



# Airway Management

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Revision notes for  
DFMRT Casualty Care Examination Course  
January 2013

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# Indicating special information in “Revision Notes” presentations

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**NEW**

New information since *Casualty Care in Mountain Rescue* was published in 2006.

*NOTE: This presentation only includes essential information. To know the subject in greater depth, you must read *Casualty Care in Mountain Rescue*.*



# Casualty Care syllabus 2009-13

## Airway

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- Understand the importance of the airway
- Appreciate the basic anatomy and physiology
- Recognise an obstructed airway and its causes
- Be able to manage an airway problem using simple airway manoeuvres and adjuncts



# REMINDER

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*Important*

**A** = Airway + CERVICAL SPINE!

*Get into the habit of always thinking 'Airway + Cervical Spine' or you will forget it in the heat of the moment and miss a spinal injury.*



# Airway Management

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## AIM

TO ENSURE AIR CAN FLOW FREELY IN AND OUT OF THE LUNGS WITH MINIMAL RESPIRATORY EFFORT

*Important*

Simple things kill e.g. failed basic airway management.

Do the basics well



# Upper Airway – Essential anatomy & physiology relevant to MR

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## Parts

- Nose
- Mouth
- Throat

## Functions

- Warming and humidifying inspired air.
- Trapping small foreign particles in the inspired air.
- Directing food & fluids into the oesophagus (otherwise, they go down the “wrong way”).



# Upper Airway

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Mouth breathing by-passes the humidification process leading to greater loss of heat + moisture from the body, especially in cold, dry weather.



# Lower Airway – Essential anatomy & physiology relevant to MR

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## Parts

- Voice box (larynx).
- Windpipe (trachea) divides into 2 large tubes (bronchi).

## Functions

- Gas exchange.
- Speech.



# Body mechanism to keep the lower airways clear

*Important*

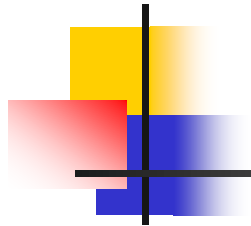
## VOCAL CORDS

- Can close completely to prevent material from entering.
- Closure triggered by material in contact with the cords, or in the throat e.g. oropharyngeal airway.

## COUGHING

Anything interfering with coughing will allow secretions & any fluid to accumulate. This will impair gas exchange e.g.

- Head injury causing unconsciousness
- Chest injury (fractured ribs makes coughing painful, and damaged lungs can fill with blood)
- Spinal cord damage



# AIRWAY OBSTRUCTION



# Airway Obstruction

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Narrowing or obstruction of any part of the airway from the lips to the alveoli will have a great & immediate effect on a person's wellbeing.

Even a small obstruction will cause a fall in blood oxygen levels, a rise in carbon dioxide, and make the patient work harder to breathe.

Obstruction of the larger airways, including the pharynx, larynx, trachea and bronchi can follow inhalation of a foreign body e.g. peanuts, vomit, snow, etc.

In complete airway obstruction, death will occur in a few minutes.

**ANY airway obstruction is EXTREMELY serious  
and requires IMMEDIATE action**



# Causes of airway obstruction

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- Tongue
- Swelling of the lining of the airway
- Fluid in the airway
- Anatomical changes e.g. facial trauma



# Airway Obstruction – Tongue

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- Commonest cause of airway obstruction.
- In a conscious person, tongue is prevented from blocking the airway by muscle tone.
- In an unconscious casualty, muscle tone is reduced.
- Tongue can easily fall backwards and block the airway, especially if the casualty is lying on his back.

## *Important*

So long as the jaw is intact, moving the jaw forwards (chin lift or jaw thrust) will move the tongue forwards and this may be sufficient to relieve the obstruction.

**This manoeuvre may not be effective if the jaw is broken.**

# Airway Obstruction – The lining of the airway

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Swelling of the lining of the throat, larynx, trachea and bronchi can occur due to:

- Allergic (anaphylactic reaction) due to e.g. insect sting or drug.
- Chemical irritation e.g. smoke inhalation. The victim usually has to inhale the fumes for some time for this to occur.

# Airway Obstruction – Free fluid in the airway

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- Free fluid inside the lungs will impair gas exchange. Causes include:
  - Vomit
  - Blood
  - Water
  - Body fluid e.g. fluid fills the lungs in heart failure.
- Bleeding anywhere in the airway due to trauma to the face and/or neck can cause airway obstruction. If the casualty is unconscious e.g. from an associated head injury, then even a relatively small amount of bleeding may prove fatal.

# Airway Obstruction – Changes in anatomy

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- Tracheal displacement
  - Pneumothorax (see separate presentation)
  - Bleeding in the neck
- Muscle in the walls of lower airways may contract making them narrower. This causes an audible wheeze (asthma) & impairs gas flow. Causes include
  - Asthma
  - Inhalation of an irritant substance or vomit
  - Anaphylaxis





# Airway Obstruction

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Chest movement + no air flow = obstruction

*Important*

**Know how to recognise and manage -**

- Upper airway obstruction due to the tongue or foreign body.
- Asthma
- Pneumothorax

**Know how to manage the airway when there is a possible cervical spine injury**

# Airway practicalities



# Airway –

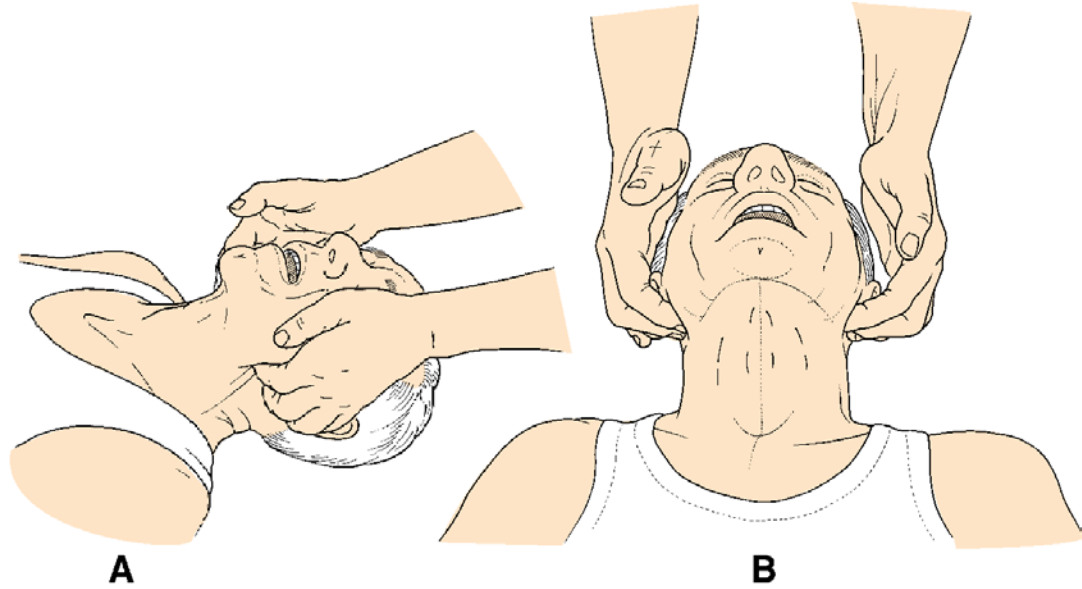
## Simple methods to clear the airway

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- Remove foreign bodies e.g. dentures, vomit, blood. Use careful suction if appropriate.
- Head tilt + chin lift.
- Jaw thrust.

BE CAREFUL WHEN CLEARING THE AIRWAY  
IF SUSPECTED CERVICAL SPINE PROBLEM

# Head tilt Chin lift (left) and Jaw thrust (right)



# Airway – Videos of Jaw thrust



How to perform jaw thrust.



How effective is it?



# Airway – the patient with dentures

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Dentures are not always bad news.

- When some people remove their dentures, their cheeks fall inwards. This makes it very difficult to obtain a seal with a face mask.
- Consider leaving well-fitting dentures in place, particularly in unconscious subjects who need airway support



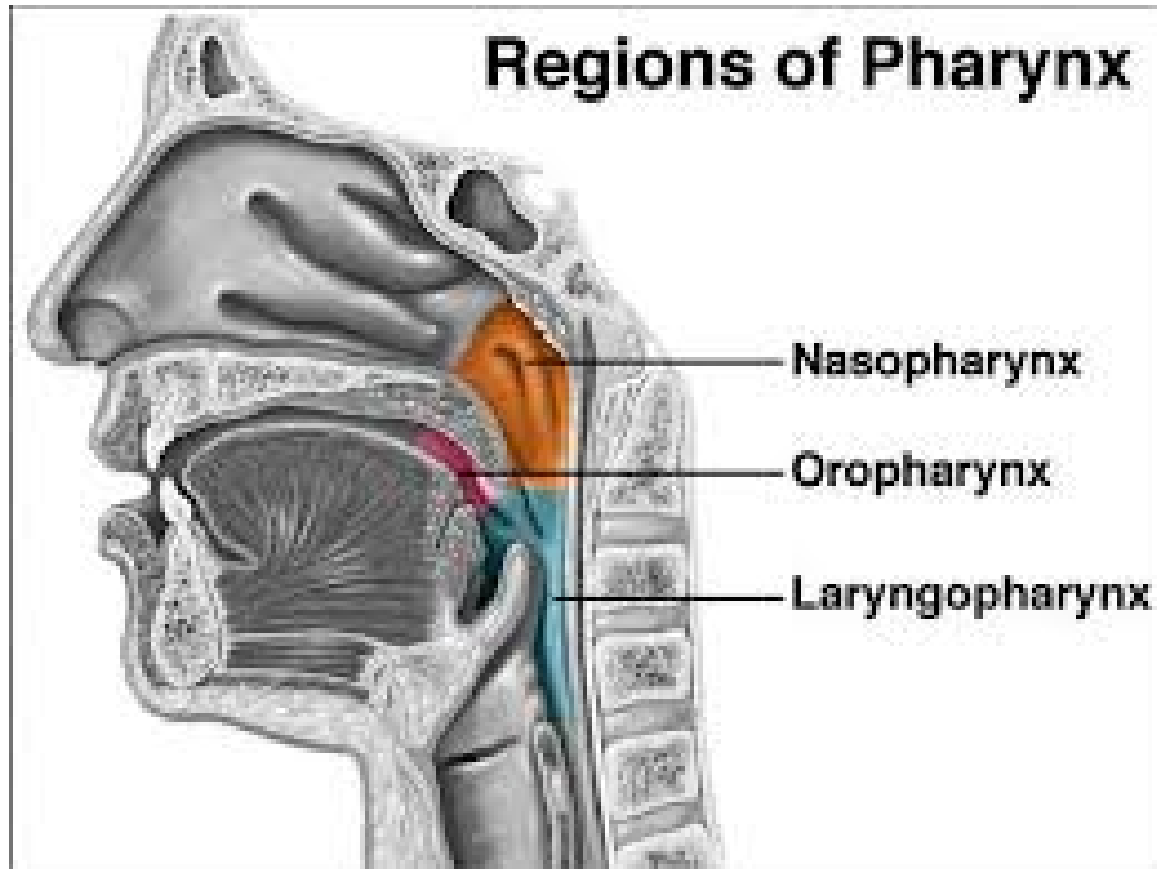
# Airway devices

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- Simple airway devices:
  - Oropharyngeal airway (Guedel)
  - Nasopharyngeal airway
  - Suction
  
- Advanced:
  - I-Gel
  - Classic Laryngeal Mask Airway (LMA)
  - (Endotracheal tube)

# The Pharynx

- Nasopharynx lies behind the nose
- Oropharynx lies behind the mouth and tongue.
- Laryngopharynx lies behind the larynx (voice box)





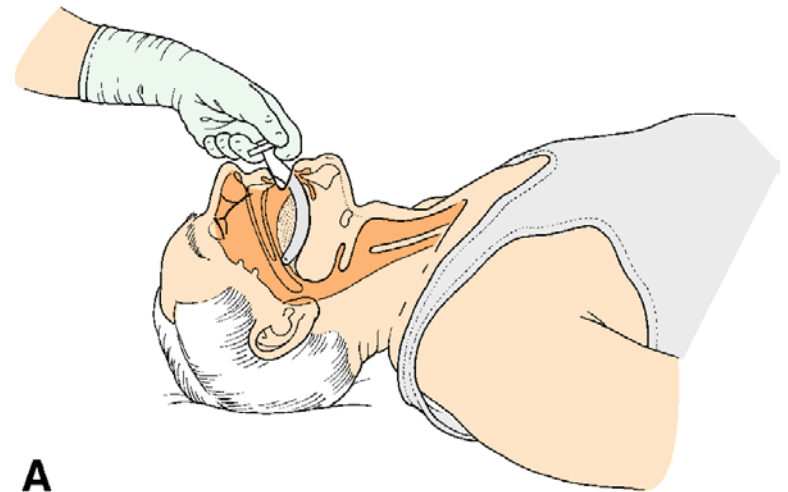
# Oropharyngeal airway (Guedel)

- Size from front teeth to angle of jaw ('hard to hard')
- NOTE – Different manufacturers use different numbering systems to denote size. Therefore you cannot always rely on remembering a colour or number to get the correct size.

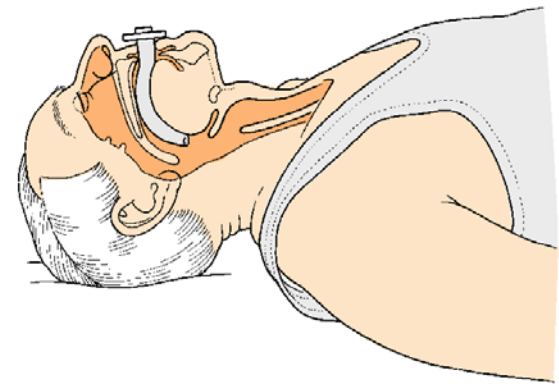


# Oropharyngeal airway (Guedel)

- Only insert if patient is deeply unconscious.
- If the patient starts to reject the airway, remove it immediately.
- In adults & children >2y, insert upside down until about  $\frac{3}{4}$  way in, then turn through  $180^\circ$ .
- Useful to facilitate mask ventilation in a patient who isn't breathing (apnoea).



**A**



**B**



# Oropharyngeal airway (Guedel) – Risks

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- Stimulates laryngospasm or vomiting if patient not unconscious.
- NB vomiting increases intracranial pressure.
- Using the wrong size
  - Too small will be ineffective. It will just sit on top of the tongue.
  - Too long can cause airway obstruction.
- Dental damage.

Laryngospasm means a sudden and uncontrollable closure of the vocal cords. If closure is complete, there will be no breath sounds even though the patient is trying to breathe. If closure is partial, the breathing will be noisy. Remove the OPA immediately.



# Nasopharyngeal airway

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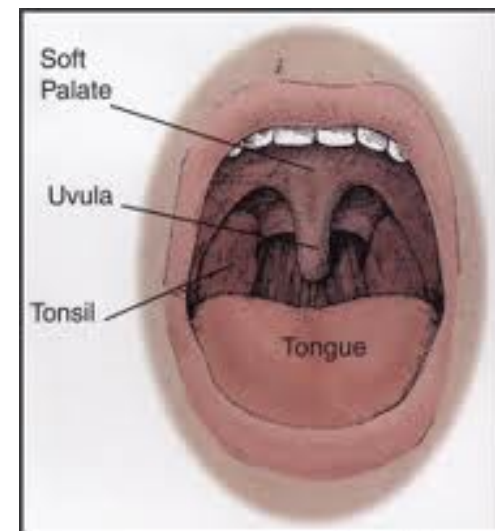
- If cannot use oropharyngeal airway.
- Can insert if patient semi-conscious or unconscious.
- Well tolerated.
- *Can use* in a base of skull fracture **IF** no viable alternative to keeping the airway clear **AND** you are meticulous about how you insert it.

## *Important*

- **Risks**
  - Nose bleed (can be profuse!). More likely if NPA too large or heavy handed insertion.
  - Ineffective if too long and tip enters upper oesophagus.
  - Airway irritation if too long as tip goes into upper trachea.

# Nasopharyngeal airway – Size & position after insertion

- Diameter:
  - 6 mm for female.  
7 mm for male.
  - Research has shown that the patient's little finger is not a reliable guide to size (see Roberts K, et al. How do you size a nasopharyngeal airway. *Resuscitation* 2003; **56**: 19-23)
- Length:
  - From nostril to tragus of the ear
- Tip lies in nasopharynx behind uvula or tongue but above voice box and oesophagus.



# Nasopharyngeal airway – Insertion

- Well lubricated with gel.
- Direction in casualty lying down is *straight back* (as though nailing casualty to the floor), **not up**, especially if possible base of skull fracture.
- Be very gentle.
- Can use a “twisting” motion.
- Start with the R nostril as might be easier due to the bevel of the NPA tip.
- If nostril blocked, try other one.

Right



Wrong!



# Portex nasopharyngeal airway

- If using this type, put safety pin through flange rim at upper end.
- Do not obstruct lumen with safety pin.



# NasoSafe nasopharyngeal airway

- Integral flange (so don't need safety pin) stops airway from migrating into nose.
- Range of sizes made but stick to 6 or 7 mm.



Dark green  
4 mm



Black  
5 mm



GREEN  
6 mm



ORANGE  
7 mm



Red  
8 mm



Purple  
9 mm



Use size 9 if you have to resuscitate a horse!







# The i-Gel and Laryngeal Mask Airway

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- Included here for completeness as some teams carry them.
- Use in MR
  - Casualty not breathing at all e.g. cardiac arrest, severe hypothermia with cardiac arrest
  - Also possibly inadequate breathing e.g. head injury, stroke, drug overdose.
  - The only way to breathe for the casualty during stretcher carry. You cannot ventilate a patient with a bag-valve-mask in this situation.
- Both have risks
  - Will stimulate laryngospasm or vomiting if patient not deeply unconscious.
  - Damage to teeth if inserted with a heavy-handed manner.
  - Inflation of the stomach possible if patient ventilated.
  - LMA in particular can be inserted in an incorrect position making ventilation very difficult or impossible.
- If you do use these devices, then your team will provide full training.



# i-Gel

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- Latex-free thermoplastic. At normal body temperature, moulds to shape of pharynx. The moulding may be less in severe hypothermia.
- Connector will fit self-inflating bag
- Size 4 for most adults.
- May be preferable to LMA in MR as
  - Easier to insert
  - No cuff to inflate (or overinflate!)
  - Hard to insert it the wrong way round
  - One size fits most people
- Check i-Gel before use for signs of damage.
- Tips for insertion and use:
  - Lubricate the back + edges but not the front (where fits over vocal cords)
  - Do not use excessive force to insert. Jaw thrust facilitates insertion.
  - When ventilating a patient who is not breathing, squeeze the bag gently to minimise likelihood of air being forced into the stomach.

# i-Gel insertion

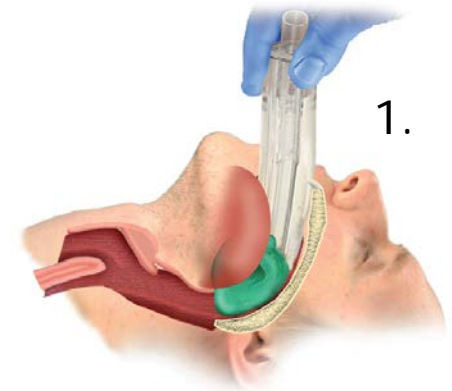
**NEW**



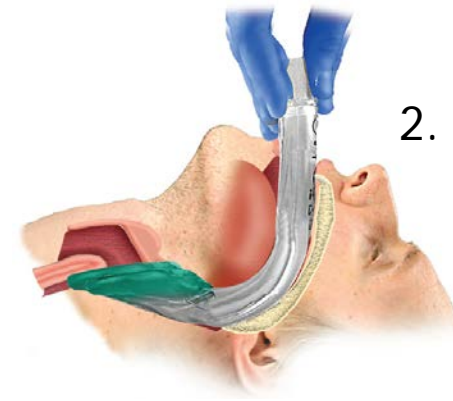
Head position prior to insertion.



Can use jaw thrust to assist placement if encounter resistance.



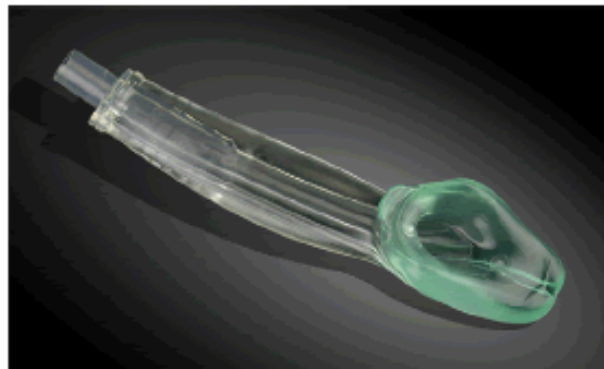
1.



2.

Insertion pathway (1,2). The black line should be level with the teeth (3).

Front surface of i-gel



3.



# Laryngeal Mask Airway

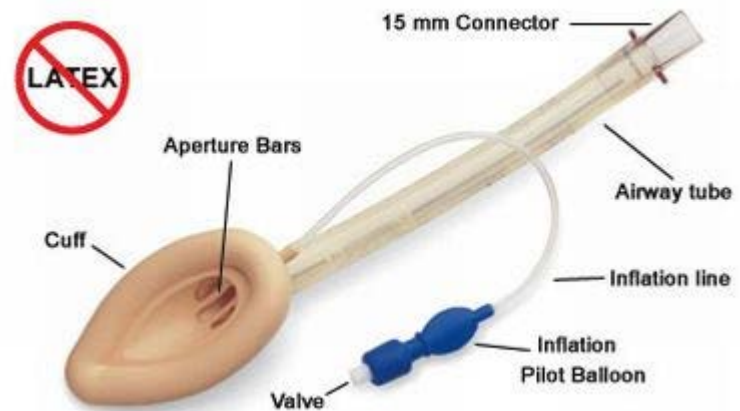
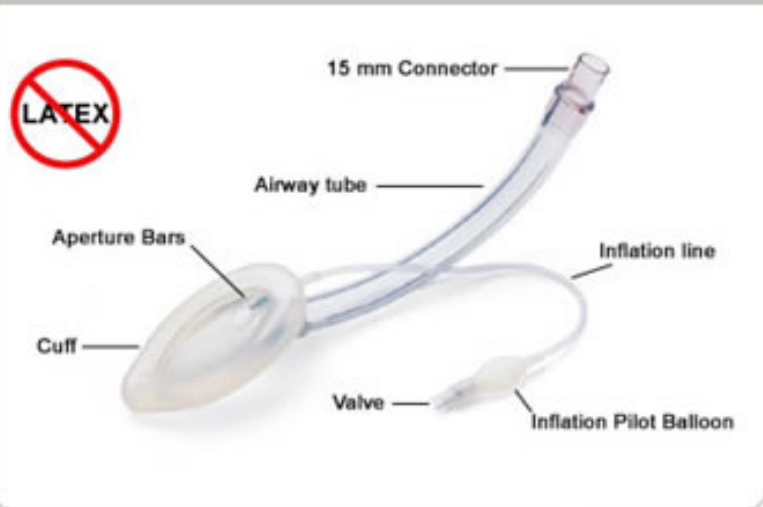
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- In MR, same indications as for i-Gel.
- Size: 3 for 30-50 kg child, 4 for adult female, 5 for adult male.
- Check LMA before use for damage.
- Insertion tips:
  - Insert with cuff fully deflated.
  - Do not over inflate the cuff as this is very stimulating and can cause breathing difficulties.
  - When ventilating a patient who is not breathing, squeeze the bag gently to minimise amount of air forced into the stomach.

# Classic LMA

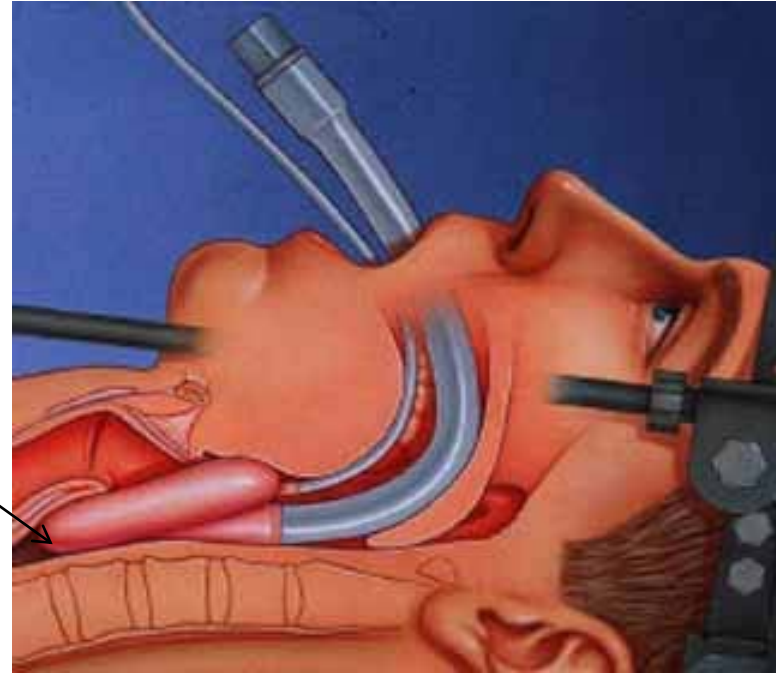
- Single use version (upper)
- Re-usable version (lower)

The Single Use LMA™ Airway



# LMA position and malposition

- Tip of LMA should lie in upper oesophagus.
- The black line on the tube should be in line with the nose to ensure the device is the right way round.
- Do not overinflate the cuff.





# Airway Summary

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- A = Airway + Cervical Spine.
- Any airway obstruction is extremely serious and requires immediate action.
- Chest movement + no air flow = obstruction.
- Tongue is the commonest cause of airway obstruction.
- Use nasopharyngeal airway if cannot use oropharyngeal. Pay attention to direction of insertion.
- Repeat assessment and record findings as often as necessary.



# Skills

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## Essential

- Recognise airway obstruction
- Clear the airway, & maintain a clear airway with your hands only
- Insert a correctly sized oropharyngeal airway
- Insert a correctly sized nasopharyngeal airway
- Correct use of oxygen mask with reservoir bag

## Other

- Insertion of i-Gel/LMA





# Scenarios

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Consider the airway management in the following (either as isolated problems, or in combination):

- Anaphylaxis
- Asthma
- Cervical spine injury
- Combative casualty with head injury
- Falling SpO<sub>2</sub>
- Facial fractures
- Falling blood pressure
- Head injury
- Major limb fractures
- Major haemorrhage
- Rib fracture
- Spinal injury
- Uncontrolled seizures