How to ensure patient observations lead to prompt identification of tachypnoea

Tachypnoea is one of the first signs of patient deterioration. To prevent further decline it is essential to know how to assess and manage a high respiratory rate.

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Tachypnoea is one of the first signs of patient deterioration and accurate measurement of respiratory rate is a fundamental part of assessment. This article aims to describe the assessment and management of tachypnoea.

A normal respiratory rate is 12-20 breaths per minute in adults (Resuscitation Council UK, 2006). Tachypnoea is defined as a fast respiratory rate, that is, greater than 20 breaths per minute (Resuscitation Council UK, 2006). It can be a normal physiological response, for example, during strenuous exercise, but in the healthcare setting it is usually one of the first signs of patient deterioration (Jevon, 2009a).

Accurately measuring respiratory rate is a fundamental part of patient assessment and an important baseline observation. It is a main component of the Resuscitation Council UK’s systematic airway, breathing, circulation, disability, exposure (ABCDE) approach to the assessment of critically ill patients (Resuscitation Council UK, 2006). Nurses are expected to be competent in the accurate measurement and interpretation of respiratory rate (Department of Health, 2008) but monitoring of this vital sign is poor (National Patient Safety Agency, 2007).

Local policies should reinforce the importance of measuring respiratory rate, and early warning scoring (EWS) systems should identify patients who develop tachypnoea to be at risk of deterioration (unless proven otherwise) (NICE, 2007).

RELATED PHYSIOLOGY

Breathing or respiration is the process whereby air passes into the lungs so the blood can absorb oxygen and excrete carbon dioxide and water. Fig 1 shows the structure of the respiratory system. Breathing is controlled by the respiratory centre in the medulla oblongata in the brain. Higher centres in the cerebral hemispheres can voluntarily control respiratory rate so that breathing can temporarily stop, slowed or increased (Marcovitch, 2005). The respiratory centre generates the basic rhythm of breathing; the depth and rate can be altered in response to the body’s requirements, mainly by nervous and chemical control (Dougherty and Lister, 2008).

Nervous control of breathing

Nervous control of breathing is via the phrenic and intercostal nerves, which activate the diaphragm and intercostal muscles respectively. Stretch receptors in the thoracic wall generate inhibitory nerve impulses once the lungs have inflated (Hering-Breuer reflex), which are then transmitted to the respiratory centre via the vagus nerve (Waugh and Grant, 2006). Pain, emotion and anxiety can lead to an increase in respiratory rate.

Chemical control of breathing

Generally, the effects of chemoreceptors are to increase ventilation in response to:

- Hypercapnia (high levels of carbon dioxide);
- Hypoxaemia (low levels of oxygen);
- Acidosis (Shahid and Nunhuck, 2008). Peripheral chemoreceptors (in the carotid and aortic bodies) mainly respond to hypoxaemia, while central chemoreceptors (on the surface of the medulla oblongata) mainly respond to hypercapnia.

Hypercapnia is the main respiratory drive. Hypoxia is the respiratory drive for people with chronic respiratory disease such as emphysema and chronic obstructive pulmonary disease (COPD). This is sometimes referred to as hypoxic drive rather than hypercapnia. Administering high concentrations of supplementary oxygen to this group may lead to respiratory depression and even respiratory arrest.

Those who need to increase respiratory effort will use their accessory muscles of respiration (sternocleidomastoid muscles), together with the diaphragm and intercostal muscles, to maximise the capacity of the thoracic cavity (Waugh and Grant, 2006). The use of accessory muscles of respiration is an indication that patients may be in respiratory distress.

CLINICAL SIGNS OF CRITICAL ILLNESS

Regardless of the cause, the clinical signs of critical illness are usually similar because they reflect a compromise of the respiratory, cardiovascular and neurological functions (Nolan et al, 2005). These are usually:

- Tachypnoea;
- Tachycardia;
- Hypotension;
- Altered level of consciousness (indicated by lethargy, confusion, restlessness or falling level of consciousness) (Resuscitation Council UK, 2006).

Tachypnoea is the most common clinical abnormality found in critical illness (Goldhill and McNarry, 2004). It is an important
Measurement of respiratory rate is central to the comprehensive ABCDE assessment of patients who are critically ill. Tachypnoea can result from a problem with A, B, C, D or E, but a description of all aspects of the assessment is beyond the scope of this article. However, it is helpful to describe the assessment of B (breathing).

When assessing breathing, follow the look, listen and feel approach (see Box 2).

Managing Patients
Assess patients following the ABCDE approach to ascertain whether they are critically ill and ensure appropriate help is called if necessary:

- Establish oxygen saturation monitoring;
- Ensure patients have a clear airway;
- Ideally, sit them upright (to maximise chest movement);
- If patients are critically ill, administer at least 10L of oxygen via a non-rebreathing mask (Resuscitation Council UK, 2006; Thoracic Society, 2008a) has published guidance on the use of emergency oxygen in adults, which have been endorsed by the National Patient Safety Agency (2009). Arterial blood gas analysis is important in sick patients and particularly those with chronic respiratory disease;

- Attempt to establish the cause of the tachypnoea. If possible, treat the underlying cause, for example, administer nebulised salbutamol to those having a severe asthma attack. Monitor the response to treatment;

- Monitor patients’ vital signs and complete an EWS chart following local policies. It is important to adjust the frequency of the EWS observations as appropriate for individuals, following local protocols.

In Depth Assessment
It is sometimes appropriate to assess the extent of breathlessness and how it affects activities of daily living. This will help identify existing and/or undiagnosed respiratory problems. Ask patients if they become breathless when at rest, talking, eating, dressing, walking upstairs/uphill.

The following questions explore underlying factors that may indicate respiratory disease (Docherty and McCallum, 2009; Jevon, 2009a);

- Do you smoke? If so, how many cigarettes do you smoke per day?
- Does your position affect your breathing? Orthopnoea and having to sleep in an upright position propped up with pillows suggests a cardiac cause for breathlessness;

- Do you live in a damp home?

CAUSES OF TACHYPROEA
There are many causes of tachypnoea, including anxiety, emotional distress, pain, fever and exercise. It is also a common finding in many acute illnesses, including:

- Asthma;
- Pulmonary embolism;
- Pneumonia;
- Acute respiratory distress syndrome;
- Anaphylaxis;
- Heart failure;
- Shock.

Nurses must be familiar with the common causes of this condition (DH, 2008). Indications for measuring respiratory rate are listed in Box 1.

Indications for Measuring Respiratory Rate
Indications include:

- Critical illness: it is an important component of the airway, breathing, circulation, disability, exposure (ABCDE) approach;
- Ascertaining a baseline respiratory rate for comparison;
- Monitoring changes in oxygenation or in respiratory rate;
- Evaluating response to treatment, for example, following administration of a beta₂ agonist in the treatment of asthma.

Sources: Docherty and McCallum (2009); Dougherty and Lister (2008); Jevon and Ewens (2007)
practice review

BOX 2. MEASUREMENT OF RESPIRATORY RATE

To assess breathing:

- Note patients’ general appearance: breathless people usually look anxious;
- Observe their colour: central cyanosis is a severe adverse sign;
- Talk to patients: breathless people may experience difficulty talking (being unable to complete sentences in one breath is considered a severe adverse sign during an asthma attack) (British Thoracic Society, 2008a);
- Count the respiratory rate;
- Look at patients’ posture: for example, those sitting upright supported by pillows may suffer from orthopnoea (shortness of breath when lying flat);
- Evaluate chest movement: chest movement should be symmetrical; unilateral chest movements suggest unilateral pathology, for example, pneumothorax, pneumonia, pleural effusion (Smith, 2003). Observe for use of accessory muscles of respiration, as this may indicate respiratory distress;
- Evaluate depth of breathing: only marked degrees of hyperventilation and hypoventilation can be detected; hyperventilation is associated with metabolic acidosis or anxiety and hypoventilation may be seen in opioid toxicity (Ford et al, 2005);
- Evaluate respiratory pattern: Cheyne-Stokes breathing pattern (periods of apnoea alternating with periods of hyperpnoea) is associated with brain stem ischaemia, cerebral injury or severe left ventricular failure (Ford et al, 2005);
- Note the oxygen saturation (SaO2) reading: normal is usually considered to be 97-100%. A low SaO2 could indicate respiratory distress or compromise;
- Listen to the breathing: normal breathing is quiet. Rattling airway noises indicate the presence of airway secretions, because patients are unable to cough sufficiently or are unable to take in a deep breath (Smith, 2003). The presence of stridor or wheeze indicates partial, but significant, airway obstruction;
- Feel for signs of breathing: in some situations it is necessary to feel for signs of breathing to help confirm whether patients are breathing normally or not.

Some senior nurse practitioners may undertake additional respiratory assessment and:

- Check the position of the trachea: deviation of the trachea to one side indicates mediastinal shift (pneumothorax, lung fibrosis or pleural fluid);
- Palpate the chest wall: to detect surgical emphysema or crepitus (suggesting a pneumothorax until proven otherwise) (Smith, 2003);
- Percuss the chest: abnormal percussion notes can indicate pathology;
- Auscultate the chest: to detect air entry and additional sounds such as wheeze (indicating narrowing of the airways associated with, for example, asthma) and crackles (usually indicates excessive fluid in the airways associated with conditions such as pulmonary oedema) (Jevon, 2009a, 2009b; Resuscitation Council UK, 2006).

During the assessment of breathing, it is important to quickly diagnose and treat any life threatening breathing problems such as acute asthma (Resuscitation Council UK, 2006).

REFERENCES

British Thoracic Society (2008a) BTS guideline for emergency oxygen use in adults patients. Thorax; 63(Suppl 6), 1-68. tinyurl.com/bts-emergency-oxygen

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