Abnormal breathlessness is a common symptom with a wide variety of causes and it can be quite a challenge to diagnose the cause and plan appropriate treatment. Practice nurses are often the first point of contact for patients with these conditions and play an important role as part of the multidisciplinary healthcare team. This article completes a series of three on causes of breathlessness ('The breathless patient: is it asthma or COPD?' Vol 2, Issue 1, December 2007 and 'Respiratory causes of breathlessness.' Vol 2, Issue 2, March 2008).

Abnormal breathlessness is a common symptom and a number of terms are used to describe it (Table 1). It can indicate a wide variety of conditions affecting a number of systems and can be due to:
- Respiratory disease
- Cardiovascular disease/dysfunction and circulatory disorders
- Neurological disease
- Systemic disorders
- Psychological problems
- Lifestyle factors.

A number of processes are needed for efficient respiration (Box 1). This article describes some of the common, non-respiratory conditions encountered in general practice and discusses how they can affect these processes.

### Diagnosis

**NON-RESPIRATORY CAUSES OF BREATHLESSNESS**

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### Box 1. Requirements for efficient respiration

1. Clear passage of air through an unobstructed upper and lower respiratory tract.
2. Co-ordinated, effective movement of respiratory muscles and efficient ventilation of the lungs.
3. Effective exchange of gas across the alveolar membrane.
4. Uptake of oxygen by haemoglobin.
5. An efficient circulatory system able to deliver oxygen to the tissues.
6. Functioning homeostatic controls.

### Table 1: Terms used to describe abnormal breathlessness

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyspnoea</td>
<td>Awareness of increased respiratory effort that is perceived as unpleasant or inappropriate</td>
</tr>
<tr>
<td>Tachypnoea</td>
<td>Increased breathing rate</td>
</tr>
<tr>
<td>Hyperpnoea</td>
<td>Increased rate and depth of breathing</td>
</tr>
<tr>
<td>Orthopnoea</td>
<td>Breathlessness when lying down</td>
</tr>
<tr>
<td>Paroxysmal nocturnal dyspnoea</td>
<td>Being woken at night by breathlessness</td>
</tr>
</tbody>
</table>

**There are many reasons for abnormal breathlessness and frontline health professionals need to consider all possible causes, not solely those conditions with which they are most familiar.**
Pulse oximeters should be widely available in all medical settings. An SpO2 < 92% is abnormal. A brief clinical history will often give clues as to the most likely cause and indicate whether immediate transfer to hospital is needed.

CARDIOVASCULAR AND CIRCULATORY CAUSES
The cardiovascular and respiratory systems are closely linked. Cardiovascular and respiratory diseases can look very similar and be difficult to differentiate. Many patients with chronic respiratory disease (particularly chronic obstructive pulmonary disease) have co-morbid cardiovascular disease.

Heart failure
Heart failure is caused by conditions that interfere with the pump mechanism or electrical activity of the heart. The most common causes are coronary heart disease and hypertension, but it can also be caused by rhythm disturbances, valve disease and cardiomyopathy. Left ventricular systolic dysfunction, when the left ventricle fails to pump effectively during the systolic phase of the cardiac cycle, is the most well-understood type of heart failure. The management of diastolic heart failure, where the heart fails to fill properly during the diastolic phase of the cardiac cycle, is less well defined.

When the left ventricle fails to pump effectively, pressure in the pulmonary circulation rises. Fluid leaks out of the pulmonary vasculature into the lungs, leading to pulmonary oedema. Oedematous lungs are unable to exchange gas efficiently and are stiffer and less elastic. Lying down compounds the problems and worsens the breathlessness.

In summary, heart failure causes abnormal breathlessness by:
- Interfering with gas exchange in the lungs
- Disrupting efficient ventilation of the lungs
- Reducing the efficiency of the circulation and delivery of oxygen to the tissues.

The presenting symptoms therefore include breathlessness on exertion, orthopnoea, peripheral oedema and fatigue.

Acute left ventricular failure (LVF) causes acute-onset, very severe, rapidly worsening breathlessness. A key clinical feature is orthopnoea. The clinical features, causes and emergency management are summarised in Table 2. It is a medical emergency.

### Acute myocardial infarction
An acute myocardial infarction (MI) can disrupt normal pumping of the heart and lead to acute and severe breathlessness. MI is typically associated with severe, crushing, central chest pain, but in some patients, particularly diabetics and the elderly, may cause only mild ‘indigestion’ or be completely ‘silent’. In such patients acute-onset breathlessness may be the main, or only presenting symptom.

### Cardiac dysrhythmias
Dysrhythmias can be medical emergencies (Box 2). Supraventricular tachycardia causes an abnormally fast heart rate (typically 140-180 bpm, but up to 300 bpm). Typically it produces palpitations, but it can also present with acute breathlessness and chest pain.

### Pulmonary embolism
Pulmonary embolism is usually caused by a blood clot in the major veins of the leg or abdomen that has moved to the lungs along the inferior vena cava. The main risk factors include:
- Immobility (particularly following surgery)
- Recent trauma
- Pregnancy
- Combined oral contraception or hormone replacement therapy.

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**Table 2: Clinical features and causes of acute left ventricular failure**

<table>
<thead>
<tr>
<th>Clinical features of acute LVF</th>
<th>Causes of acute LVF</th>
<th>Immediate management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudden-onset and rapidly increasing dyspnoea</td>
<td>Coronary heart disease</td>
<td>High-flow oxygen</td>
</tr>
<tr>
<td>Wheezing</td>
<td>Rheumatic heart disease</td>
<td>Emergency transfer to hospital</td>
</tr>
<tr>
<td>Profuse sweating</td>
<td>Congenital heart disease</td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>Hypertension</td>
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<td></td>
<td>High altitude</td>
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</tbody>
</table>

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**Box 2: Red flags for life-threatening cardiac dysrhythmias**

- Possible imminent cardiac arrest
- Reduced level of consciousness
- Pulmonary oedema
- Systolic BP < 80 mmHg
- If the pulse rate is over 150 bpm emergency cardioversion may be required
- If the pulse rate is less than 50 bpm IV atropine may be needed. If this fails cardiac pacing is indicated.
Blockage of a pulmonary blood vessel causes infarction of lung tissue and disruption of gas exchange in the area of the lung served by that blood vessel. The symptoms of a minor embolism are pleuritic pain over the affected area and mild breathlessness. The SpO2 is always reduced in major embolism, but a normal SpO2 does not exclude a minor embolism. Recurrent minor embolism can lead to chronic, progressive breathlessness.

An acute, major pulmonary embolism causes blockage of the main pulmonary arteries, depriving the heart of oxygenated blood. Breathlessness is extremely severe and acute, and sudden death is a frequent outcome.

If you suspect pulmonary embolus the patient must be urgently assessed in hospital. (Box 3).

**Box 3: Red flags for potential pulmonary embolus**
- Acute-onset dyspnoea
- Sudden-onset pleuritic pain
- Presence of risk factors for thromboembolism, eg trauma or recent surgery, immobility etc.

**NEUROLOGICAL CAUSES**

There are a host of neurological diseases that can cause weakness of the respiratory muscles, inefficient ventilation of the lungs and therefore breathlessness. Respiratory failure is often the cause of death in patients with chronic, progressive neurological disease. Breathlessness is associated with symptoms of the underlying neurological problem.

Examples of neurological diseases causing breathlessness include:
- Myasthenia gravis
- Lower motor neurone disease
- Muscular dystrophy
- ‘Old’ poliomyelitis
- Guillain-Barré syndrome.

**SYSTEMIC CAUSES**

Anaemia

Haemoglobin is needed to transport oxygen from the lungs to the tissues. If haemoglobin is deficient the body will not be able to respond to increased demand for oxygen during exercise and abnormal breathlessness on exertion will result. Severe anaemia can also lead to heart failure, compounding the breathlessness.

The main clinical sign is pallor, but this is a somewhat subjective clinical finding. A full blood count is a readily available method of excluding this.

**Diabetic ketoacidosis**

Diabetic ketoacidosis interferes with normal homeostatic control mechanisms and breathlessness can be associated with it. Ketoacidosis can be the presenting symptom of type 1 diabetes, but it is also seen in known diabetics who have stopped their insulin or whose diabetes is poorly controlled because of concomitant infection or illness.

Lack of insulin prevents normal energy production through the metabolism of glucose. In order to provide the energy necessary for normal physiological function the body compensates by metabolising lipids. Lipid metabolism produces ketones. These are acidic and accumulate in the blood, producing a metabolic acidosis. Acidosis acts as a respiratory stimulant and the rate and depth of respiration increase in an attempt to ‘blow off’ carbon dioxide and reduce the acidity of the blood.

Breathlessness in diabetic ketoacidosis is usually associated with:
- Nausea and vomiting
- A typical ‘acid drop’ smell on the breath
- Severe abdominal pain
- Dehydration.

**Hypothyroidism**

Hypothyroidism is a rare but easily overlooked cause of breathlessness. Excess thyroid hormone increases the metabolic rate and interferes with normal homeostatic mechanisms. It affects five times more women than men, with a prevalence of 2-5% of women 20-40 years old. The clinical features include:
- Increased appetite, but with weight loss
- Intolerance of heat
- Cardiac arrhythmia – particularly atrial fibrillation
- Muscle weakness
- Tremor
- Breathlessness, particularly on exertion

Hypothyroidism due to Graves’ disease (an autoimmune disorder) is also associated with prominent eyes.

**PSYCHOLOGICAL CAUSES**

**Panic attacks**

The natural response to fear is to increase the heart and respiratory rate in order to fight or run away (the fight or flight response). However, this physiological response can also occur when there is no real danger – a panic attack. Panic attacks often occur in response to a psychological trigger, such as a phobia, but can also occur for no obvious reason. Panic attacks are quite common. One in every ten people experience an attack at some point in their lives.

Breathlessness is one of the main presentations, but other symptoms can include:
- Palpitations
- Chest pain
- Throat tightness and choking sensations
- Nausea
- Dizziness, numbness or tingling
- Sweating or hot flushes
- Catastrophic thoughts (such as thinking you are about to die, have a heart attack etc.).

Panic attacks can be very frightening, even though the physical symptoms are actually harmless, and the fear perpetuates and escalates the symptoms.

**Dysfunctional breathing**

Dysfunctional breathing and chronic hyperventilation were mentioned in the second article in this series (B) PCN Resp March 2008, Vol 2, Issue 2). Chronic hyperventilation reduces the flow of blood to the heart and the brain, resulting in cardiac and neurological symptoms. It can also lead to gastrointestinal symptoms as a result of mouth breathing and swallowing air. The increased respiratory rate is less marked than occurs in a panic attack and most patients are unaware of it. They often think they have a serious organic disease and their chronic hyperventilation may be related to anxiety about their condition.
LIFESTYLE CAUSES

Obesity

Obesity is an obvious cause of breathlessness on exertion. Moving excess weight around increases the demand for oxygen. In addition, fat in the abdominal cavity and excess fat on the chest wall restricts movement of the respiratory muscles and adversely affects ventilation. People with a Body Mass Index >30 are at risk of obesity hypoventilation syndrome. This is characterised by reduced lung volumes and ventilation and can lead to chronic respiratory failure.

SUMMARY

In recent years practice nurses have taken on extended roles in the diagnosis and care of patients with long-term conditions and have often become the first point of contact for patients. There are many reasons for abnormal breathlessness and front-line health professionals need to consider all possible causes, not solely those conditions with which they are most familiar. For practice nurses taking on these extended roles good, practical protocols, the support of medical colleagues and easy communication and team work with all members of the multidisciplinary primary healthcare team are essential.