Airway management for nurses: emergency assessment and care

Ray Higginson, Bridie Jones, Kevin Davies

Abstract

Within the hospital environment patients can deteriorate rapidly and for many different reasons. Maintaining a patient’s breathing is the main priority in any emergency situation—although achieving airway control can be difficult. All health professionals need to be able to safely undertake airway management and the key to the management of an airway is through a thorough assessment, to firstly ensure whether the airway is patent or not. This article will discuss airway management—both acute and chronic—as well as associated nursing care.

Key Words: Airway assessment ■ Airway management ■ Critical care

A compromised airway can be maintained by using an artificial airway, such as a Guedel airway. A severely compromised airway can be treated by intubation and, in certain circumstances, cricothyroidotomy and emergency tracheotomy.

For the critically ill trauma patient, cervical spine protection is paramount throughout the airway management process until radiologically cleared.

The quick assessment of whether an airway is clear or not is to ask the patient a question. A normal verbal response from the patient immediately informs the assessor that the patient has a patent airway, is breathing and is perfusing his/her brain (Oh et al, 2003). If the patient can only speak in short sentences or with one or two words, then he/she is in respiratory distress and requires a further in-depth assessment of respiratory function.

Breathing assessment

Breathing assessment is required to ascertain the patient’s ability to adequately ventilate. The first step is to observe the patient and simply watch how they breathe. In medical terms this aspect of assessment is termed ‘inspection’, with medical colleagues adopting a logical progression of inspection, palpation, percussion and auscultation. What this means for nurses is observe (look), feel and listen.

Observations

When assessing a patient’s respiratory system, it is important that the nurse makes a number of important observations (Table 1). The nurse should look for effective, equal and bilateral chest wall expansion without any paradoxical movements. Paradoxical movements might include:

■ Observing only one side of the chest moving up and down
■ Greater movement of one side of the chest when compared with the other
■ One side of the chest moving up and the other side moving down.

Any asymmetrical chest expansion is abnormal and any form of unilateral lung or pleural disease can cause this asymmetry of the chest. Furthermore, any of these observations might indicate respiratory disease/pathology.

When undertaking a respiratory assessment it is not only important to consider the above, but also to perform checks for and record any vital signs.

Airway assessment

The ability to place and maintain a secure airway in a variety of patients and clinical circumstances represents an obligatory skill for critical care staff (Reynolds and Heffner, 2005).

Airway assessment should ascertain whether there is any airway obstruction such as foreign bodies, vomit or tongue. Facial, mandible and laryngeal fractures should also be assessed for. See Figure 1 for a diagram of airway anatomy.

In the event that a patient’s airway is closed, the most effective method to open it is the head tilt, chin lift approach. Place one hand on the patient’s forehead, and apply firm, backward pressure with the palm of your hand. This will cause the patient’s head to tilt back. Place the fingertips of your other hand under the bony part of the chin; lift the chin with your fingertips and lift the mandible upward and outward. However, it must be noted that this procedure is not to be performed if a neck injury is suspected. In such a case, seek senior medical assistance.

A patient with a blocked airway will die quickly, so it is vital that all nurses (especially those working on the intensive care unit) have appropriate airway management skills. Airway management must come first in an emergency situation and must not be attempted until the airway is patent. Many airway problems can be dealt with effectively with the use of simple techniques. Before attempting to secure a patient’s airway, it is first necessary to perform a respiratory assessment, even if this is brief, because any airway management strategy used will need to be appropriate and patient-specific.

Ray Higginson is Senior Lecturer in Critical Care Physiology; Bridie Jones is Senior Lecturer in A&E Nursing; and Kevin Davies is Principal Lecturer, Disaster Healthcare, University of Glamorgan

Accepted for publication: August 2010

Abstract

Within the hospital environment patients can deteriorate rapidly and for many different reasons. Maintaining a patient’s breathing is the main priority in any emergency situation—although achieving airway control can be difficult. All health professionals need to be able to safely undertake airway management and the key to the management of an airway is through a thorough assessment, to firstly ensure whether the airway is patent or not. This article will discuss airway management—both acute and chronic—as well as associated nursing care.

Key Words: Airway assessment ■ Airway management ■ Critical care

A compromised airway can be maintained by using an artificial airway, such as a Guedel airway. A severely compromised airway can be treated by intubation and, in certain circumstances, cricothyroidotomy and emergency tracheotomy.

For the critically ill trauma patient, cervical spine protection is paramount throughout the airway management process until radiologically cleared.

The quick assessment of whether an airway is clear or not is to ask the patient a question. A normal verbal response from the patient immediately informs the assessor that the patient has a patent airway, is breathing and is perfusing his/her brain (Oh et al, 2003). If the patient can only speak in short sentences or with one or two words, then he/she is in respiratory distress and requires a further in-depth assessment of respiratory function.

Breathing assessment

Breathing assessment is required to ascertain the patient’s ability to adequately ventilate. The first step is to observe the patient and simply watch how they breathe. In medical terms this aspect of assessment is termed ‘inspection’, with medical colleagues adopting a logical progression of inspection, palpation, percussion and auscultation. What this means for nurses is observe (look), feel and listen.

Observations

When assessing a patient’s respiratory system, it is important that the nurse makes a number of important observations (Table 1). The nurse should look for effective, equal and bilateral chest wall expansion without any paradoxical movements. Paradoxical movements might include:

■ Observing only one side of the chest moving up and down
■ Greater movement of one side of the chest when compared with the other
■ One side of the chest moving up and the other side moving down.

Any asymmetrical chest expansion is abnormal and any form of unilateral lung or pleural disease can cause this asymmetry of the chest. Furthermore, any of these observations might indicate respiratory disease/pathology.

When undertaking a respiratory assessment it is not only important to consider the above, but also to perform checks for and record any vital signs.

Airway assessment

The ability to place and maintain a secure airway in a variety of patients and clinical circumstances represents an obligatory skill for critical care staff (Reynolds and Heffner, 2005).

Airway assessment should ascertain whether there is any airway obstruction such as foreign bodies, vomit or tongue. Facial, mandible and laryngeal fractures should also be assessed for. See Figure 1 for a diagram of airway anatomy.

In the event that a patient’s airway is closed, the most effective method to open it is the head tilt, chin lift approach. Place one hand on the patient’s forehead, and apply firm, backward pressure with the palm of your hand. This will cause the patient’s head to tilt back. Place the fingertips of your other hand under the bony part of the chin; lift the chin with your fingertips and lift the mandible upward and outward. However, it must be noted that this procedure is not to be performed if a neck injury is suspected. In such a case, seek senior medical assistance.

A patient with a blocked airway will die quickly, so it is vital that all nurses (especially those working on the intensive care unit) have appropriate airway management skills. Airway management must come first in an emergency situation and must not be attempted until the airway is patent. Many airway problems can be dealt with effectively with the use of simple techniques. Before attempting to secure a patient’s airway, it is first necessary to perform a respiratory assessment, even if this is brief, because any airway management strategy used will need to be appropriate and patient-specific.

Ray Higginson is Senior Lecturer in Critical Care Physiology; Bridie Jones is Senior Lecturer in A&E Nursing; and Kevin Davies is Principal Lecturer, Disaster Healthcare, University of Glamorgan

Accepted for publication: August 2010
Vital signs
An assessment of the vital signs provides essential physiological information about patients. Impending critical illness and respiratory compromise can alter these signs. For example:
- Increased temperature (indications for pneumonia, increase in the work of breathing)
- Increased pulse (cardiovascular to respiratory disease)

Table 1. Respiratory observations

<table>
<thead>
<tr>
<th>Colour</th>
<th>The colour of the patient’s skin and mucus membranes is a useful indicator of haemoglobin saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pursed lips</td>
<td>A sign of respiratory compromise. The patient appears to pucker or purse his/her lips, as if he/she is going to whistle</td>
</tr>
<tr>
<td>Flared nostrils</td>
<td>Flaring of nostrils is another sign of respiratory distress</td>
</tr>
<tr>
<td>Ability to speak</td>
<td>Increased effort to speak and/or inability to speak, as well as only being able to speak in monosyllables</td>
</tr>
<tr>
<td>Use of accessory muscles</td>
<td>A patient who is in respiratory distress uses additional muscles to breathe. These include sterno-mastoid, scalene and abdominal muscles. With advanced training the nurse should be able to assess whether a patient is using these additional muscles or not</td>
</tr>
<tr>
<td>Rate, rhythm and depth of breathing</td>
<td>Nurses should assess whether the patients’ respiratory rate is above or below normal level. In an emergency situation, it is difficult to assess lung volumes, so observing the depth of breathing is an important indicator</td>
</tr>
<tr>
<td>Shape and expansion of chest</td>
<td>When performing a respiratory assessment it is important to consider both the shape and expansion of the chest. For example, the anteroposterior (AP) diameter may change for a number of reasons and not just because of an underlying respiratory problem</td>
</tr>
</tbody>
</table>

Oxygen saturation monitoring
An effective way to monitor for hypoxaemia is to use a pulse oximeter. This is a good bedside monitor, but its limitations should be recognized. A pulse oximeter is a continuous and non-invasive monitor. Its principal limitation is that, in patients who are receiving supplemental oxygen, it will not reliably detect hypoventilation. In the clinical environment, hypoventilation must be confirmed by measurement of the PaCO₂ by arterial blood gas analysis. PaCO₂ (partial pressure of carbon dioxide) is the amount of carbon dioxide gas dissolved in the plasma.

The amount of carbon dioxide expelled from the lungs can be measured using an end-tidal CO₂ monitor. The normal end-tidal value is approximately 40 mmHg or 5%, but this rises in patients with respiratory diseases (Viney, 2002; Oh et al, 2003).

In most circumstances, the trend in oxygen saturation is more important than the value per se, as this can indicate whether the patient is responding to therapy or deteriorating.

Normally, a person’s O₂ saturation will range between 98% and 100%. However, saturations will fall in many respiratory conditions. It is therefore necessary to maintain oxygen saturation as near to normal as possible.

In order to obtain O₂ saturations successfully, the probe should be placed in the best possible position to gauge the best possible reading. There are a number of places where the probe can be attached; these include the fingers, toes, ears and nose.

The nurse should bear in mind that pulse oximeters can provide false information if the probe is inappropriately placed, or if the patient is cardiovascularly compromised (low blood pressure) and/or unduly sweaty or cold. In addition, it must be acknowledged that certain patient groups (e.g. patients with chronic obstructive pulmonary disease (COPD) and emphysema) may have normally low oxygen saturations, and so the nurse will need to consider this when interpreting pulse oximeter data.

Respiratory management skills
Any deviations discovered during the basic respiratory assessment will need to be acted on. One of the very first and most basic respiratory management skills essential for good patient care is that of oxygen therapy.

Nurses need to know when to initiate oxygen therapy, how to deliver oxygen safely and appropriately, and base oxygen delivery on patient needs.

In combination with respiratory assessment and oxygen saturation monitoring, if a patient requires oxygen, then this needs to be administered safely and effectively.

Administering oxygen
If a patient’s condition necessitates the administration of oxygen, then this should be carried out as quickly and as efficiently...
as possible. Although technically and legally oxygen is a drug that must be prescribed by a qualified practitioner, in the emergency situation the absence of a prescription should not delay the administration of this essential intervention. Once the decision to administer oxygen has been made, an appropriate oxygen delivery device will need to be used.

There are two types of oxygen delivery system—variable performance and fixed performance.

Variable performance oxygen delivery systems
These oxygen delivery systems are classed as variable because it is impossible to predict the true inspired oxygen concentration (FiO₂) that they deliver. Although the system delivers oxygen at a given rate, the concentration delivered is dependent on the patient’s pattern of breathing.

i) Simple face mask—Hudson mask
(2 in Figure 2). This mask will deliver between 35% and 45% oxygen and is commonly used as an initial oxygen delivery device in a respiratory emergency. However, owing to its inability to deliver high concentrations of oxygen above 45%, it is of limited use in severe respiratory distress where high oxygen flow is needed.

ii) Non-rebreathing mask with reservoir bag
(3 in Figure 2). The reservoir bag improves the maximum FiO₂ to up to 70%. The reservoir fills up with oxygen during expiration and is breathed in during inspiration. This is used in severe respiratory distress where high-flow oxygen is needed.

iii) Nasal cannula
(4 in Figure 2). A nasal cannula is used for delivering supplementary oxygen, but has limited use in an emergency situation. This system delivers 28–30% oxygen.

Fixed performance oxygen delivery systems
These systems deliver a precise concentration of inspired oxygen (FiO₂), which is unaffected by the patient’s breathing pattern.

i) High airflow enrichment masks—Venturi masks
(1 in Figure 2). When used correctly they will deliver a known FiO₂. Precise FiO₂ of 24%, 28%, 35%, 40% and 60% can be achieved. These masks are used for treating patients requiring controlled oxygen therapy.

All of the above oxygen delivery systems can only be used in patients who are spontaneously breathing and who can maintain their own airway.

Should the patient develop severe respiratory distress and become unable to maintain their own airway, it may become necessary for the patient to have a Guedel airway inserted (Figure 3). These are colour-coded to aid in the selection of the correct size, and size is determined by the size of the patient (Table 2). The shape of the airway is designed to hold the tongue in the right anatomical position, but insertion of the airway requires that it is initially inserted upside down and rotated 180°. The correct positioning is shown in Figure 4.

Although supplementary oxygen can improve oxygenation and a Guedel airway can help maintain a patent airway, both require that the patient spontaneously breathes. However, when cessation of breathing occurs or when respiratory rate and effort is insufficient to maintain normal respiratory function, intubation may be required. This will involve the insertion of an endotracheal (ET) tube (Figure 5). Nurses need to be competent in assisting medical practitioners in the performance of this respiratory management task.

Laryngeal mask airway
Another means of maintaining an airway is via the use of a laryngeal mask airway (LMA) (Figure 6). The use of these airways has increased in the last few years as they can be placed with ease and speed. The LMA is usually indicated as an alternative to the face mask for achieving and maintaining control of an airway, and has proved to be a valuable tool in the emergency management of a failed intubation, as it helps establish and maintain an airway (Chethan and Hughes, 2008). The LMA is a supra-glottic airway device and can be inserted by less experienced practitioners.

LMAs come in five different sizes (1–5). Before insertion, the cuff of the LMA is inflated and checked for any leaks and this is then deflated, lubricated, and the mask end of the device inserted through the mouth with the bowl end facing the tongue. The mask is then pushed backwards gently and should follow the natural bend of the oropharynx. The cuff is then inflated to form a low pressure seal around the glottis.

Table 2. Guedel airway sizes and colours

<table>
<thead>
<tr>
<th>Sizes</th>
<th>Colour</th>
<th>Smaller</th>
<th>Larger</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>Violet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00</td>
<td>Blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Grey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Green</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Orange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Yellow</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4. Fitting of the Guedel airway
However, the LMA does not protect against aspiration and is contraindicated in patients who are at risk of regurgitation.

**Endotracheal intubation**

The most common method of securing a patient’s airway in an emergency situation is via the ET tube. Again, the size of the ET tube is usually determined by the size of the patient in question. However, usually a size 8 tube will suffice for a female and a size 9 tube for a male.

Once inserted, the nurse should check that the ET tube is in the correct place. This is done by watching for both equal and bilateral chest movements and listening for air entry. It is, of course, of great importance to secure the ET tube once it is in place to prevent it from moving.

The indications for intubation usually mean that the patient is respiratorily compromised with little or no spontaneous respiratory effort. Therefore, once the ET tube is correctly placed, some form of artificial support will need to be provided. This will include either the use of an ambu bag or attachment to a mechanical ventilator.

**Tracheostomy**

A tracheostomy is commonly performed in seriously ill patients to allow continued maintenance of a compromised airway (Veelo et al, 2008). A tracheostomy is usually a surgical procedure indicated in a number of acute and chronic conditions. It involves the creation of an opening into the trachea to facilitate breathing, but while the main aim of the procedure is to facilitate ventilation of an airway-compromised patient, its secondary use is ensuring the ease of using suction techniques to remove secretions (Delaney et al, 2006; Trouillet et al, 2010).

A number of different tracheostomy tubes are available and the choice for use will depend on patient need. If the patient needs ventilation, then a cuffed tube will be used with the cuff inflated to between 15 and 22 mmHg. It is vital that the cuff pressure is checked regularly and that the cuff is deflated and reinflated at appropriate intervals to prevent the effects of pressure on the internal wall of the trachea. Suction should be applied above the cuff prior to deflation to remove any secretions. Fenestrated tubes are used when weaning the patient off ventilation and encouraging oral communication. Patients considered for a fenestrated tube must have a patent airway and be able to expectorate secretions (Marchese et al, 2010).

Whatever the need for a tracheostomy, there is always a higher risk of chest infection owing to the by-passing of the protective measures of the upper airway, such as warming, filtering and humidifying air. A tracheostomy is often associated with a number of potential early and late complications (see Table 3—overleaf).

Given the range of potential complications, it is evident that the patient must be closely monitored and that cleansing measures must be scrupulous, timely and meticulous (Arabi et al, 2004). Suction must be applied regularly and immediately if the patient displays any signs of low oxygen saturations, cyanosis, gurgling sounds within the chest, or displays visible secretions around the tracheostomy site. However, it may be appropriate to nebulize and pre-oxygenate the patient before this procedure. Stringent measures to control any cross-infection risk must also be adhered to. Equally, the required emergency equipment must be kept at the patient’s bedside for immediate use should the need arise (Marchese et al, 2010).

**Maintenance of oxygen delivery**

Whichever oxygen delivery system is used, it is important that the nurse continuously monitors the effectiveness of oxygen delivery. If the patient does not respond to initial oxygen therapy and/or if the patient’s condition deteriorates, then the nurse will need to take appropriate action. For example, oxygen delivery might have to be increased and adjusted.

**Suctioning**

Suctioning is a vital skill that all nurses need to be able to perform and perfect. If, after the initial assessment, the patient appears to be retaining secretions and unable to remove these secretions, then they will need to be removed manually. If the patient is receiving non-invasive oxygen therapy, then secretions can be removed using a Yankauer sucker. If a patient requires ET intubation, then it might be necessary for the nurse to perform ET suctioning. This is done to remove secretions from the airways and it is another essential skill that nurses need to be able to perform effectively. ET suctioning can improve the patency of the airway, improve oxygenation and improve gaseous exchange (Viney, 1999).

To perform ET suctioning appropriately, the
correct size suction catheter should be used. (Figure 7) The following formula can be used to work out the correct size of catheter:

\[
\text{suction catheter size} = \frac{\text{ET tube size} \times 3}{2}
\]

For example, a patient with a size 8 ET tube will require a size 12 suction catheter.

**Conclusions**

Airway management is a vital and important skill that all nurses should possess. Skill in managing a patient’s airway forms part of the core critical care skills that the National Institute for Health and Clinical Excellence (NICE) (2007) have identified as essential for all nurses to possess. In addition, all nurses should be competent in performing a respiratory assessment using the look, feel and listen principles.

Based on the assessment, nurses should also be able to implement appropriate airway management strategies as outlined in this article. Using these skills, patients will receive appropriate respiratory care quickly, efficiently and effectively.

Conflict of interest: none


**Table 3. Early and late complications of a tracheostomy**

<table>
<thead>
<tr>
<th>Early complications</th>
<th>Later complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemorrhage</td>
<td>Tracheal stenosis</td>
</tr>
<tr>
<td>Hypoxia</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>Damage to larynx</td>
<td>Fistula formation</td>
</tr>
<tr>
<td>Surgical emphysema</td>
<td>Pressure sores from flange or cuff</td>
</tr>
<tr>
<td>Blockage from secretions</td>
<td>Tracheomalacia (destruction and necrosis of tracheal wall)</td>
</tr>
<tr>
<td>Potential cardiac arrhythmias</td>
<td></td>
</tr>
</tbody>
</table>

**KEY POINTS**

- A blocked airway will quickly lead to serious cardio-respiration compromise
- Effective airway management is one of the first considerations in any emergency situation, and is a vital skill that all nurses should be able to perform
- With appropriate assessment and intervention, a blocked airway can be appropriately managed, improving a patient’s outcome