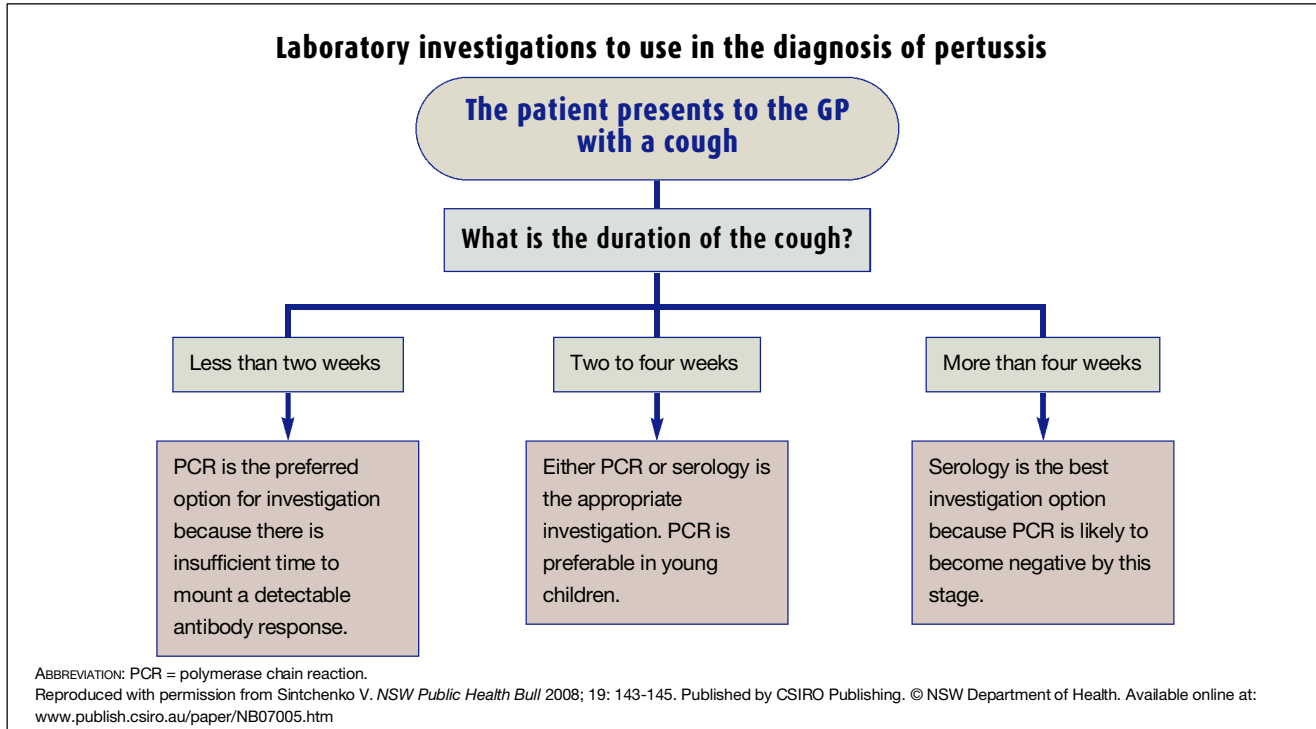
- postnasal drip
- asthma
- GORD.

History should focus on the duration of cough, presence or absence of sputum, and associated features such as shortness of breath or chest discomfort (Table 3). An association with eating, phonation or recumbency suggests reflux as a cause. Postnasal drip is suggested by the feeling of material draining from the nose to throat or the accumulation of secretions in the throat overnight. If sputum is produced, volume, colour and presence of haemoptysis are important. Production of a large volume of sputum is suggestive of chronic bronchitis or bronchiectasis, whereas smaller amounts can be related to sinusitis or postnasal drip. Haemoptysis should be a warning sign of significant underlying disease and patients with this condition need further investigation under specialist care.

Smoking and occupational history are essential. Even in young otherwise healthy individuals, smoking is commonly associated with symptoms of cough and shortness of breath. Patients should be counselled to quit smoking, which may reduce cough after a period of two months of cessation.¹⁸ Occupational exposures to asbestos or other dusts can suggest interstitial lung disease.

Nocturnal cough can be related to

continued



undiagnosed asthma or may be a feature of GORD or postnasal drip.

ACE inhibitor-induced cough can occur after any duration of use of the class of drugs. This tends to be a dry, persistent

cough and a trial off this medication may be helpful. Cough can be expected to resolve within one to four weeks after stopping treatment with ACE inhibitors in most cases, although it can persist for

up to three months.¹⁹

Examination of patients with chronic cough should involve:

- chest auscultation and percussion
- assessment for hyperinflation
- examination for lymphadenopathy/neck masses
- palpation for facial tenderness associated with sinusitis
- nasal examination for polyps or congested mucosa
- assessment of dentition and the upper airway, because dental caries can increase the risk of chest infections particularly with anaerobic organisms.

Table 3. Distinguishing features of chronic cough

Cause	Distinguishing features
Asthma	Wheeze, chest tightness, nocturnal cough, trigger factors (e.g. cold weather, exercise, allergens), reversible airflow obstruction
GORD	Heartburn, associated with food, worsening in recumbency or at night, acid brash
Postnasal drip	Throat clearing, rhinitis, sinusitis
COPD	Smoking history, shortness of breath, sputum production, wheeze
Malignancy	Weight loss, smoking history, lymphadenopathy, haemoptysis
ACE inhibitor use	Dry cough, no associated features
Pulmonary fibrosis	Shortness of breath, dry cough, clubbing, cyanosis, exertional limitation
Bronchiectasis	Sputum production, haemoptysis, recurrent infections or an antibiotic requirement

ABBREVIATIONS: ACE = angiotensin-converting enzyme; COPD = chronic obstructive pulmonary disease; GORD = gastro-oesophageal reflux disease.

Investigations

If no obvious cause can be elucidated from history and examination, a chest x-ray should be performed looking for evidence of chronic lung disease or malignancy. The chest x-ray may identify findings typical of COPD, atelectasis, bronchiectasis or pulmonary fibrosis, and in some cases further clarification may be necessary using CT scanning. Spirometry with

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continued

measurement of bronchodilator responsiveness is a rapid, reliable and simple test to identify asthma and COPD.

If these tests are not helpful in establishing a diagnosis, a trial of treatment is recommended. Initial therapy should target the three most common causes of chronic cough – postnasal drip, asthma and GORD.

Gastro-oesophageal reflux disease

Chronic cough may be the only symptom in a patient with GORD. A trial of a proton pump inhibitor for six to eight weeks has a relatively high sensitivity for the diagnosis of GORD.²⁰

Postnasal drip

A trial of intranasal corticosteroids and antihistamines is helpful to establish the diagnosis of postnasal drip.

Asthma

Cough may be the only manifestation in a patient with cough-variant asthma. Although variability in peak flow or reversibility on spirometry confirms a diagnosis of asthma, the absence of these findings does not exclude asthma. Peak flows can be relatively stable in patients with cough-variant asthma. Similarly, eosinophilic bronchitis is not associated with airflow obstruction but responds to inhaled or oral corticosteroids.

Eosinophilic bronchitis, therefore, shares with asthma an eosinophilic airway infiltration, demonstrable eosinophils in the sputum, cough and corticosteroid responsiveness of symptoms. However, it is not associated with airflow obstruction and presents with normal spirometry. Sputum cytology requesting a leucocyte differential count can be very helpful, although there is much variability between pathology providers in access and reproducibility of this test.

Therefore, a trial of inhaled corticosteroids should be considered for patients with an undifferentiated chronic cough. Inhaled corticosteroids in moderate doses should be trialed for at least eight weeks to assess adequately the patient's response.²¹ When basic investigations and suggested treatments fail to reveal a diagnosis for the cause of chronic cough, referral to a specialist is recommended. Further investigations that can be performed include CT scans, further lung function tests and bronchoscopy. In most cases a diagnosis can ultimately be made.

Prevention of cough

There are few measures available to prevent the occurrence of acute cough although influenza vaccination is one available preventive measure. Currently, the US Centers for Disease Control and Prevention (CDC) advise influenza vaccination for persons who are at higher risk of influenza complications, including:²²

- children aged 6 months to 19 years

continued

- pregnant women
- all persons who have chronic health conditions
- healthcare workers
- individuals who share a household or provide care for persons in these high-risk groups.

According to the CDC, about 85% of people in the USA fall into one of these groups. Despite these already broad recommendations, only about half of high-risk individuals typically receive the vaccine.

Importantly, emerging data indicate that otherwise well 19 to 49-year-olds have been particularly vulnerable to complications from infection with the currently circulating influenza A (H1N1) virus. Other groups not included in previous recommendations, such as obese individuals, postpartum women and certain racial or ethnic groups, also appear to have been disproportionately vulnerable to complications from the H1N1 virus.²³

In Australia, vaccination against influenza is recommended for individuals over the age of 65 years, all Aboriginal and Torres Strait Islander people aged over 15 years and children (>6 months of age) and adults with a medical condition that predisposes them to severe influenza (e.g. chronic medical illness, cardiac or respiratory disease, impaired immunity or chronic neurological

conditions).²⁴ Pneumococcal vaccination every five years is also recommended in these high-risk individuals.

Viral upper respiratory tract infections are frequent causes of asthma exacerbation and premonitory signals may include worsening of symptoms or lung function. High doses of inhaled corticosteroids (e.g. fluticasone 2000 µg daily or budesonide 3200 µg daily) for one to two weeks may assist in settling the inflammatory response to viral infection without impacting the natural history of the viral infection. These higher dose strategies now replace the previous recommendation of doubled dosing, which is demonstrably ineffective in controlling asthma exacerbation.²⁵

Conclusion

Cough is a frequently encountered symptom that can have a multitude of causes. Acute cough is present for less than three weeks and chronic cough for more than eight weeks. Differential diagnoses can be narrowed down with a thorough history and examination. Acute cough does not usually require further investigation and will resolve spontaneously, whereas diagnosis of chronic cough is more of a challenge. Most patients with chronic cough will have asthma, GORD or post-nasal drip, or potentially a combination of these. A trial of appropriate therapy is helpful in making a diagnosis. **MT**

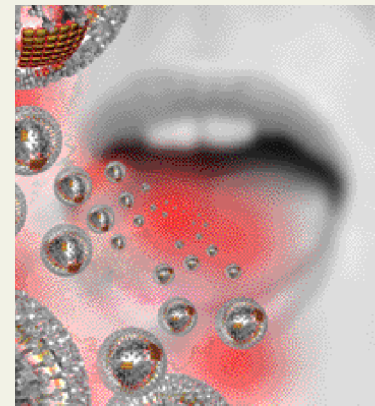
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A list of references is available on request to the editorial office.

COMPETING INTERESTS: Dr Stirling has served on advisory boards for AstraZeneca and has received speakers honoraria from Boehringer Ingelheim, AstraZeneca and GlaxoSmithKline.

Dr Howden: None.

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