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Effective airway maintenance and ventilation are a cornerstones of A&E nursing.

Nick Castle examines the types of airway devices available and how they can be used to support nursing practice

The airway and the A&E nurse

This article relates to UKCC professional development category: Practice development

Fig. 1. Opening the airway

Top: Airway obstruction produced by tongue and epiglottis

Bottom: Relief by head tilt/chin lift



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AIMS AND INTENDED LEARNING OUTCOMES

The aim of this article is to review basic and advanced methods of opening and clearing an airway and to discuss effective means of ventilation and oxygenation in A&E. As an A&E nurse, you are encouraged to look at your practice and ask yourself: 'Am I providing the best for my patient?' After reading this article you should be able to:

- Describe and perform basic airway opening devices
- Be aware of a range of airway adjuncts
- Select an appropriate device for assisted ventilation; understand the rationale for its use
- Discuss the merits of newer devices for advanced airway management and why such devices are more appropriate for use by non-anaesthetic trained staff

The ability to maintain a clear, patent airway is a vital skill required for all types of emergencies, both medical and trauma, and yet it is often poorly performed.

Airway maintenance techniques can be divided into basic and advanced. Newer devices such as the laryngeal mask airway (LMAs) and combitubes are classed as advanced airway techniques but are much easier to use than intubation.

OPENING A PATIENT'S AIRWAY

Head tilt chin lift is the easiest of the basic techniques and requires one hand on the forehead to provide backward pressure while the thumb and index finger grasp the chin and lift it upwards and open the mouth (Fig. 1).

This technique can be used to per-

form mouth-to-mouth ventilation, when using an airway adjunct or for opening the airway of a patient with a reduced level of consciousness. Care should be taken not to occlude the airway by placing pressure on the soft tissues of the neck when performing the chin lift.

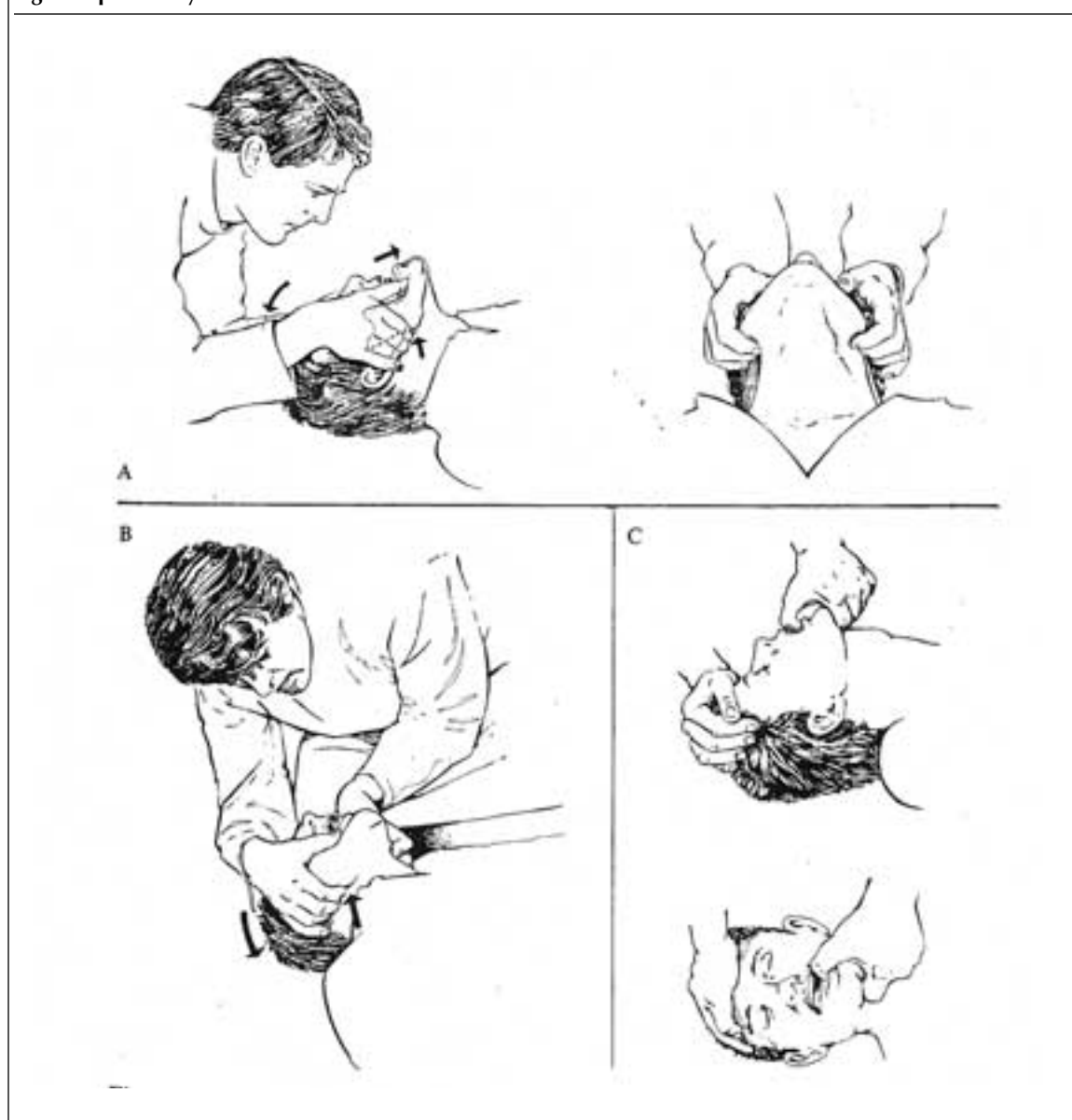
Where possible this technique should be avoided in trauma patients, but airway maintenance must always take preference over spinal control. Especially as only about 5 per cent of unconscious patients have a cervical spine injury (Greaves and Hodgetts 1997), whereas poor airway maintenance is a common cause of death (Anderson 1988).

Jaw thrust is common when using airway adjuncts or where cervical spine injury is expected. Although still feasible, it is more difficult to perform mouth to mouth using this technique. The jaw thrust is performed by identifying the angle of the jaw (just below the ear). With index and forefinger, steady upward pressure is used to displace the jaw forward bringing with it the tongue (Fig 2).

This technique is painful and more difficult to learn although it has been successfully taught to lay persons (Safar and Bircher 1988).

Jaw thrust and head tilt, mouth open and jaw thrust (the triple manoeuvre) The triple manoeuvre incorporates head tilt and mouth opening to provide greater airway opening (Fig. 2). Where the airway cannot be maintained with jaw thrust alone, varying degrees of head tilt should be used to achieve airway patency and minimal movement of the neck in the trauma patient.

Fig. 2. Triple airway manoeuvre



Now do Time Out 1

A PATIENT'S AIRWAY

The A&E nurse needs to look, listen and feel to effectively assess an airway.

Look Is the airway clear? Is the chest raising and if so is it raising equally? Note the patient's colour. Cyanosis if present is obvious but is a late sign of hypoxia and may never develop.

Listen to breath sound note rate, rhythm and depth of ventilation. Note any abnormal respiratory noises such as gurgling, wheezing, snoring or crowing which suggest an airway or breathing problem

Feel air movement at the mouth and nose as well as noting the chest raising by placing your hand on the patient's chest. If examining the chest, do one side at a time and observe the patient's face for signs of discomfort which may aid detection of chest injury such as fractured ribs.

Smell is not normally discussed in association with the airway, it can assist with patient

TIME OUT 1

With a colleague practice the head tilt chin lift procedure and locate the angle of the jaw

Box 1. Potential complications with airways

Oral	Nasal
Displacement of the tongue	Nasal bleeding
Vomiting	Vomiting
Gagging	Gagging
Laryngeal spasm	Laryngeal spasm
Worsening gastric distension	Basal skull fracture

TIME OUT 2

Liaise with your resuscitation officer to practise the insertion and sizing of oral and nasal airways

assessment. The nurse may note a strong smell of solvent on the breath of a youth which may suggest glue sniffing or the presence of acetone (a fruity smell like pear drops) which may suggest diabetes.

The most unreliable smell in an unconscious patient is the presence of alcohol as it can lead to patient labelling and aid serious misdiagnosis.

CLEARING A PATIENT'S AIRWAY

The tongue is the most likely cause of obstruction. This can be relieved in 80 per cent of cases by the head tilt manoeuvre (Safer and Bircher 1988) although the airway can also be obstructed by vomit and foreign bodies. Check the airway briefly before head tilt to help detect vomit in the mouth. This should be cleared before the airway is fully opened to reduce the risk of aspiration.

Finger sweep This may be the only option if no equipment is available. It will provide a degree of airway clearance although it is difficult to remove liquid with this technique. Ideally, place the patient on his or her side to assist you with clearing the airway.

Suction is the gold standard for clearing an airway. There are numerous systems available to include piped, electrical, battery, pneumatic and hand or foot operated suction. Hand held suction is often ignored in favour of electrical units primarily because they generate greater suction. All clinical areas should have a back up in case of system failure and A&E nurses must be able to provide suction during hospital transfers.

MAINTAINING A PATIENT'S AIRWAY

Once the airway is opened, airway adjuncts can assist in securing it. This may allow you to free up a team member but careful monitoring of the patient's airway is vital in the nonintubated patient as oral or nasal airway's do not provide protection to the airway from aspiration.

OROPHARYNGEAL AIRWAYS

These are designed to sit between the tongue and the hard palate providing pressure on the tongue to prevent it moving backwards.

The insertion technique is designed to avoid trauma to the teeth and to minimise accidental displacement of the tongue backwards. The main problems with oral airways are shown in Box 1.

To avoid these problems, correct sizing is required by first selecting the size

mostly likely to fit. This is normally a size 3 for a male and a size 2 for a female and confirming the size by measuring the airway from the corner of the mouth to the angle of the jaw (Advanced Life Support Manual 1998). Once the airway is placed into the mouth you should look, listen and feel for air movement to ensure breathing has improved.

NASALPHARYNGEAL AIRWAYS

This airway is used less frequently than the oral airway although it has a number of features that make it a superior device in the non arrested patient (Jenkin 1996). It is generally much better tolerated than oral airways and although it has similar complications (Box 1) these are less common.

One of the main benefits of this type of airway is in the fitting patient, the patient with a gag reflex but an obstruction airway, a patient who will not tolerate an oral airway (Nolan 1995) or trismus. An area of concern has been its use in patients with possible basal skull fractures. The possible risk of entering the brain can be minimised by correct insertion technique and by using a soft flexible nasal tube.

Now do Time Out 2**BREATHING**

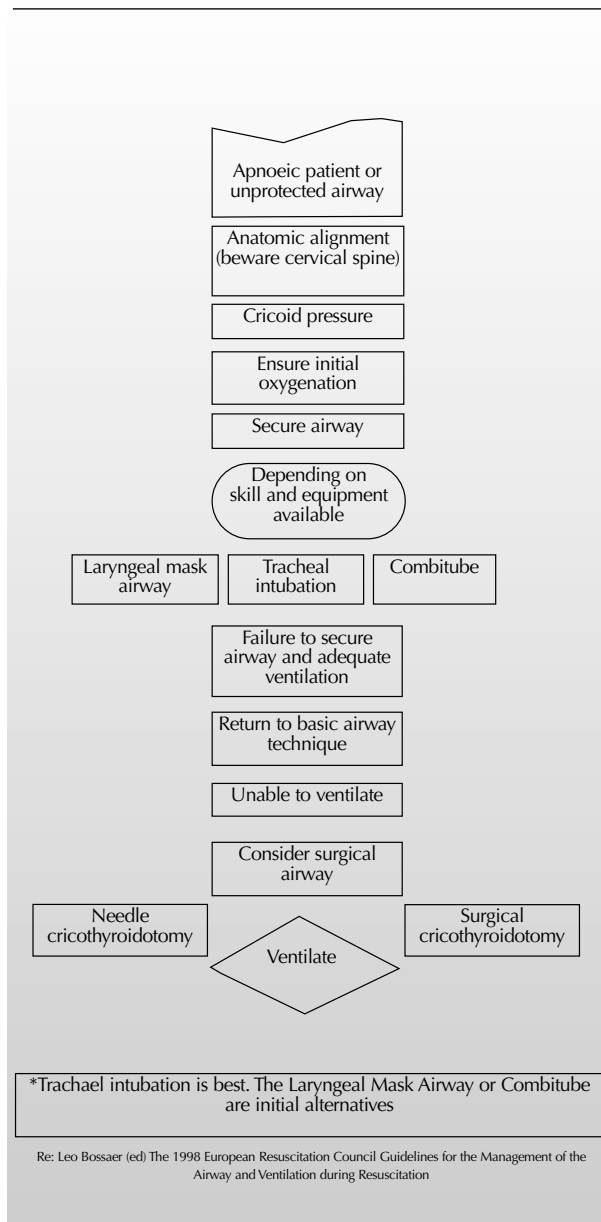
Once the airway is cleared breathing should be assessed. Any patient breathing <10 breaths per minute or >28 breaths per minute will need assistance. This involves the administration of supplementary oxygen and possibly the need for assisted ventilation.

OXYGEN ADMINISTRATION

Oxygen should be administered to all emergency patients at 15 litres per minute (Lpm) via a mask with a reservoir regardless of the concern regarding hypoxic drive. Hypoxic drive is a rare condition affecting a small number of patients with chronic airways disease. The risk is very low when compared to hypoxia due to insufficient oxygen.

When using a partial non rebreathing mask (mask with reservoir bag attached) ensure that the reservoir bag is inflated before placing the mask on the patient's face. Once a full history is obtained, consideration for reducing the flow rate and changing

Guidelines for advanced airway management



to a therapy mask can be made. Remember, even patients with documented hypoxic drive will require high flow oxygen during resuscitation. **Now do Time Out 3**

TIME OUT 3

Review all types of oxygen delivery systems available within your department. Try them on for comfort and note the flow rate through the mask.

VENTILATION

Patients who are not breathing or breathing less than eight breaths per minute will require assisted ventilation. There are a number of options for achieving this such as mouth to mouth, pocket mask, bag-valve-mask devices and the use of an anaesthetic circuit.

Mouth to mouth ventilation is the most effective in producing a good seal but is not popular with health care professionals (Brenner 1997). The main draw back is that it contains expired air which has low oxygen concentration at 16 per cent compared to 21 per cent in the atmospheric (Colquhoun 1995).

Pocket mask ventilation requires the use of expired air. Although the use of supplementary oxygen can increase the delivered percentage of oxygen to as high as 50 percent. If a mask without an oxygen port is available, then the operator can administer oxygen to him or herself via nasal cannula to increase the total expired oxygen administered to the patient. The pocket mask should be the preferred device for a single handed rescuer as it is a better facial seal, allowing the operator to use both hands.

Airway adjunct should be widely available within A&E to provide assisted ventilation to patients following respiratory or cardiac arrest. Brenner (1996) demonstrated that there was a delay of more than 3 minutes in 18 per cent of patients already collapsed because no airway adjunct was immediately available. Such a delay would be unacceptable in an A&E department.

Bag-valve-mask device is the most popular adjunct for assisting ventilation and can be the most ineffective. Health care professionals tend to use this device single handedly which results in ineffective venti-

EQUIPMENT FOR ADULT INTUBATION

- Size 7.0, 8.0, 9.0 ET tubes.
- 10 ml syringe
- Magil forceps
- Intubation stylet
- Gum elastic bougie
- Water based lubrication gel and gauze
- Laryngoscope and a size 3 and 4 mackintosh blade. Ensure it generates a bright light source.
- ET tube ties.

lation. Martin (1993) showed only 6 out of 26 anaesthetised patients were effectively ventilated (tidal volume >400ml) by nurses or anaesthetists using a single handed technique.

To produce both a tight seal at the patient's face, and maintained jaw thrust or head tilt, a two-person technique is recommended. Wheatley (1997) demonstrated that when one nurse held the mask in place and a second squeezed the bag, an average tidal volume of 480ml was generated, compared with 260ml tidal volume when using more traditional methods.

The main reason why this is not the standard technique is because staff believe their abilities are greater than they actually are (Marteau *et al* 1990);

this is a common finding in resuscitation.

Stone (1998) demonstrated positive signs of aspiration in 12.4 per cent of patients who had been ventilated with a bag-valve-mask device. Even with a two person technique, the risk of aspiration is high as the airway is unprotected and it is difficult to limit inflation pressure to below the recommended 20 cm H₂O (Weiler *et al* 1995).

Bag and mask ventilation does have a number of benefits. It allows greater amounts of inspired oxygen to be delivered, ranging from 21 per cent through to 85 per cent with supplementary oxygen and a reservoir bag.

Anaesthetic machines and anaesthetic bags are popular in some A&Es but are difficult to use. Such devices should be used with a two handed technique and ideally be left to the anaesthetist in the non intubated patient. As these systems are dependant on a guaranteed oxygen supply, a back-up system should be available in case of oxygen supply failure. The main benefit for such systems is that they allow the administration of 100 per cent oxygen; an experienced operator can assess lung compliance which will reduce the risk of pulmonary barotrauma.

VENTILATION

Effective ventilation is directly affected by the volume of gas delivered (tidal volume)

which facilitates the chest to raise and then fall, thus ensuring inspiration and expiration.

To minimise gastric distension and the risk of aspiration, a tidal volume sufficient to raise the chest is now recommended to be 400-500ml (Baskett *et al* 1996). To further minimise the risk of gastric distension, each breath should be delivered slowly over two seconds, with one to two seconds to allow the chest to deflate (Gabbott and Baskett 1997) prior to a second breath being given.

Therefore, the tendency to give a number of small fast breaths with a bag and mask prior to intubation should be discouraged as it represents ineffective ventilation and increases the risk of

gastric distension.

Now do Time Out 4

TIME OUT 4

Review all the ventilation devices and liaise with your resuscitation training officer for assistance in using them. Practice controlled ventilation, allowing the chest to raise and fall between each breath.

ADVANCED AIRWAY SKILLS

The gold standard for securing the airway remains intubation although it is a difficult skill to learn and maintain (Gabbott and Baskett 1997) and Kasper (1998) demonstrate a 6 per cent oesophageal intubation rate in emergency intubation by doctors outside of an anaesthetic room.

Intubation will rarely (if ever) be performed as an elective procedure within A&E but will be part of resuscitation following trauma as all patients with a GCS below 8 require intubation (Nolan 1995) within ten minutes of arriving in A&E, as part of cardiac resuscitation or prior to gastric lavage to protect the airway. Intubation is a common emergency skill performed in A&E and all departments should be equipped to facilitate its immediate performance.

It is common practice in some hospitals for ODAs or intensive care nurses to attend cardiac arrests or trauma calls. However, A&E nurses should still be able to assist with intubation, provide cricoid pressure and know what equipment is required. A&Es should have rapid sequence induction drugs immediately available within the resuscitation room and the contents of a prepared tray

Rapid sequence induction drugs

Thiopentone	500mg x2
Etomidate	200mg x 2
Midazolam	10mg x2
Water for injection	20ml x2
Suxamethonium	100mg (stored in the fridge)

should be discussed with the anaesthetic department.

DIFFICULT INTUBATION

All anaesthetists will follow a similar failed or difficult intubation drill and the gum elastic bougie is the most commonly used device for a difficult intubation and therefore should be available within A&E. Other devices such as McCoy laryngoscopes (Gabbott and Baskett 1997) and intubation stylets are also available. Where intubation proves impossible secondary airway device such as a laryngeal mask (LMA) should also be available (Illingworth and Simpson 1994) to provide interim effective ventilation.

Intubation following trauma is a challenging situation as there may be injury to the face and a greater risk of aspiration. This situation is worsened by spinal immobilisation which hampers intubation by reducing the opening diameter of the mouth and reduces the view of the vocal cords (Nolan 1995).

Now do Time Out 5

LARYNGEAL MASKS/COMBITUBES

Although some nurses do have the skills to perform tracheal intubation, most do not. In an environment where there is no anaesthetic cover or where nurses and other nonanaesthetists need to provide advanced airway skills, the combitube and LMA (Verghese 1994) are ideal.

The newly changed advanced life support course now

recommends the teaching of LMAs and/or combitubes as the airway device of choice for nurses instead of intubation (Advanced Life Support Course manual 1998) as effective training in intubation will require live practice on patients.

This move is in line with the European Resuscitation Council recommendation on advanced airway management (Gabbott and Baskett 1997) which incorporates intubation, LMA or combitubes as advanced airway devices. Within the UK, nurses have demonstrated the LMA to be an effective device for airway control in resuscitation (Stone 1994). This has been further demonstrated by trainee military paramedic staff (Davies 1990).

Such an approach has been described by Eastwick-Field (1996) where successful management of cardiac arrest has been possible with the use of nurse initiated defibrillation, LMA insertion, cannulation and adrenaline administration. This response should be the aim for a cardiac arrest within minor injury units or other similar nurse led units in the leisure industry.

Unlike intubation which requires theatre time, Roberts *et al* (1997) demonstrated that nurses can be successfully trained on mannikins. Although at three months, the group who received theatre time where more confident and had a higher degree of first time placement success (80 per cent as opposed to 75 per cent), success at the second attempt was the same for both groups.

The main drawback with the LMA is

TIME OUT 5

Liaise with your manager and the theatre manager to spend a shift in the anaesthetic room to gain experience in assisting with intubation, airway maintenance and to familiarise yourself with other airway products such as LMAs and bougies.

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that it does not isolate the airway and there is still a risk of aspiration of gastric contents. The risk of aspiration was demonstrated to be low by Stone *et al* (1994 and 1998) and was associated with previous attempts at ventilation by other devices such as bag-valve-mask. Despite this, aspiration remains a risk. Aspiration can be further reduced by using the LMA as a guide to tracheal intubation which has been demonstrated to be a reliable tool for use by nurses (Bryden 1998).

The combitube is now available in the UK. As an advanced airway device, it has gained popularity in the USA, especially with paramedics (Atherton 1993). It is currently being trialed in the UK by one ambulance service as a device for failed or difficult intubation (data due to be published soon) and provisional reports have been favourable.

Its main benefit over other devices is that it isolates and protects the airway by occluding the oesophagus and thereby eliminates the risk of aspiration. It is not without its own difficulties which include oesophageal trauma (Vezina 1998), the need to confirm placement by auscultation and difficult placement. Although the combitube is available in the UK, most anaesthetists will have little experience of how to use it (Bishop 1998) leading them to prefer to use the established LMA.

The new Cuffed Oropharyngeal airway (COPA) is currently being trialed by anaesthetists. It looks similar to an oral airway and is inserted in the same way but also

contains a large inflatable balloon. The balloon is designed to displace the tongue, form a gentle airtight seal with the pharynx and elevate the epiglottis (Greenberg 1998).

As yet, it has not been trialed in resuscitation and Greenberg (1998) has demonstrated it not to be as easy to use as the LMA although he demonstrated 81 per cent of first time placements to be successful and less trauma to the mouth was observed.

The main benefits of the LMA, Combitube and the COPA is that they need relatively little training and do not result in an accidental oesophageal intubation. The gold standard is intubation but where this is not available these newer devices are more effective than bag-valve-mask ventilation.

CONCLUSION

Effective airway maintenance and ventilation is a cornerstone of A&E nursing. But to be proficient in the skill, training and regular practice is required. Nurses also need to question their choice of device and how best to use these devices to ensure best practice.

Where an A&E has full time support from onsite anaesthetists there is little need for advanced airway skills, but basic airway management skills are vital. Where such cover is not available, for example minor injury units, the A&E nurse needs to adopt an approach to meet this demand.

To achieve this, the A&E nurse needs to be aware of what airway devices are available and how they can be used to support nursing practice.



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