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Breathlessness and cough in the acute setting

Ben G Marshall

Veronica White

Jo Loveridge

Abstract

The symptom of breathlessness is well recognized as part of the presentation of a wide range of medical conditions. It can be a manifestation of a life-threatening emergency. In acute medical settings, the priority is to quickly recognize patients who are critically unwell and require emergency treatment. For these patients, rapid initial assessment and immediate treatment are essential. However, once symptoms have stabilized or in less acute settings, a more thorough assessment is required. Cough is a common respiratory symptom, often part of a symptom complex, which is troublesome for the patient. It is important to recognize worrying associated features to prompt further investigation. In late 2019, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection emerged from a zoonotic source, resulting in many cases of infection, hospitalizations and deaths, and has since spread in a pandemic across every continent. A substantial percentage of patients with COVID-19 develop an acute respiratory illness requiring hospital care. Cough and acute breathlessness are two of the most prevalent symptoms in this infection; any patient presenting to an acute setting should currently be assumed to have this infection and immediately tested with a viral swab from the upper airway to guide management.

Keywords Acute cough; acute setting; breathlessness; MRCP

Breathlessness

Breathlessness is a common symptom in patients presenting in acute secondary care settings (as well as in primary care). They can present acutely or with a worsening of more chronic symptoms. Symptoms range from a mild deterioration of the patient's normal level of function through to a life-threatening medical

Ben G Marshall PhD FRCP DTM&H is a Consultant Chest Physician at the University Hospital of Southampton and Honorary Associate Professor at the University of Southampton, UK, where he leads subspecialist services in pneumonia, tuberculosis and interstitial lung diseases. His research interests also lie in these disease areas. Competing interests: none declared.

Veronica White MSc MD is the Clinical Director of Respiratory Medicine at St Bartholomew's Hospital, Barts Health NHS Trust, London, UK. She trained in North East Thames in Respiratory and General Medicine and subspecialized in tuberculosis. Competing interests: none declared.

Jo Loveridge MB ChB(Hons) MRCP DTM&H Diploma in Clinical Education is a Consultant in Acute Medicine at King's College Hospital, London, UK. Competing interests: none declared.

Key points

Breathlessness

- An urgent assessment of airway, breathing and circulation should be made in the first instance for patients presenting with acute breathlessness
- A detailed history and examination should be made when the patient is more stable, along with more detailed investigations such as lung function and echocardiography. This usually leads to the correct diagnosis

Acute cough

- Patients with acute cough associated with fever, chest pain, breathlessness, haemoptysis or weight loss should have an urgent chest X-ray and sampling of the upper airway with rapid molecular viral antigen testing
- Patients are unlikely to present acutely with the sole symptom of chronic cough, but if it is part of a symptom complex as an acute presentation, they should be referred for a chest X-ray; if normal, spirometry is non-invasive and readily available
- Asthma, bronchiectasis, postnasal drip and gastro-oesophageal reflux disease are the most common pathologies causing cough in a patient with no systemic symptoms and a clear chest X-ray

emergency. Breathlessness is a recognized symptom of cardio-respiratory disease but can also be present in other systemic conditions, such as anaemia or endocrine disorder. Competent assessment and management of breathless patients is essential in reducing morbidity and mortality.

Definition

'Breathlessness' or dyspnoea is a symptom that is complex to define and is not a clinical sign. It is used to describe discomfort or distress associated with breathing. This includes the sensation of suffocation, choking or 'air hunger', the inability to take an adequate breath, rapid breathing or increased effort related to breathing. It can also be an expression used by a patient to describe chest tightness. It is important to understand and help patients to define what they mean when they describe breathlessness.

Pathophysiology

The physiology of normal ventilation and respiration is complicated and the detailed pathophysiology of breathlessness is not fully understood. Unlike in pain, there are no specific 'breathlessness' receptors or nerves, neither is there a location within the brain that can be recognized as a breathlessness centre. A number of distinct stimuli trigger various different receptors; the afferent input leads to the sensation of 'a need to breathe' (like thirst or hunger sensations). Breathlessness can arise because of either an increased drive to breathe or increased work of breathing. It is a subjective sensation that can be perceived only by the breathless person, further complicated by the fact that

social, cultural, emotional and situational factors influence how the sensation is perceived.

Aetiology

Because the sensation of breathlessness can be provoked by various mechanisms, many different disease states present with this symptom (Table 1). Breathlessness is most often precipitated by cardiac or pulmonary disorders. However, it can also be present in metabolic derangements, anaemia and neuromuscular weakness, or be a consequence of pain, anxiety and physical deconditioning.

Assessment

Appropriate personal protective equipment should be worn when assessing patients in an acute setting to minimize the risk of transmission of respiratory viruses. Patients can present acutely unwell, and the conventional approach of a history followed by examination and then investigations may not be appropriate. Instead the 'ABC' approach (Table 2) can be used, with immediate interventions administered as required. The aim of this urgent assessment is to detect and correct life-threatening physiological disturbances and start emergency treatment. Initial investigations include electrocardiography (ECG) and chest X-ray, instigated as soon as possible, and blood tests.

ABC approach

Airway: in most cases the airway is patent, but rapid assessment looking for airway obstruction should be undertaken (Table 3). In breathlessness, oxygen should be immediately given, with target oxygen saturations of 92–96% unless there is

Causes of breathlessness

Acute	Subacute	Chronic
Airways obstruction	Pneumonia	COPD
Anaphylaxis	Exacerbation of COPD	Pleural effusion
Asthma	Angina	Malignancy
Pneumothorax (including tension)	Cardiac tamponade	Chronic pulmonary embolism
Pulmonary embolus	Metabolic acidosis	Restrictive lung disorders
Myocardial infarction	Pain	Congestive cardiac failure
Pulmonary oedema	Pontine haemorrhage	Valvular dysfunction
Arrhythmias	Acute hypersensitivity pneumonitis	Cardiomyopathy
Anxiety		Diastolic dysfunction
Anaemia		Neuromuscular disorders
Pulmonary infection		Deconditioning
		Interstitial lung disease
		Abdominal distension, e.g. ascites

COPD, chronic obstructive pulmonary disease.

Table 1

The ABC approach

Airway	Is the airway patent? Is the patient talking? Is there noisy breathing or drooling?
Breathing	Respiratory rate. Oxygen saturations. Look, feel and listen to the chest
Circulation	Heart rate, blood pressure, pallor, sweating, and warmth, capillary refill time

Table 2

decompensated chronic obstructive pulmonary disease (COPD), for which target saturations should be 88–92%.

It is important to assess whether the patient can talk, and to examine for a foreign body or secretions such as blood or vomit around the mouth. If there is obstruction, immediate suctioning may be needed. In severe obstruction, paradoxical movement of the chest wall and abdomen may be seen. Breathing can be noisy if the airway is partially obstructed, with audible stridor, gurgling or grunting. Airway manoeuvres (head tilt and chin lift) or airway adjuncts may be required to keep the airway clear, and immediate anaesthetic help can be needed. Laryngeal oedema and airway compromise can occur with anaphylaxis, and this should be managed according to recommended guidelines.

If an infective cause of airway obstruction is suspected, examination of the oropharynx should be undertaken in an area where the patient can be immediately intubated as manipulation of the airway can cause further obstruction. Antibiotics are the mainstay of treatment, but corticosteroids are sometimes used to treat airway oedema.

Breathing: most patients complaining of breathlessness have a raised respiratory rate and they may be using their accessory muscles. All patients should be assessed for whether they can speak easily in sentences. Poor respiratory effort is always worrying as the patient may be tiring and intensive therapy unit (ITU) help might be needed.

If an expiratory wheeze is heard on auscultation of the lung fields, bronchodilator therapy and corticosteroids should be given following guidelines for asthma or COPD.¹ Continuous monitoring of oxygen saturations is essential for all acutely unwell patients with breathlessness. For patients with hypercapnic respiratory failure, who are not critically ill, target oxygen saturation should be 88–92%, using prescribed controlled oxygen of 24–28% via a Venturi mask.² Blood gas analysis guides further management, including the requirement for non-invasive or

Causes of airway obstruction

- Blood
- Vomit
- Secretions
- Foreign body
- Airway oedema (with anaphylaxis or infection, e.g. epiglottitis)
- Central nervous system depression and loss of airways reflexes
- Malignancy

Table 3

invasive ventilation if adequate oxygenation is not possible in the presence of hypercapnia and acidosis. Examination of the chest may reveal unilateral hyperresonance and reduced breath sounds suggestive of a pneumothorax. If there are signs of 'tension' (tracheal deviation, tachycardia, hypotension), immediate needle thoracocentesis should be performed using an 18G cannula in the mid-clavicular line, in the second intercostal space, followed by definitive chest drain insertion.

Patients with pulmonary oedema may present *in extremis*, unable to complete full sentences and with diffuse widespread inspiratory crepitations and impending respiratory failure, prompting immediate treatment with diuretics, nitrates and opiates. A rapid improvement may be seen, but if the patient remains hypoxic, continuous positive airways pressure should be considered. Tachypnoea and hypoxia with signs of increased vocal resonance and bronchial breath sounds can indicate infective consolidation. Signs of associated systemic sepsis should be sought, and if present treated according to the 'Sepsis Six' pathways. Blood cultures and viral swabs should be taken, and appropriate antibiotic therapy given.

Circulation: immediate intravenous access should be obtained and haemodynamic compromise then addressed. Continuous blood pressure and ECG monitoring with oximetry is essential to monitor progress in acutely unwell patients. As arrhythmias can cause breathlessness, patients should be assessed for associated features of chest pain, altered mental state, signs of cardiac failure and hypotension. Arrhythmias should be managed according to current guidelines. Cardiac ischaemia can be silent with no chest pain and present only as breathlessness (especially in patients with diabetes). An urgent ECG should be performed as this may show ischaemic change, axis change or arrhythmia and guide diagnosis and subsequent management.

Pulsus paradoxus is an exaggerated inspiratory fall of the systolic blood pressure (>10 mmHg). It is not easily elicited but can be a worrying sign when seen in severe asthma or cardiac tamponade. With cardiac tamponade, there can be associated hypotension, tachycardia with an elevated jugular venous pressure (that rises further with inspiration) and diminished heart sounds or a pericardial rub (Kussmaul's sign). If it is suspected, urgent echocardiography with drainage of the effusion is indicated.

Acute pulmonary embolus often presents with breathlessness, and a computed tomography pulmonary angiogram (CTPA) is the investigation of choice. All patients should be treated immediately; patients with suspected massive or sub-massive pulmonary embolus may require thrombolysis.⁴ These should always be conducted with the involvement of a senior specialist in a high-dependency setting.

Further assessment of stable patients

In patients who have been stabilized or are less acutely unwell, a detailed history of the presenting complaint should be explored. This should include pre-existing cardiac or pulmonary disease and standard questions about the onset and duration of the breathlessness, whether it occurs on exertion or at rest, and whether orthopnoea or paroxysmal nocturnal dyspnoea is present.³

Additional cardiorespiratory questions should be completed on cough, sputum, fever, chest pain, pleurisy, haemoptysis and oedema. A smoking history should be included. Non-cardiopulmonary causes of breathlessness are rare, but underlying neurodegenerative disease (e.g. motor neurone disease) can present with breathlessness (related to increased effort).

On examination, special attention should be paid to the cardiorespiratory system, but supported by a full physical examination. Anxiety or hyperventilation can cause a sensation of breathlessness, but the physician should ensure that other causes of lung disease are ruled out before making such a diagnosis, and this should not be made routinely in the acute setting. These patients often require specialist referral (Figure 1).

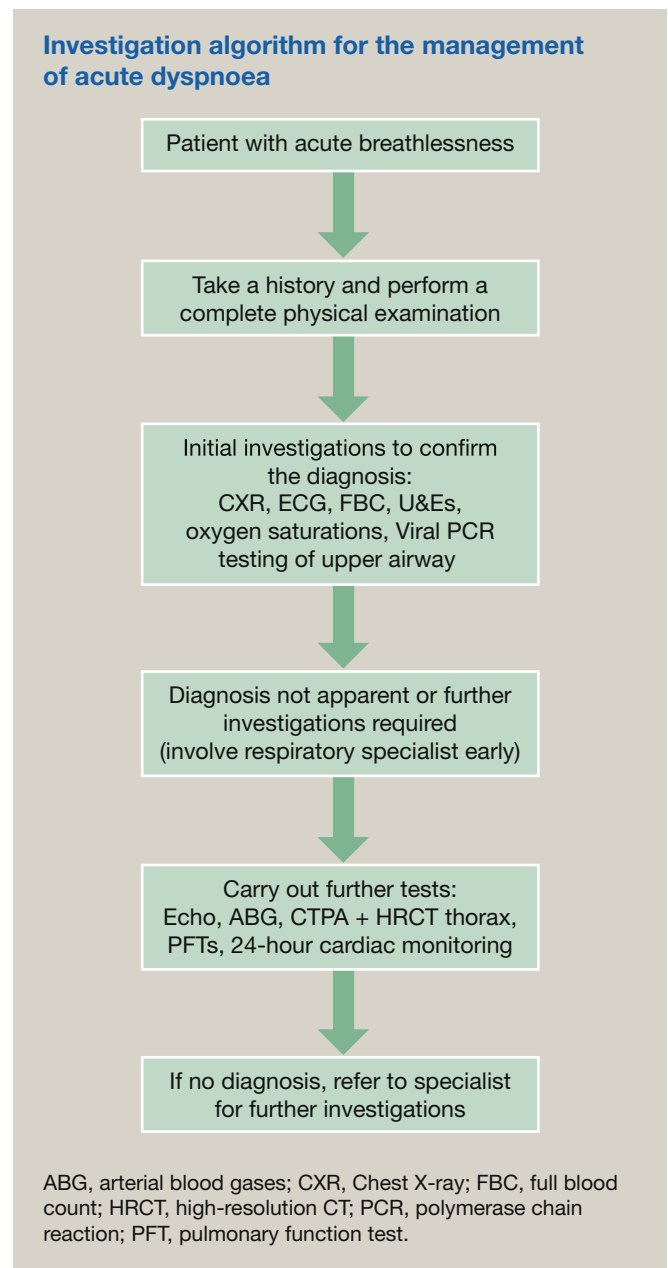


Figure 1

Cough

Definition

Cough is 'a forced expulsive manoeuvre, usually against a closed glottis, which is associated with a characteristic sound'. It is a protective reflex to help keep the airways clear or to expel an aspirated foreign body. Acute cough is defined as lasting <3 weeks, whereas chronic cough is one that persists beyond 8 weeks. The 'grey' area in between is often termed 'subacute cough'.

Pathophysiology

Cough receptors are present in the larynx, carina and branching points of the proximal airways, and are triggered by mechanical or chemical irritants. Afferent nerves carry information to the cough centre in the brainstem. Efferent outflow leads to rapid inspiration and rise in intrapleural pressure, resulting in a forced expiration that expels any foreign matter. Patients with chronic cough often demonstrate a hypersensitive cough reflex that probably relates to increased sensitivity of the receptors in the upper or lower airways, or to changes in brainstem processing. A poor cough reflex leads to atelectasis of lung sub-segments and predisposes to recurrent infection. Conversely excessive or vigorous coughing can result in complications including urinary incontinence, hernia or rib fracture. The cough reflex can in part be controlled voluntarily to either produce or suppress a cough.

Epidemiology

Cough is one of the most common reasons for patients consulting their general practitioner. However, except as part of a symptom complex, cough was not a common presentation in acute medical settings until 2020 with the emergence of the COVID-19 coronavirus pandemic. The economic burden of cough is huge, based on the cost of consultations, lost days of work and over-the-counter preparations sold (the total estimated overall cost to the UK being around £1 billion).

Aetiology

Acute cough is usually the result of a viral upper or lower respiratory tract infection and is self-limiting. The common causes of chronic cough with a clear chest X-ray are smoking, asthma, postnasal drip and gastro-oesophageal reflux disease. Other conditions that present with cough are potentially serious and should be excluded during clinical assessment (Table 4).

Assessment of acute cough

Cough in the acute setting is often part of an acute symptom complex, such as an influenza-like syndrome, or a manifestation of a coronavirus infection, with patients presenting with fever, upper airways symptoms, myalgia and cough.⁵ It is important to elicit associated worrying symptoms that merit further assessment. In particular, patients with associated haemoptysis, breathlessness, fever, chest pain or weight loss require a chest X-ray. Serious conditions associated with an isolated acute cough include neoplasms, tuberculosis, foreign body inhalation and interstitial lung disease. Patient

Causes of cough

Causes of cough	Examples
Respiratory	Viral (e.g. COVID-19) or bacterial infection, bronchospasm, COPD or chronic bronchiolitis, malignancy, interstitial lung disease, pleural disease, bronchiectasis
Upper airways disease	Postnasal drip, sinusitis, hyperreactive upper airways syndrome
Cardiovascular disease	Left ventricular failure with pulmonary oedema, mitral stenosis (with elevated pulmonary venous pressures)
Gastro-oesophageal disease	Gastro-oesophageal reflux disease
Neurological disease	Recurrent microaspiration
Drugs and irritants	Angiotensin-converting enzyme inhibitors, cigarette smoke

Table 4

groups at greater risk include current or ex-smokers, individuals who are immunosuppressed and contacts of patients with pulmonary tuberculosis. Those with suspected foreign body inhalation should be referred for further specialist review and bronchoscopy by a thoracic or ear, nose and throat surgeon.

If there are no significant associated symptoms or worrying findings, patients can usually be reassured that the cough is viral in origin and will be self-limiting, usually within 3 weeks (although post-viral cough can take longer to settle). Take the opportunity to advise smokers to quit. Antibiotics are generally not indicated, but over-the-counter preparations can offer symptomatic relief. Patients should be advised to return if the cough persists or they develop associated worrying symptoms. ◆

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TEST YOURSELF

To test your knowledge based on the article you have just read, please complete the questions below. The answers can be found at the end of the issue or online [here](#).

Question 1

A 36-year-old woman presented as an emergency with a 2-day history of cough and chest pain. She had a 20 pack-year smoking history and was taking an oral contraceptive pill. On clinical examination, her temperature was 37.4°C, heart rate 112 beats/minute, blood pressure 110/60 mmHg, and oxygen saturations 92% on air.

What is the most likely diagnosis?

- A. Gastro-oesophageal reflux
- B. Lower respiratory tract infection
- C. Myocardial infarction
- D. Pulmonary embolism
- E. Spontaneous pneumothorax

Question 2

A 79-year-old man presented acutely with severe shortness of breath and inability to move around the house. He had chronic obstructive pulmonary disease and had recently developed weakness and a productive cough with green sputum. He had a 60 pack-year smoking history.

On clinical examination, his heart rate was 120 beats/minute, blood pressure 110/65 mmHg respiratory rate 28/min, and oxygen saturations 82% on air. There were reduced breath sounds with widespread wheeze and left basal crackles.

What initial oxygen therapy should be prescribed?

- A. High-flow oxygen and then titrate down to maintain oxygen saturations at 88–92%
- B. Check arterial blood gas values on air to see how much oxygen he needs
- C. A Venturi mask with an F_iO_2 of 24%
- D. A Venturi mask with an F_iO_2 of 36% to titrate the oxygen
- E. Oxygen via nasal cannulae at 4 litres/minute to maintain saturations at 94–98%

Question 3

A 75-year-old woman presented with a history six months of increasing breathlessness on exertion.

On examination, she had a pulse rate of 78 beats per minute, which was irregularly irregular in character, and a blood pressure of 115/69 mmHg. On auscultation there was an audible diastolic murmur.

Which of the following is the most likely cause of her murmur?

- A. Mitral regurgitation
- B. Hypertrophic cardiomyopathy
- C. Mitral stenosis
- D. Aortic regurgitation
- E. Aortic stenosis