An approach to the difficult airway

A for AIRWAY is the top of any emergency equation.

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When approaching a patient in an emergency the ABCs (airway, breathing, circulation) must be rapidly assessed. If the patient talks to the caregiver the airway is clear and maintainable at that point in time. The emergency caregiver must however be aware of possible changes to the patient's condition and anticipate the need to act or react to these changes.

Preparation

All hospital wards and other areas anticipating emergencies should have a daily check routine for emergency equipment, and also be made aware of new developments or equipment that become available. People need to be trained and specifically allocated to the tasks of checking and updating emergency equipment. We all know the story: *everybody* knew that *anybody* could have done the job and *somebody* should have done it but in the end *nobody* did it.

Basic equipment needed for airway management includes:

- oropharyngeal and nasopharyngeal airways of various sizes
- face masks of various sizes (preferably see-through and soft enough to seal the mouth and nose)
- endotracheal tubes – various sizes as needed for different patients
- laryngoscope handle and blades of various sizes
- introducer/Eschmann guide (gum elastic bougie)
- strapping/tape/commercial tube holder
- laryngeal mask airway (LMA) or Proseal LMA/Combitube/ laryngeal tube (whichever is available and with which one has experience)
- Magill's forceps may be needed, especially for nasal intubations
- equipment to assist with ventilation – self-inflating bags (e.g. Ambu bag) must be available in the emergency situation
- transport ventilator
- T-piece for patients breathing spontaneously
- oxygen-filled cylinder with regulator, or piped oxygen

NB! NEVER FORGET SUCTION.

Drugs to assist with intubation are becoming more common as emergency care personnel realise the benefit of controlled conditions as opposed to simply attempting a hurried, aggressive intubation in a non- or poorly-sedated patient. Rapid sequence intubation (RSI) is now the acceptable and preferred method of intubating in the emergency room setting.[1] A comprehensive description of RSI and the necessary drugs can be found in standard textbooks of emergency care and is beyond the scope of this article.[2]

Anticipation

Anticipation of problems with the airway comes with learned knowledge as well as experience. One has to learn when to act and when to wait; this is not always easy. Anticipation can be divided into injury/disease processes and anatomical factors.

Injury/disease processes

Here the health care worker must anticipate needs related to the patient's condition. For example, if swelling is anticipated, such as in airway burns or postoperatively after massive facial surgery it is wise to protect the airway initially. Severe facial trauma may require rapid controlled intubation.

In patients whose ventilation is compromised rather than their airway, one can observe the patient, provided that proper monitoring is available, and intubate if deterioration occurs. This is best done in a high-care setting. Examples include patients with flail chest injuries, fat embolism after trauma and other causes of acute respiratory distress syndrome (ARDS).

Another potential problem to be considered is the unconscious patient. If the airway is unprotected, intubation to prevent aspiration is mandatory. This includes head injury patients with Glasgow Coma Scores of 8 and less, some patients who have overdosed, and patients with cerebral malaria, to mention but a few.

Anatomical factors

These include adverse observations such as dentition (or the lack thereof), loose dentures, beards, small mandible (often associated with an anteriorly positioned airway), mouth opening (which could be hampered by such things as wiring, trismus or arthritis), neck pathology (trauma, arthritis, multiple cervical fusions), and facial defects (congenital or acquired such as after trauma).

The above factors need to be taken into account when preparing for intubation. Awareness of anticipated problems should cause the doctor to call for back-up equipment or assistance (an extra pair of educated hands can do wonders).

Obviously there are times when one has to act immediately such as in imminent respiratory ('The patient is gasping, doctor!) or cardiac arrest, or severe anaphylaxis.

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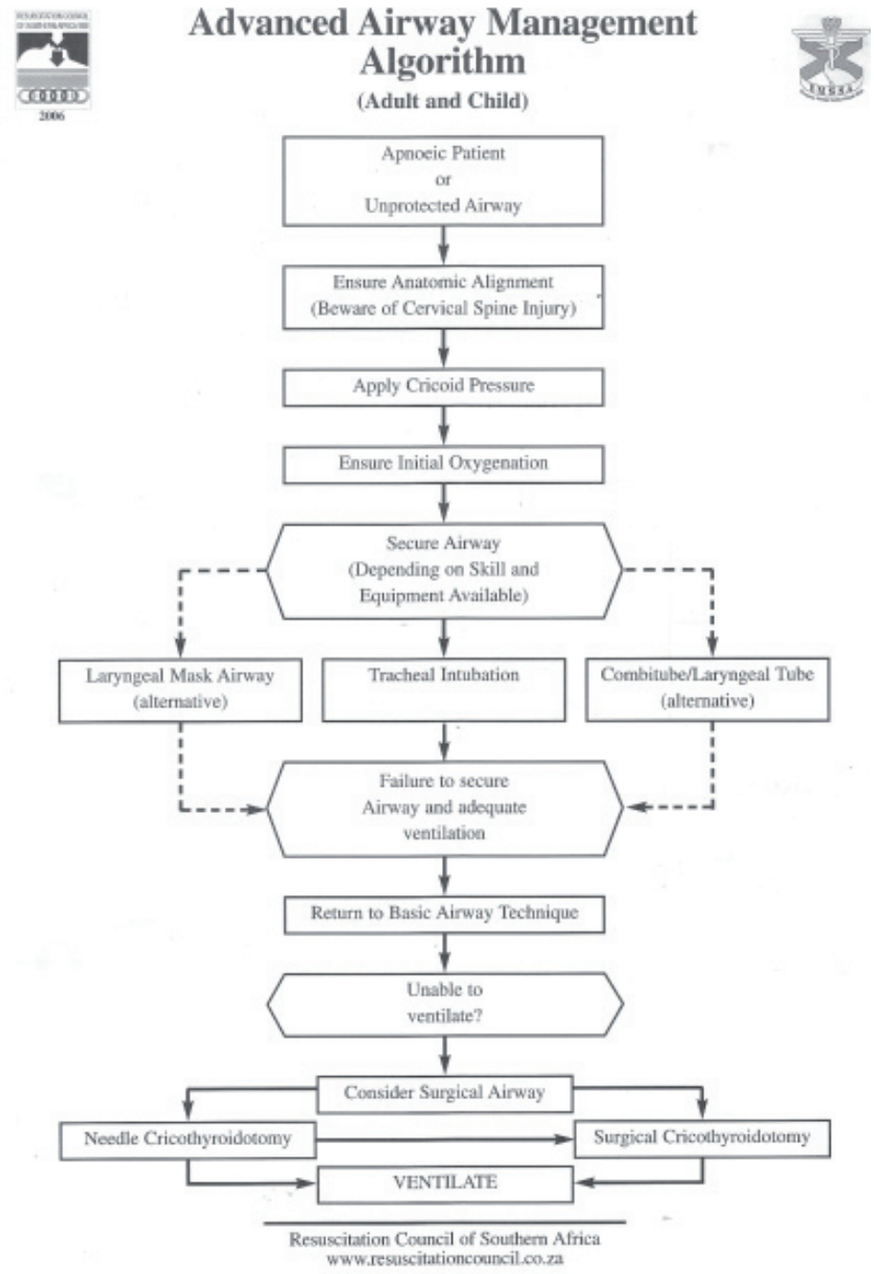

Fig. 1 Advanced airway management algorithm (adult and child).

A systematic approach according to the advanced airway management algorithm

Intubation is never done in isolation. Initially ventilation must be started or maintained. One may be taking over from the patient's own efforts, assisting the patient's own efforts or taking over from someone else's assistance. Usually in the emergency setting a self-inflating bag-valve-mask device is used. If available a flow-inflating-bag can also be used; these bags are often found in the operating theatre.

If there is any possibility that cervical spine injury could have occurred, in-line neck stabilisation must be initiated and maintained until either the neck is found to have no unstable spinal cord injury, or the injury is documented and definitive treatment started.

During ventilation, cricoid pressure should be initiated if not done already, and should only be released once the patient is correctly intubated and the tube cuff has been inflated.

Prior to intubation, give the patient as high a concentration of oxygen as possible. This pre-oxygenation of the patient is vital to the success of intubation. Assisted ventilation should be slow and controlled at a rate of about 10 breaths per minute in an adult. One would normally like to see the chest rise so as to know that the airway is not obstructed. Sometimes this may be difficult to see, such as in a severely emphysematous individual.

Once the equipment is on hand the process of intubation should start. In an emergency it is best to use the person with the most skill. Remember that the laryngoscope is held in the left hand (no matter which is one's dominant hand) and should be introduced down the right side of the patient's tongue so as to pull the tongue to the left and bring the blade into the centre for best visualisation of the vocal cords. If pulse oximetry is available one can gauge from the patient's saturation how long to continue with intubation before (if unsuccessful) withdrawing and reventilating the patient with the bag-valve-mask device. Stop the intubation attempt when the saturation falls below 90%. More time is available if the patient has been well pre-oxygenated. If no pulse oximeter is available, a best guess may be to attempt intubation for no more than 30 seconds. Some people suggest holding your breath during intubating, and if you need to breathe then so does your patient! Other signs of deoxygenation may be a drop in the heart rate (if there is only an ECG monitor available) – this is serious. Central cyanosis (blue lips/tongue) if no monitoring is available is even more serious! Remember that different disease processes and the age of the patient can influence the speed of desaturation. Anaemia may prevent visualisation of cyanosis. Carbon monoxide poisoning may result in a persistently high saturation reading, despite the presence of severe tissue hypoxia.

Once intubation is successful the tube must be secured, noting the level of the tube at the lip. Various methods are described to validate the position of the tube. This clearly indicates that mistakes are always possible – with disastrous consequences. It is better to be safe than sorry and so use both confirmatory devices and clinical skill to confirm tube placement. A device that

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The Combitube.

Oesophageal detector device.

Endotracheal tube with syringe.

The laryngeal mask.

Self-inflating bag-valve-mask device.

The position for cricothyroidotomy.

A commercially available cricothyrotomy set.

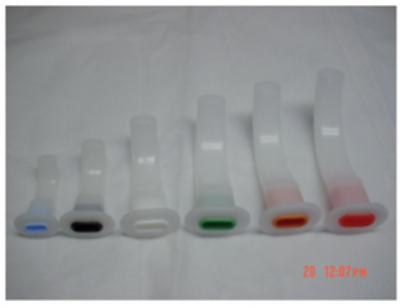
Laryngoscope and blades.

Cricoid pressure.

Laryngeal tube.

Introducer.

In-line stabilisation from below the patient's head and neck allows easier access for the health care provider who is about to intubate.



Oropharyngeal airways.

Basic equipment and techniques needed for airway management.

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If there is any possibility that cervical spine injury could have occurred, in-line neck stabilisation must be initiated and maintained until either the neck is found to have no unstable spinal cord injury, or the injury is documented and definitive treatment started.

can be used is the oesophageal detector device (ODD), to be used ideally before ventilation commences. The capnograph is considered the gold standard, but remember that during CPR the carbon Dioxide released from the lungs may be minimal and so there could be a false negative reading. The faithful stethoscope should always be used: first listen to the stomach; if gurgling is heard the tube should be removed immediately and assisted ventilation with the self-inflating bag restarted. After the stomach, listen at the apices of the lungs (in the axilla) to ensure that both lungs are ventilated. The skill of the operator should be noted; many a junior doctor will assure you the tube is in when all the signs point otherwise. If in doubt, remove the tube and start again – oesophageal intubation is lethal!

If the patient talks to the caregiver the airway is clear and maintainable at that point in time.

If intubation is unsuccessful, return to bag-valve-mask ventilation and try again once the patient is well re-oxygenated. If repeated attempts fail then one must choose an alternative technique or device. Nowadays extraglottic devices such as the laryngeal mask, the Combitube and more recently the laryngeal tube are readily available and should be added to any difficult airway kit.[3] In experienced hands, especially in theatre, techniques such as retrograde intubation and rigid or flexible bronchoscopic-guided intubation may be considered. There will always be times when intubation fails and back-up devices/techniques are then vital to save the life of the patient.

Under certain circumstances some health care providers may prefer to use nasal rather than oral intubation. Long-term nasal intubation tends to lead to sinusitis and is therefore not considered the route of choice if the patient is to be ventilated in intensive care for a prolonged period. It is possible to do a blind nasal intubation where the laryngoscope is not used. This is only done if the patient is breathing spontaneously, where the movement of air through the tube guides the positioning of the tube through the vocal cords. This technique has been used in the emergency situation for unconscious patients with mandibular injuries who have not yet had their necks cleared of cervical spine injuries, and in whom neck stabilisation must still be maintained. It could also be used for a patient whose mouth opening is limited, e.g. temporo-mandibular arthritis.

In the event of failure to ventilate the patient and/or failure to intubate the patient or secure the airway by other means than those mentioned above, a surgical airway must be considered. This decision may need to be made rapidly at the initiation of bag-valve-ventilation (e.g. a choking victim when attempts to unblock the airway have failed) or after attempts to secure the airway non-invasively have failed (e.g. massive facial trauma).

With a deoxygenated, cyanosed patient, rapid access via a needle or surgical cricothyroidotomy must be done.[4] In prepubertal paediatric patients, needle cricothyroidotomy is the preferred and safer method. Cricothyroidotomy allows for rapid entry of oxygen to the lungs to prevent brain hypoxia and immediate death. Severe obstruction will however prevent removal of sufficient carbon dioxide, leading to hypercarbia. Thus, the cricothyroidotomy is not an end point in itself but a temporary effort to prevent death by hypoxia. Once oxygenation is established, an urgent plan must be made to secure the airway more definitively via tracheostomy. Severe hypercarbia causes vasodilatation, hypotension, sweating and ectopic beats, which can lead to ventricular fibrillation and death.

If intubation has failed, and a patient has needed to have a back-up device inserted, such as the laryngeal mask or Combitube, one may also consider a formal tracheostomy, e.g. in the case of massive facial trauma. Insertion of a smaller than normal endotracheal tube for the patient's size (e.g. in epiglottitis) may also require formal tracheostomy if airway swelling is anticipated. Moving air through a narrow tube increases the work of breathing and will also lead to hypercarbia.

Conclusion

Correct emergency airway management for a patient is often life-saving and life-protecting if done efficiently. It is a stressful time for the health care personnel involved due to the need for rapid decision-making and follow-through with procedures; it is also a critical time for the patient. Anticipation and preparation beforehand, practising in a controlled environment and extra, educated help during the actual incident allow for successful outcomes.

References

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In a nutshell

- Airway management is the first priority of resuscitation.
- Preparation of equipment, training of staff and anticipation of problems will improve management of the patient with a difficult airway.
- The flow diagram, as prepared by the Resuscitation Council of Southern Africa and endorsed by Emergency Medicine Society of South Africa, is an easy-to-remember algorithm for airway management.
- Aim to achieve oxygenation and then ventilation of the patient via the safest, most effective method available.

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