ALS Module 4
Airway Management

Relates to HLT404C Apply Advanced Resuscitation Techniques
Overview on Airways

Upper airways - nose, mouth, oro-pharynx, larynx.

Lower airways - trachea, bronchi, bronchioles, alveoli.

Purpose of airway O2 and CO2 exchange.

Gradients in thoracic pressure and atmospheric pressure allow the inhalation and expiration of gases.
Overview on Airways
Medulla Oblongata with the respiratory centre and apneustic centre enhances respiration. Pneumotaxic area terminates inspiration. Chemical receptors in the carotid bodies and arch of Aorta that detect rises in C02. Damage to any of these organs alters respiratory effort.

- Trauma to head, swelling and oedema.
- Brain tumours. Cerebral bleeds.
- ETOH and Drugs
Overview on Breathing

Essential to life. If not breathing does not matter what airway you have in.

Always look at your patient for signs of hypoxaemia.

• Agitation
• Restlessness
• Odd answers to questions
• Excessive drowsiness
• Peripheral cyanosis

Central cyanosis is a LATE SIGN.
Overview on Breathing

The Diaphragm

• Major muscle of respiration. Changes the thoracic cavity during inspiration/expiration.

With the use of scalene muscles and intercostals allows the chest to expand and deflate.

Any damage to or loss of nervous innervation can effect breathing.

• Trauma
• Motor Neurone Disease
• Guillian Barre Syndrome
• Spinal Cord injury/lesions
Special Considerations

Children use abdomen to breath.
  • Diaphragm and intercostal muscles are not yet cartilaginous.

Huge amount of force required to # ribs so high level of suspicion for underlying organ injury.

The pt has guarded breaths due to pain, decreasing lung expansion
Airway Management

There are four steps in the management of the airway:

1. **OPEN** the airway
   - Posture, jaw thrust or chin lift

2. **CLEAR** the airway
   - Finger sweep, suction

3. **SECURE** the airway
   - Airway adjuncts

4. **4. MONITOR** the airway
Airway Management

Jaw thrust and/or Chin lift

[Diagram showing the difference between a blocked airway and an open airway]
Airway Management

Following institution of BLS measures, mechanical aids may be used in the restoration and maintenance of a patient airway.

Management of an airway can be categorised into two processes: -

• Upper Airway
• Lower Airway
Upper airways

Lower airways
Upper Airways

Chin

Nose

Throat

Tongue

Open airway
Upper Airways

- Nasopharynx warms air to 32-34 degrees dependent on the ambient air and humidity
- Mouth and nasal passages both moisten air as it enters
- Oropharynx allows air to pass into trachea
  - Its job is to block off the trachea when swallowing allowing food to move down the oesophagus
- Pharynx
Upper Airway Management

Oropharyngeal Airways

Nasopharyngeal Airways

Laryngeal Masks
Oropharyngeal Airways

Indications

• The unconscious patient with a loss of tonicity to the submandibular muscles resulting in airway obstruction.

• The patient’s airway has not been successfully opened by other manoeuvres e.g. head tilt, jaw thrust.

• The patient is being ventilated by bag-mask device. An oral airway elevates the soft tissues of the posterior pharynx making it easier to ventilate the lungs and minimise gastric insufflation.
Oropharyngeal Airways

Contraindications and Precautions

Insertion of an OPA in a conscious or semiconscious patient may stimulate the gag reflex and cause the patient to vomit.

Incorrect placement of the OPA may compress the tongue into the posterior pharynx causing further obstruction.
Oropharyngeal Airways

**Contraindications and Precautions**

Failure to clear the oropharynx of foreign material before insertion of the airway may result in aspiration.

Lower face trauma or surgery.
Oropharyngeal Airways

**Equipment**

Oropharyngeal suction equipment

Oropharyngeal airway
Oropharyngeal Airways

Patient Preparation

Place the patient in supine position.

1. Suction the oropharynx of blood, secretions and other foreign material

2. Select the appropriate airway size.
   - A wrong sized OPA can worsen the airway obstruction (when too short) and laryngospasm (when too long).
Oropharyngeal Airways

Align the tube on the side of the face and the airway should reach from the middle of the patients mouth to the front of the ear lobe.
Oropharyngeal Airways

Procedure

1. Insert the airway upside down into the mouth. As the tip of the airway reaches the posterior wall of the pharynx, rotate the device 180 into its proper position.

2. The distal tip of the airway should lie between the base of the tongue and the back of the throat. The flange of the tube should sit comfortably on the lips.
Oropharyngeal Airways

3. Auscultate the lungs for equal and clear breath sounds during ventilation.
Oropharyngeal Airways

Complications
Trauma to lips, tongue, teeth or oral mucosa

Aspiration

Hypoxia secondary to aspiration or improper placement
Nasopharyngeal Airways

Indications
When the use of an oropharyngeal airway is contraindicated e.g. a conscious or semi conscious patient with a gag reflex.

When the patient has severe facial trauma making placement of other types of airway devices difficult.
Nasopharyngeal Airways

Contraindications and Precautions

Insertion of a nasal airway may stimulate the gag reflex causing the patient to vomit.

If the tube is too long it may enter the oesophagus causing gastric insufflation and hypoventilation.
Nasopharyngeal Airways

Contraindications and Precautions

Epistaxis may occur leading to aspiration of blood.

The nasal airway should not be used in the presence of facial fractures causing nasal obstruction or base of skull fractures.
Nasopharyngeal Airways

**Equipment**

Nasopharyngeal suction equipment
Lubricant
Nasopharyngeal airway.
Nasopharyngeal Airways

Patient Preparation

1. Place the patient in a supine position.
2. Assess the nasal passages for trauma, foreign body or septal deviation
   Align the tube on the side of the face and choose an airway that extends from the tip of their nostril to the angle of the jaw (or front of the ear)
3. Lubricate the airway with either gel or water
4. Prepare suction equipment for use.
Nasopharyngeal Airways

Procedure

1. Pass the airway along the floor of the nostril with the bevel facing the nasal septum.
2. If resistance is encountered, slight rotation of the tube may facilitate passage as the device reaches the pharynx.
3. Maintain head tilt and/or jaw thrust to ensure proper positioning of the airway.
4. Auscultate the lungs for equal and clear breath sounds during ventilations/respirations.
Nasopharyngeal Airways
Nasopharyngeal Airways

Complications
Epistaxis

Aspiration

Hypoxia due to aspiration or improper placement
Bag Mask Ventilation

Indications

To manually provide positive pressure ventilatory support in the presence of inadequate respirations or apnoea.
Bag Mask Ventilation

Contraindications and Precautions

Avoid excessive airway pressure or tidal volumes which can cause gastric distension and pneumothoraces.

Care should be taken to properly fit mask and provide a good seal.

- Frequently two people are required for adequate ventilation of a non-intubated patient
- One to maintain the airway and seal mask and the other to squeeze the bag.
Bag Mask Ventilation

**Equipment**

Oral airway (for non-intubated patient).
Suction equipment.
Bag and mask with Oxygen reservoir.
Oxygen tubing.
Bag Mask Ventilation

Patient Preparation

1. Open and secure the airway.

2. Suction the airway of any obvious debris.
Bag Mask Ventilation

Procedure

1. Connect oxygen tubing to oxygen flow meter and set at 15 litres to deliver 100% oxygen.

2. For the non intubated patient, choose the appropriate size of mask and secure to bag.

3. Stand behind the patient’s head. Seat the mask on the face covering the nose, mouth, and tip of the chin. The narrow end of the mask goes over the patient’s nose.
4. Hold the mask firmly with your thumb over the patient’s nose and your fingers grasping the bony edge of the mandible.

5. With your free hand, squeeze the bag to force air into the lungs. Squeezing the bag against your thigh or the stretcher will assist in generating an adequate tidal volume.

6. The gentle symmetrical rise and fall of the chest signals an adequate tidal volume and mask seal.
Bag Mask Ventilation

One Hand Technique

Two Hand Technique
Bag Mask Ventilation

Complications

1. Excessive tidal volumes may cause gastric distension, leading to vomiting and aspiration.
2. Excessive airway pressures can result in pneumothoraces.
3. Inadequate tidal volumes or mask seal will result in inadequate ventilation.
4. Ophthalmic damage can occur if the mask is too large and pressure is exerted on the eyes during ventilation.
Laryngeal Mask Airways
The LMA provides a safe and swift airway by sealing the outside of the laryngeal inlet with an inflatable cuff.

The LMA is designed for blind insertion without a special introducer tool.

It should only be used when reflexes are sufficiently depressed.
Laryngeal Mask Airways

Indications

Situations involving a difficult mask (BVM) fit or technique.

May be used as a back-up device where endotracheal intubation is not successful.

May be used as a “second-last-ditch” airway where a surgical airway is the only remaining option.
Laryngeal Mask Airways

Contraindications and Precautions

Greater than 14 to 16 weeks pregnant

Patients with multiple or massive injury

Massive thoracic injury

Massive maxillofacial trauma

Patients at risk of aspiration

NOTE: Not all contraindications are absolute
Laryngeal Mask Airways

**Equipment**

- PPE – Gloves and goggles
- Appropriate size LMA
- Syringe with appropriate volume for LMA cuff inflation and water soluble lubricant
- Ambu bag for ventilation
- Stethoscope
- Tape to secure LMA
Laryngeal Mask Airways

Patient Preparation

1. Place the patient in a supine position.
2. Assess the oral passages for trauma & foreign bodies.
3. Prepare suction equipment for use.
4. Position patient’s head and pre-oxygenate with BVM and oxygen.
Laryngeal Mask Airways

Procedure
1. Select correct size
   • Visually inspect the LMA cuff for tears or other abnormalities
   • Inspect the tube to ensure that it is free of blockage or loose particles
   • Deflate the cuff to ensure that it will maintain a vacuum
   • Inflate the cuff to ensure that it does not leak
Laryngeal Mask Airways

Procedure (Continued…)

2. Slowly deflate the cuff to form a smooth flat wedge shape which will pass easily around the back of the tongue and behind the epiglottis.

3. Lubricate the back of the mask thoroughly

• Avoid excessive amounts of lubricant on the anterior surface of the cuff or in the bowl of the mask.

• Inhalation of the lubricant following placement may result in coughing or obstruction.
Laryngeal Mask Airways

Procedure (cont…)

4. Grasp the LMA by the tube, holding it like a pen as near as possible to the mask end.

5. Place the tip of the LMA against the inner surface of the patient’s
   • Press the mask tip upwards against the hard palate to flatten it out.
   • Using the index finger, keep pressing upwards as you advance the mask into the pharynx to ensure the tip remains flattened and avoids the tongue.
Laryngeal Mask Airways

Procedure (cont…)

6. Continue pushing with your index finger.
   • Guide the mask downward into position

7. Grasp the tube firmly with the other hand
   • Then withdraw your index finger from the pharynx.
   • Press gently downward with your other hand to ensure the mask is fully inserted.
8. Inflate the mask with the recommended volume of air.

9. Do not touch the LMA tube while it is being inflated unless the position is obviously unstable.
   - Normally the mask should be allowed to rise up slightly out of the hypopharynx as it is inflated to find its correct position.
Laryngeal Mask Airways

Procedure (cont...)  
10. Connect the LMA to a Bag-Valve Mask device or low pressure ventilator

11. Ventilate the patient while confirming equal breath sounds over both lungs in all fields and the absence of ventilatory sounds over the epigastrium

12. Document insertion and tube size
Laryngeal Mask Insertion

Video links to watch
http://www.youtube.com/watch?v=96e46PyARaU
Laryngeal Mask Airways

Complications

Failure to press the deflated mask up against the hard palate or inadequate lubrication or deflation can cause the mask tip to fold back on itself.
  • pushing the epiglottis into its down-folded position causing mechanical obstruction

If the mask is inadequately deflated it may either
  • push down the epiglottis - aspiration
  • penetrate the glottis.
Upper airways

Lower airways
The Lower Airways

• Trachea, left bronchus and right bronchus.
• Bronchi slightly smaller lead to the bronchioles and finally the alveoli.
• Upside down boab.
• Alveoli have a capillary/blood flow running underneath and they exchange O2 and CO2.
• Just like a river O2 is trying to get to the other side if it can not cross membranes then VQ mismatch occurs.
• Remember O2 can be delivered but needs to be utilised.
Endotracheal Intubation

**Principles**

Endotracheal intubation refers to the procedure of inserting a tube directly into the trachea. The endotracheal tube (ETT) may be placed through the nose or mouth.

Gold standard for airway management

Requires a skilled operator to perform procedure.
Endotracheal Intubation

**Indications**

To secure the airway in cases of inadequate ventilatory rate and/or depth.

- The cuffed tube protects the trachea and lungs from gastric contents, saliva, or blood and fluid from the upper airway.
- Direct access to the lungs provides an easy route for supplemental ventilation.
Endotracheal Intubation

Indications
Direct access to the lungs allows suctioning of secretions from the lungs.

Direct access to the lungs allows administration of medications for rapid absorption through the pulmonary tree.
Endotracheal Intubation

Contraindications and Precautions
There are no absolute contraindications to endotracheal intubation.
The procedure should be carefully considered in those with:

a. An intact gag reflex
b. Potential or actual cervical spine injury
c. Head trauma and/or increased intracranial pressure
d. Epiglottitis
e. Facial fractures
Endotracheal Intubation

**Equipment**

- Endotracheal tube
- Size estimates are made on the size of the patient’s little finger. For most males an 8mm tube is appropriate while a 7.5mm tube is suitable for most females.
- Laryngoscope handle/blades
- Introducer
- Magill’s forceps
Endotracheal Intubation

Equipment (Continued…)

- 10ml syringe
- Lubricating gel
- Paralysing drugs if required
- Cotton tape for securing tube
- Stethoscope for auscultation of tube position
- Suction equipment
Endotracheal Intubation

Equipment (Continued…)

• Oxygen supply
• Bag and Mask
• Bag mask ventilation must be provided during preparation for intubation and to sustain ventilation if the initial intubation attempt is unsuccessful
• Extra laryngoscope bulbs and batteries unless using disposable equipment
Endotracheal Intubation

Equipment (Continued…)

Have resuscitation drugs and sedatives available

- Adrenaline
- Atropine
- Maxalon
- Morphine
- Vecuronium
- Cardiac monitoring

- Amiodorone
- Lignocaine
- Midazolam
- Pancuronium
- Suxamethonium
Endotracheal Intubation

Patient Preparation

1. Assess patient’s colour and ventilatory status prior to intubation attempt.

2. Initiate hyperventilation with 100% oxygen using a bag-mask.

3. Administer sedative, or paralytic agents, as ordered.
Endotracheal Intubation

Procedure

1. Inflate the cuff to test for air leaks. Deflate after testing.
2. Turn on suction and place the Yankeur Sucker next to the patient’s head.
3. Ventilate the patient for approximately 3-5 minutes (optimal) via bag-valve-mask with 100% oxygen.
4. Place the patient in the sniffing position unless spinal precautions prohibit it.
5. Provide manual stabilisation of the head if spinal movement is contraindicated.

6. Administer a short-term sedative and then a paralytic to allow intubation.

7. Insert the laryngoscope with the left hand. The tongue should be swept to the left side and the laryngoscope inserted and lifted up and away.

8. Visualise the vocal cords and the larynx.
Endotracheal Intubation

Procedure (Continued…)

9. If the cords are not visible, downward cricoid pressure (also known as the Sellick manoeuvre) may also serve to prevent aspiration of emesis by occluding the oesophagus during intubation.
10. Place the endotracheal tube through the cords using the right hand. The tube should be advanced until the cuff disappears through the cords.

11. Remove the laryngoscope, maintaining a grip on the endotracheal tube.

12. Attempt ventilation through the endotracheal tube.

13. Check for correct tube placement. Listen to the chest/lungs.
Endotracheal Intubation

Procedure (cont…)

14. If the tube is in the correct position, continue ventilations while inflating the cuff. Instil air until an adequate seal is attained; 10 to 15 ml of air are usually required.

15. Secure the tube.

16. Obtain a chest x-ray to confirm correct placement.
Endotracheal Intubation

Video link on ETT insertion

https://vimeo.com/47496362
Endotracheal Intubation

Complications
1. Oesophageal intubation
   This is a serious complication because the patient’s lungs will not be ventilated and gastric distension may occur. Gastric distention increases the risk of vomiting and may decrease the patient’s tidal volume.
Endotracheal Intubation

Complications (Continued…)

2. Dislodgement of the tube
   Frequent reassessment of tube position, especially after the patient is moved, is necessary.

3. Damage to teeth, nasal mucosa, posterior pharynx, or larynx
Endotracheal Intubation

Confirm Tube Placement

A number of methods may be employed to confirm correct endotracheal tube placement.

- Direct visualisation of the tube passing through the cords.
- Chest movement with ventilation.
- Breath sounds:
  - a. Upper lobes, both sides
  - b. Lower lobes, both sides
Endotracheal Intubation

Confirm Tube Placement (cont...)

- Unilaterally absent or decreased breath sounds (usually the left) suggests that the tube was advanced into a main bronchus. Withdraw the tube slightly and reassess until breath sounds are equal bilaterally.

- Epigastric sounds: the presence of burping sounds over the epigastrium during ventilation suggests oesophageal placement. Remove the tube immediately and hyperventilate the patient before attempting intubation again.
Endotracheal Intubation

Confirm Tube Placement (cont…)

• Bag mask compliance: Ventilation of the stomach is easier than the lungs; while a tube obstruction, bronchospasm, or tension pneumothorax makes ventilation more difficult.

• Condensation in the ET tube on exhalation confirms tube position in the trachea.

• Pulse oximetry: maintenance of an adequate oxygen saturation confirms tube placement.
Endotracheal Intubation

Confirm Tube Placement (cont…)

• End tidal CO₂ gauge – placed on the end of the ETT and will change colour depending on placement

• Presence of gastric contents in endotracheal tube: If food is present in the tube, recheck the position; may indicate oesophageal intubation.

• Chest x-ray documentation of tube location in the trachea just above the carina.
Endotracheal Intubation

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Endotracheal Intubation

Securing the Endotracheal Tube

To prevent accidental extubation and movement of the tube, the ETT must be carefully secured. While individual departments frequently use different techniques, a number of principles apply

1. In order to allow suctioning and mouth care, the mouth must not be occluded by tape, ties, or other devices.
Endotracheal Intubation

Securing the Endotracheal Tube (Continued…)

2. When possible, the method used should minimise pressure points on the skin to prevent long-term complications.

3. When tape or ties are used, they should completely encircle the head for maximum security.

4. When possible, the markings on the tube should be noted at the teeth and documented so that movement of the tube can be checked visually.
Endotracheal Intubation

Taping ETT with trachy tape
Endotracheal Intubation

Taping ETT with tape
Frequency of Ventilation

When ventilating a casualty without an advanced airway, ventilation should be continued at a ratio of 30 compressions to 2 ventilations, irrespective of the number of rescuers, until an advanced airway is in place.
Frequency of Ventilation

After an advanced airway (e.g. ETT, LMA) is placed, ventilate the patient’s lungs with supplementary oxygen to make the chest rise.

During CPR for a patient with an advanced airway in place it is reasonable to ventilate the lungs at a rate of 6 to 10 ventilations per minute without pausing during chest compressions to deliver ventilations.

[Class B; Expert consensus opinion]
– ARC Guideline 11.6, Dec 2010
Patient Care

General Nursing Care as they unable to perform them due to intolerance to exertion

• Monitor fluid balance closely.
• Alert team leader to patients fluid status
  - i.e. poor urine output, -ve/+ve balance.
• Note the type of secretions, colour, amount.
• Assess patients respiratory effort.
  - Colour, respiratory rate, use of accessory muscles, chest excursion
Further Reading/Resources


• Airway Management Notes
References


Roberts, J.R., and Hedges, J.R. Clinical Procedures in Emergency Medicine 3rd Ed Sydney: W.B. Saunders Company


Remote Are Nursing Emergency Guidelines DOH Fourth Edition 2005

National Advanced Life Support Adult and Paediatric. Manual for Health Professionals. ACCCN 2008
End of Module

Next Steps
Please now complete the online quiz by clicking on the Exit button - top right hand of your screen.

Next, return to the Topic Outline page.

Scroll down to Module Assessment and complete the online knowledge assessment.

Please complete the evaluation form and print off your certificate.