



Airway Management Principles For MO

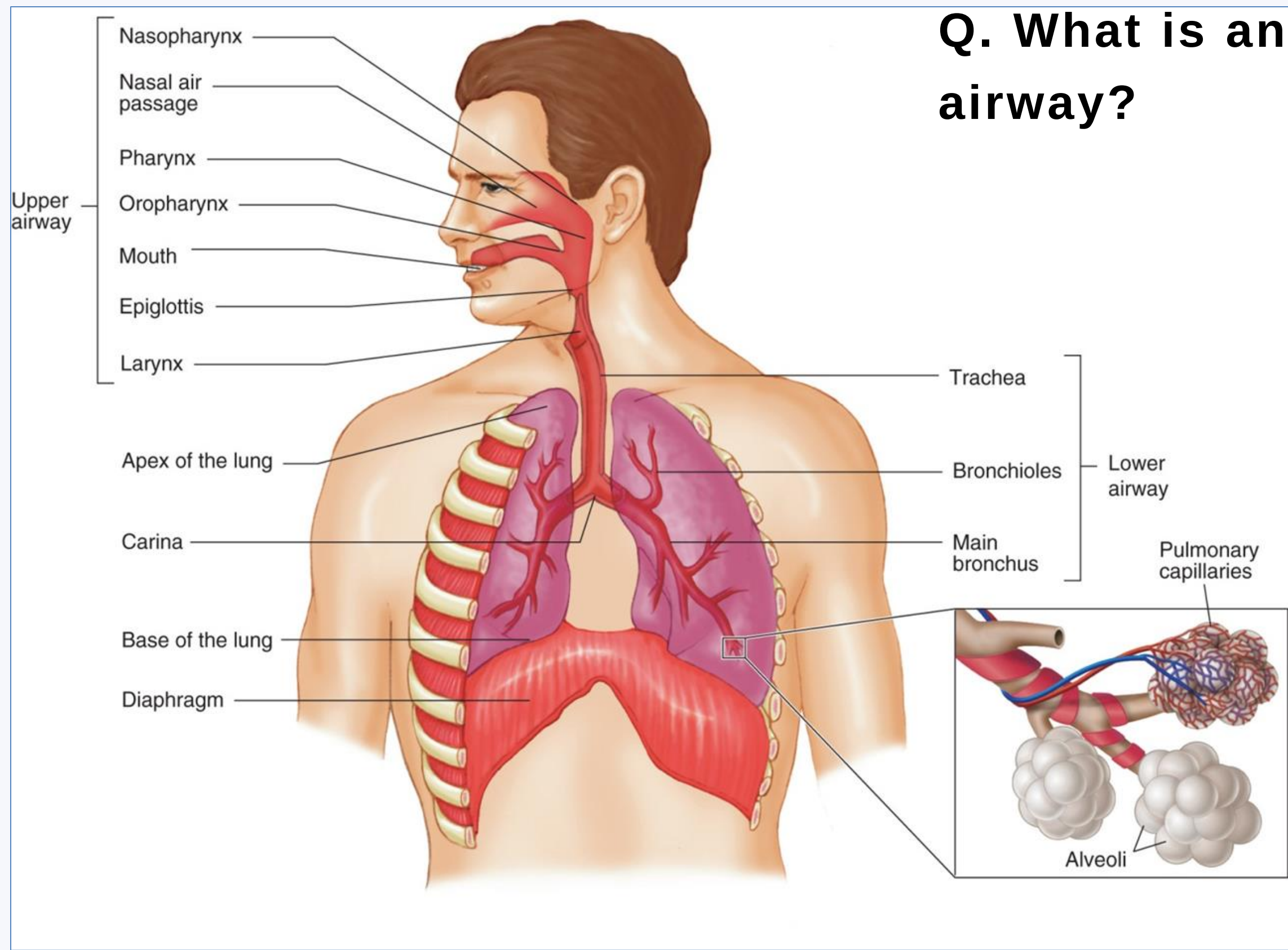




LEARNING OBJECTIVES

1. To know the anatomy of the airway
2. To know the importance of Airway
3. Know the various adjuvants in the airway management
4. Know and select correct airway management strategies
5. Know how to assess a difficult airway
6. To know when to intervene, when to transfer?

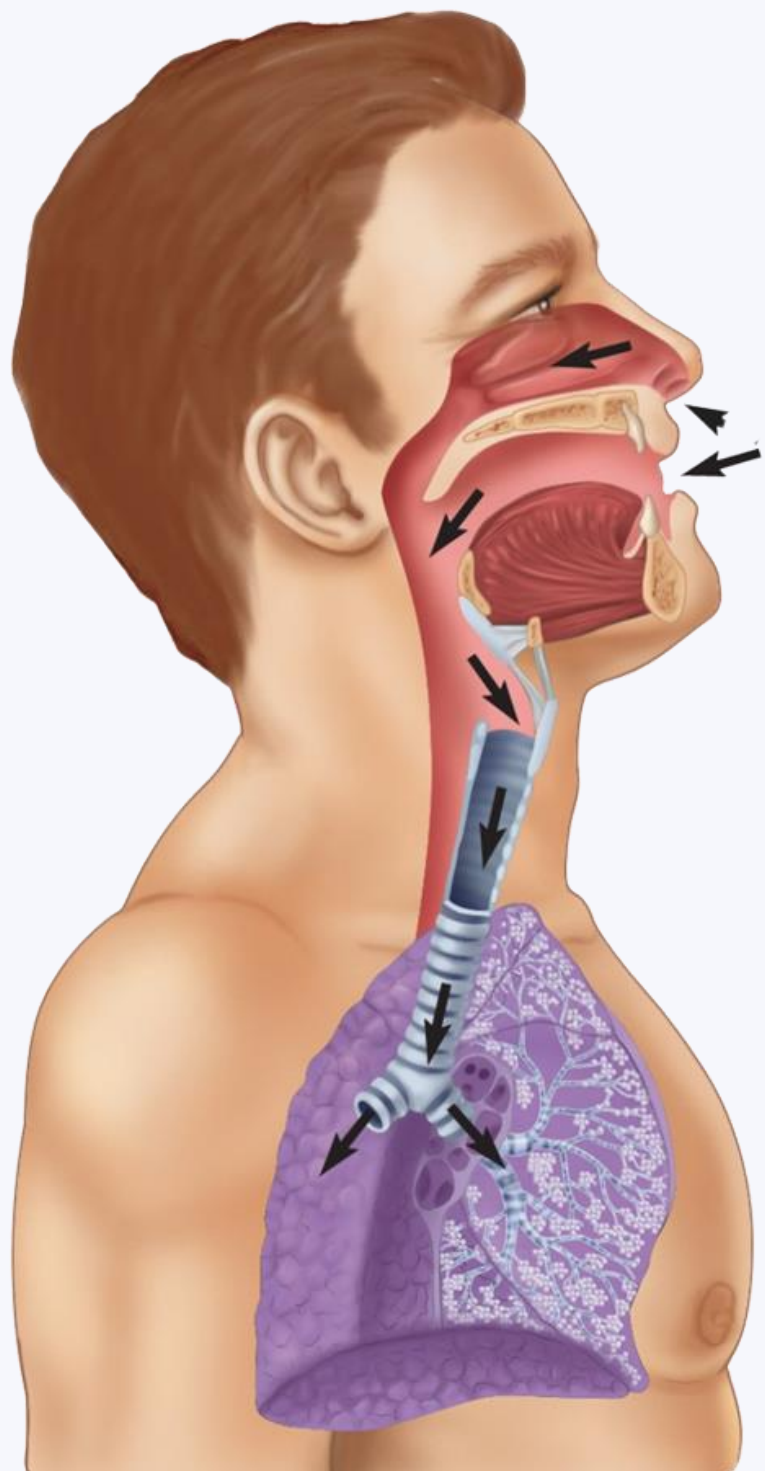




A conduit between the lungs and the outside world



IMPORTANCE OF AIRWAY?



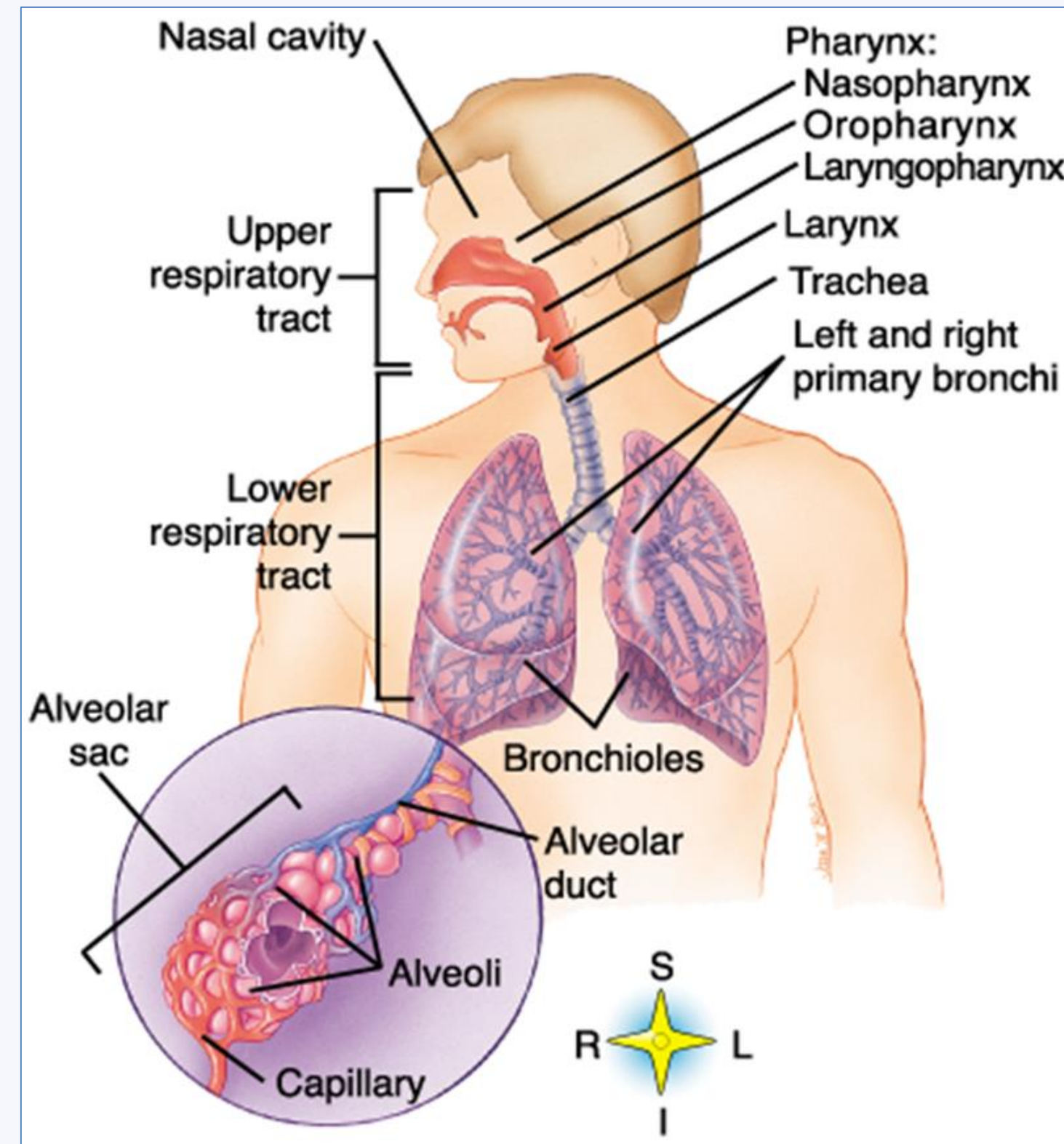
- The airway is the passage way by which air enters the body during respiration, or breathing.
- A patient cannot survive without an open airway.
- Maintaining an open airway is the first priority of emergency care.



AIRWAY ANATOMY REVIEW

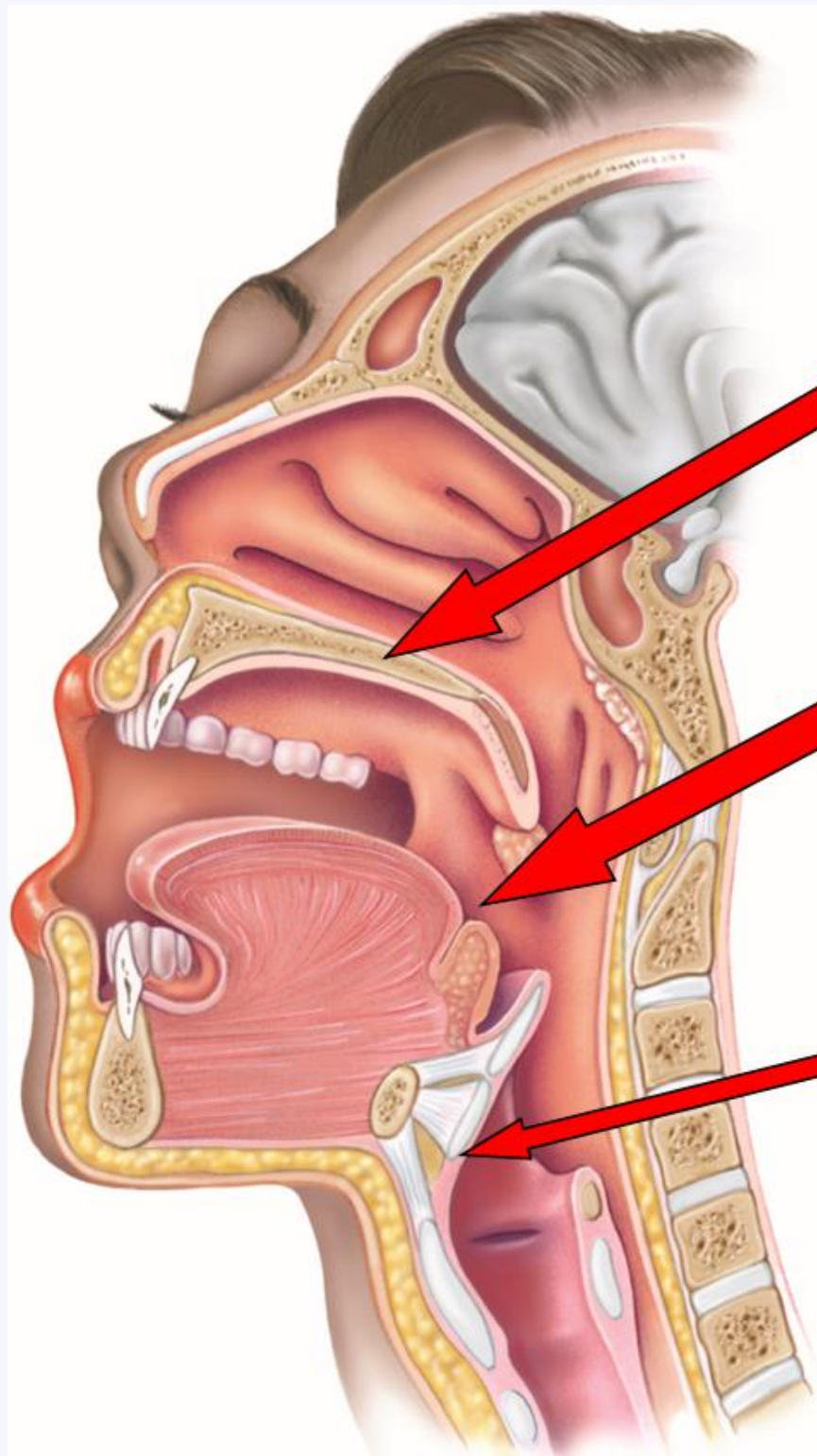
Airway Divisions?

- Upper airway
- Lower airway





UPPER AIRWAY-PHARYNX (THROAT)

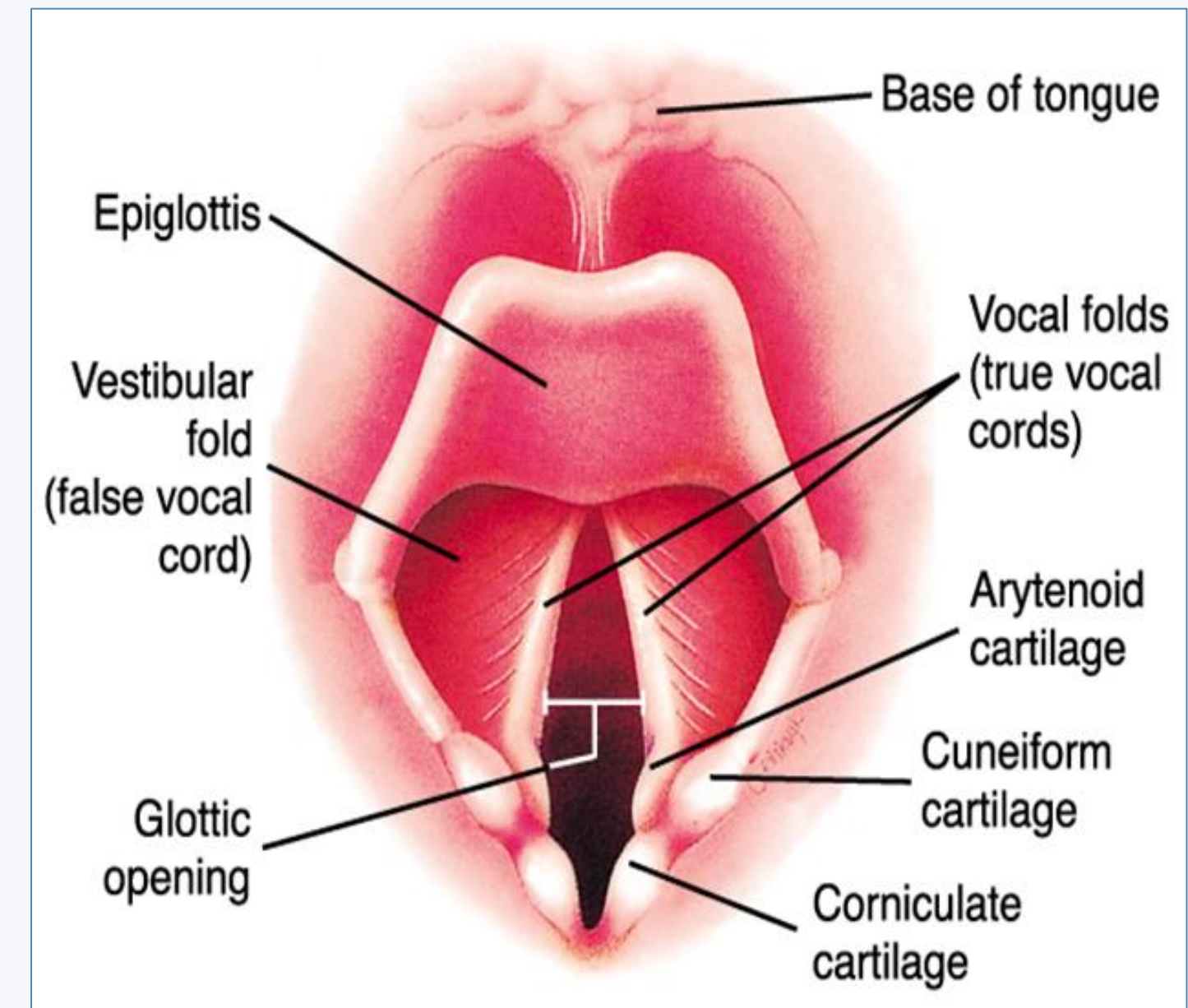


The base of the skull to the esophagus has **3 divisions:**

- 1) **Nasopharynx** - Behind nose to the soft palate.
- 2) **Oropharynx** - Behind mouth, soft palate to the hyoid bone.
- 3) **Laryngopharynx** - Hyoid bone to esophagus.

EPIGLOTTIS & VOCAL CORDS

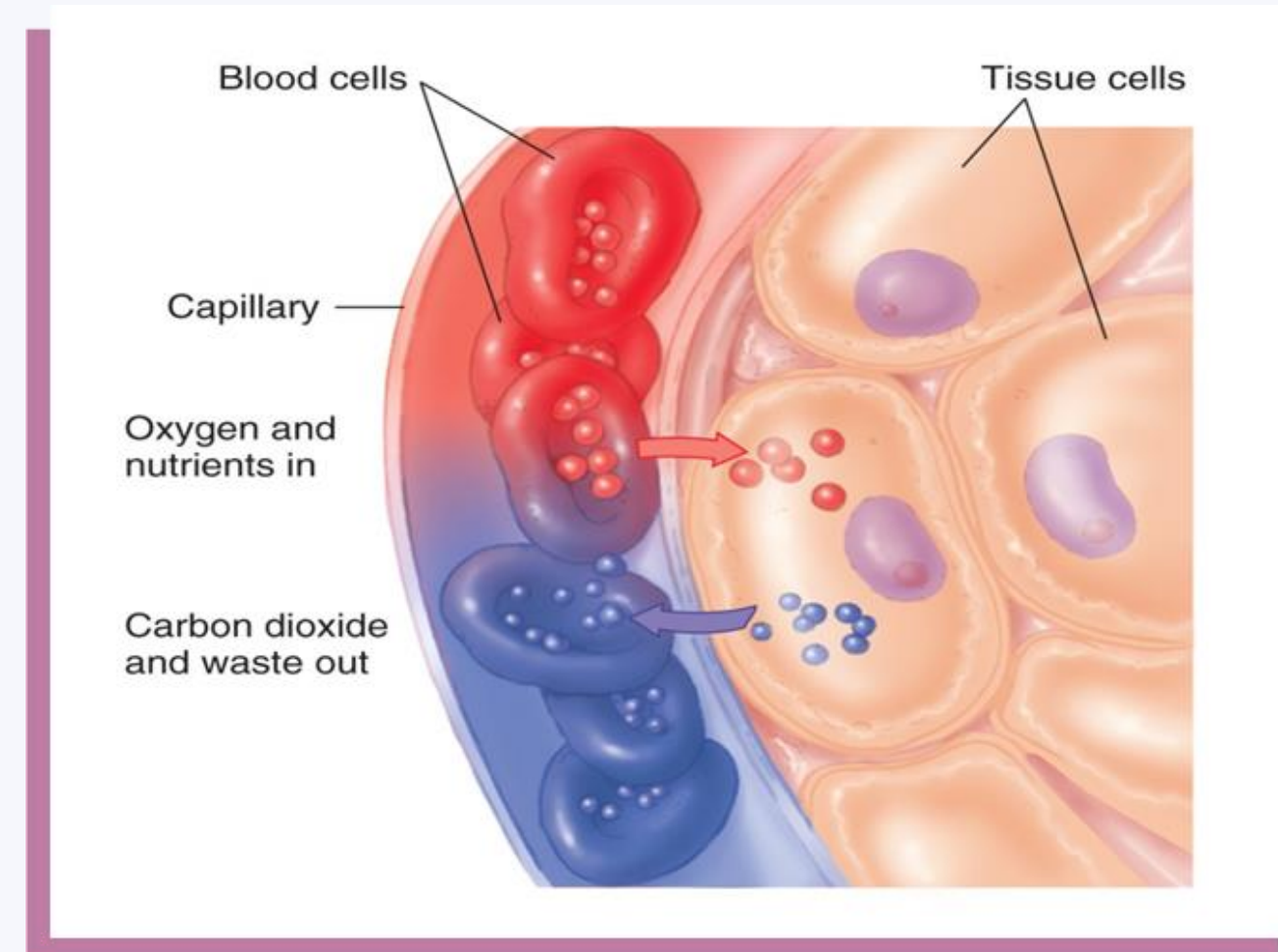
- Small, leaf-shaped cartilage
- Prevents food from entering the trachea during swallowing
- Glottic opening /vocal cords directly behind the thyroid cartilage
- Narrowest part of the adult larynx. An important landmark for intubation





OXYGEN IN THE BLOOD

Exchange of oxygen and carbon dioxide between circulatory system and cells

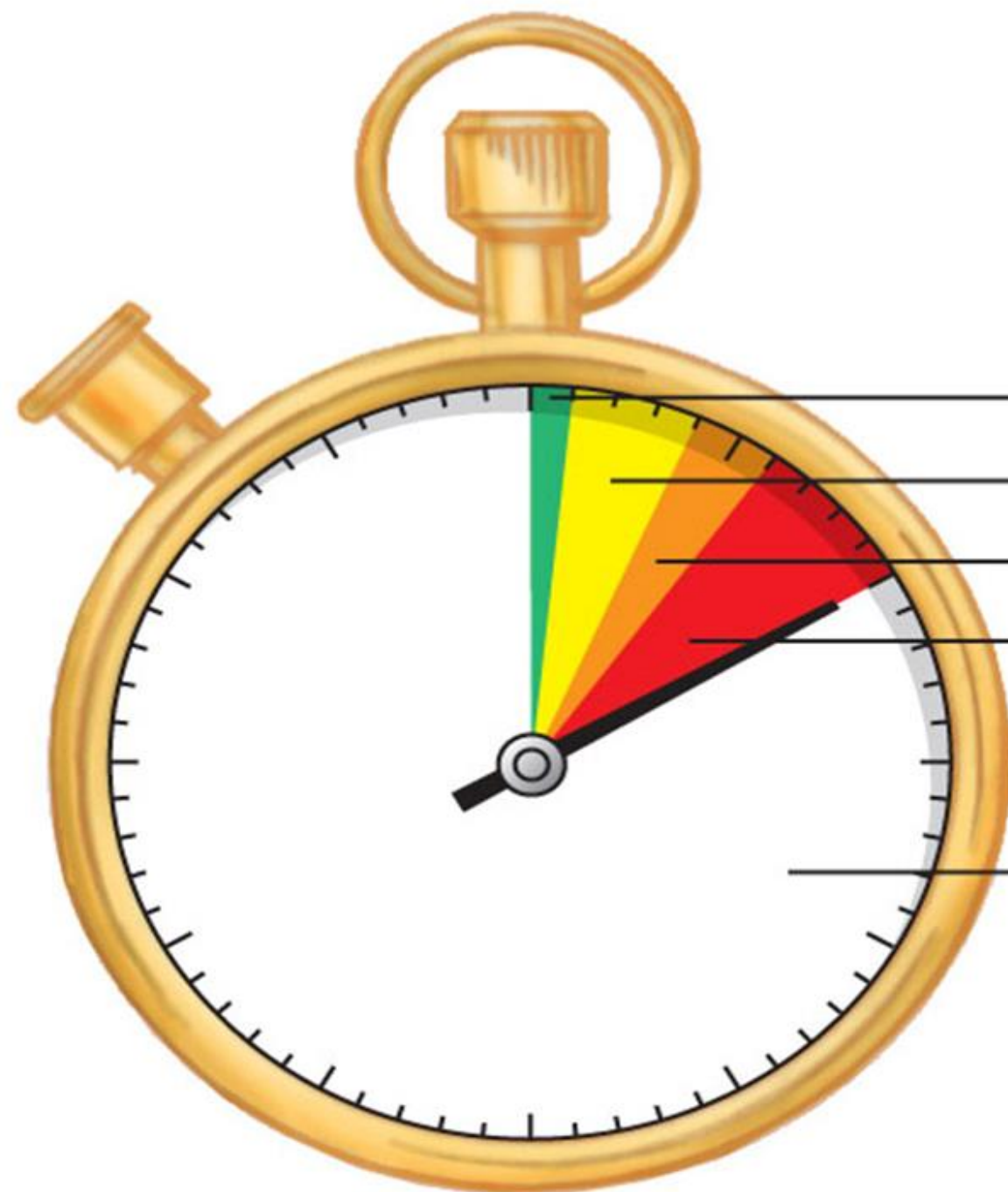


- Approximately 97% of total O₂ is bound to hemoglobin
- O₂ saturation SpO₂
 - % of hemoglobin saturated
 - Normally greater than 94%



WHY AIRWAY IS IMPORTANT?

Eventually, all cells will die if deprived of Oxygen.



TIME IS CRITICAL!

- 0–1 min: cardiac irritability
- 0–4 min: brain damage not likely
- 4–6 min: brain damage possible
- 6–10 min: brain damage very likely
- More than 10 minutes: irreversible brain damage

WHAT ARE THE CLINICAL SIGNS OF AIRWAY COMPROMISE: PATENCY?

- Inability to speak
- Unusual raspy quality to the voice
- Snoring
- Gurgling
- Drooling
- Inspiratory stridor
- Hoarseness
- Paradoxical chest wall movement
- Tracheal tug





WHAT ARE THE CLINICAL SIGNS OF AIRWAY COMPROMISE: OXYGENATION AND VENTILATION?

- Central cyanosis
- Obtundation and diaphoresis
- Inadequate/ shallow respirations (<10bpm)
- Rapid shallow respirations (>30bpm)
- Accessory muscle use
- Retractions
- Abdominal paradox
- SpO₂ < 94%





HOW IS THE AIRWAY ASSESSMENT DONE?



- Addressed in primary assessment
- Two questions must be answered-
 1. Is the airway clear? Is it open?
 2. Will the airway stay clear and open?



CASE 1: CRITICAL THINKING

A 35 year female patient comes to the PHC at 10 am.

She is feeling:

- Drowsy with snoring sounds in the throat
- Wheeled into the PHC, in a trolley

How do you proceed ?





CASE 1: CRITICAL THINKING

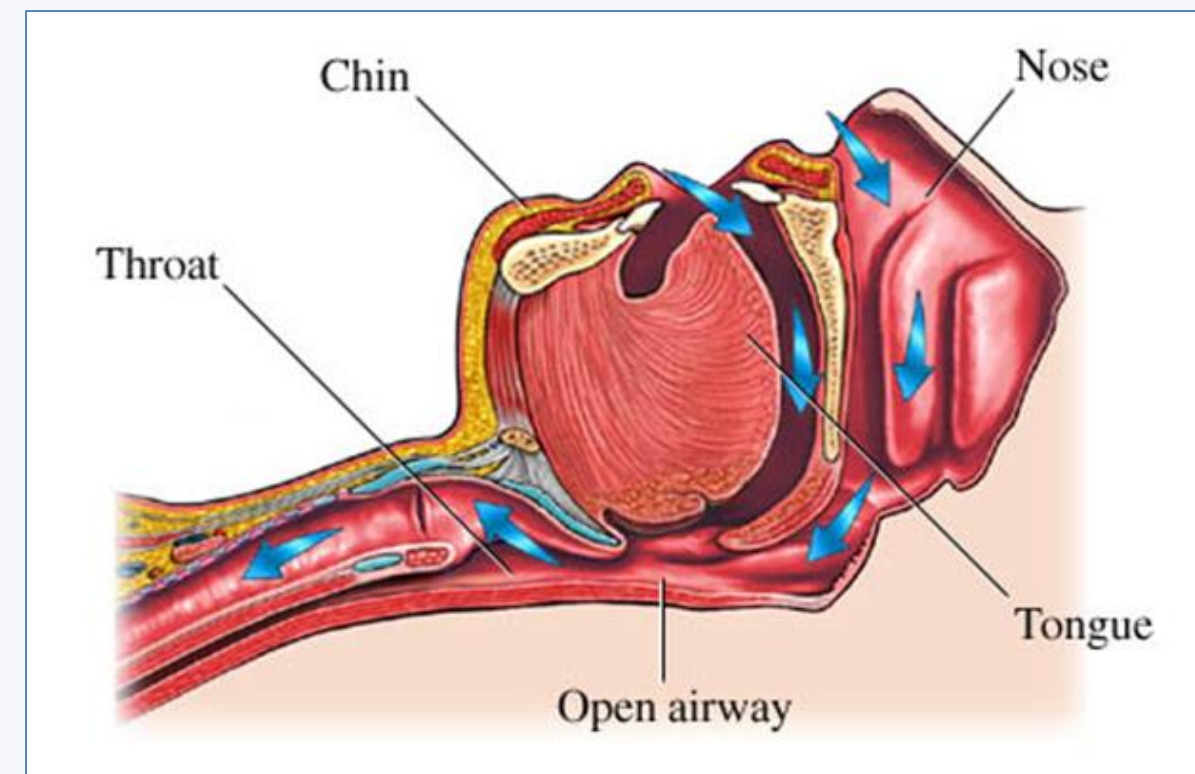
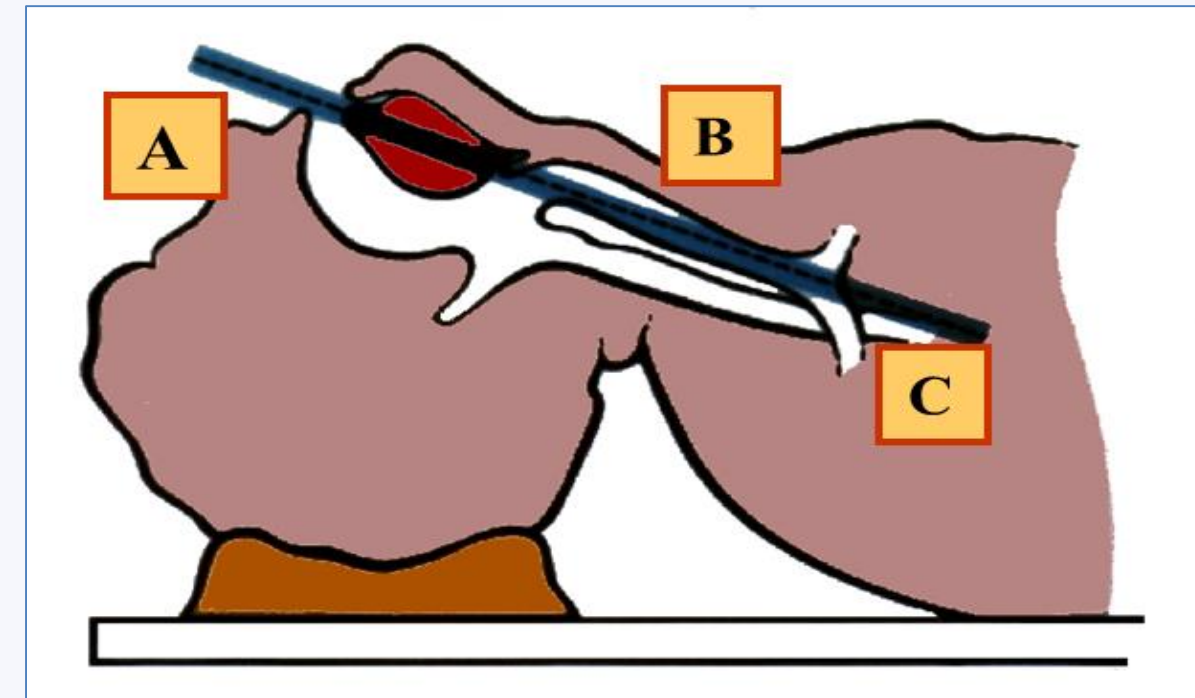
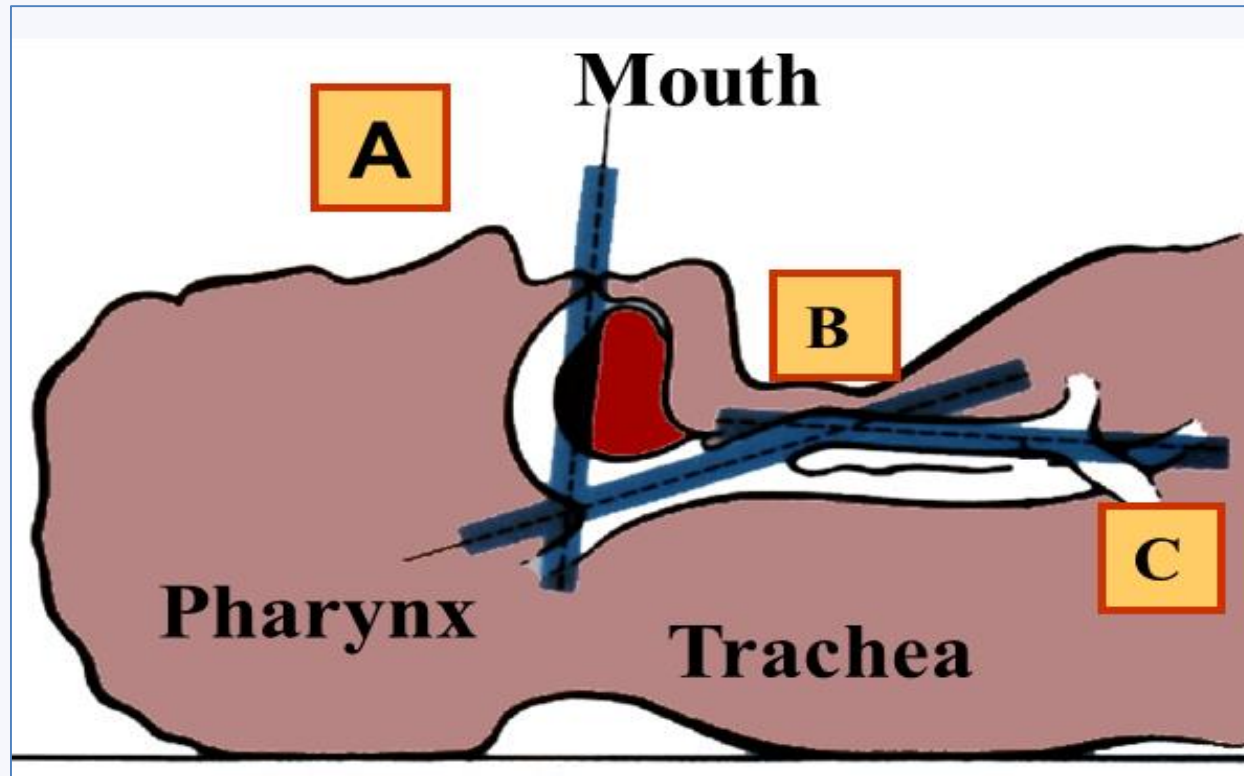
- ABCDE approach
- Connect monitors-SpO₂, ECG, NIBP
- Suction ready
- Oxygen mask

Two questions must be answered

- Is airway patent? NO
- Actions?

ACTIONS: POSITIONING

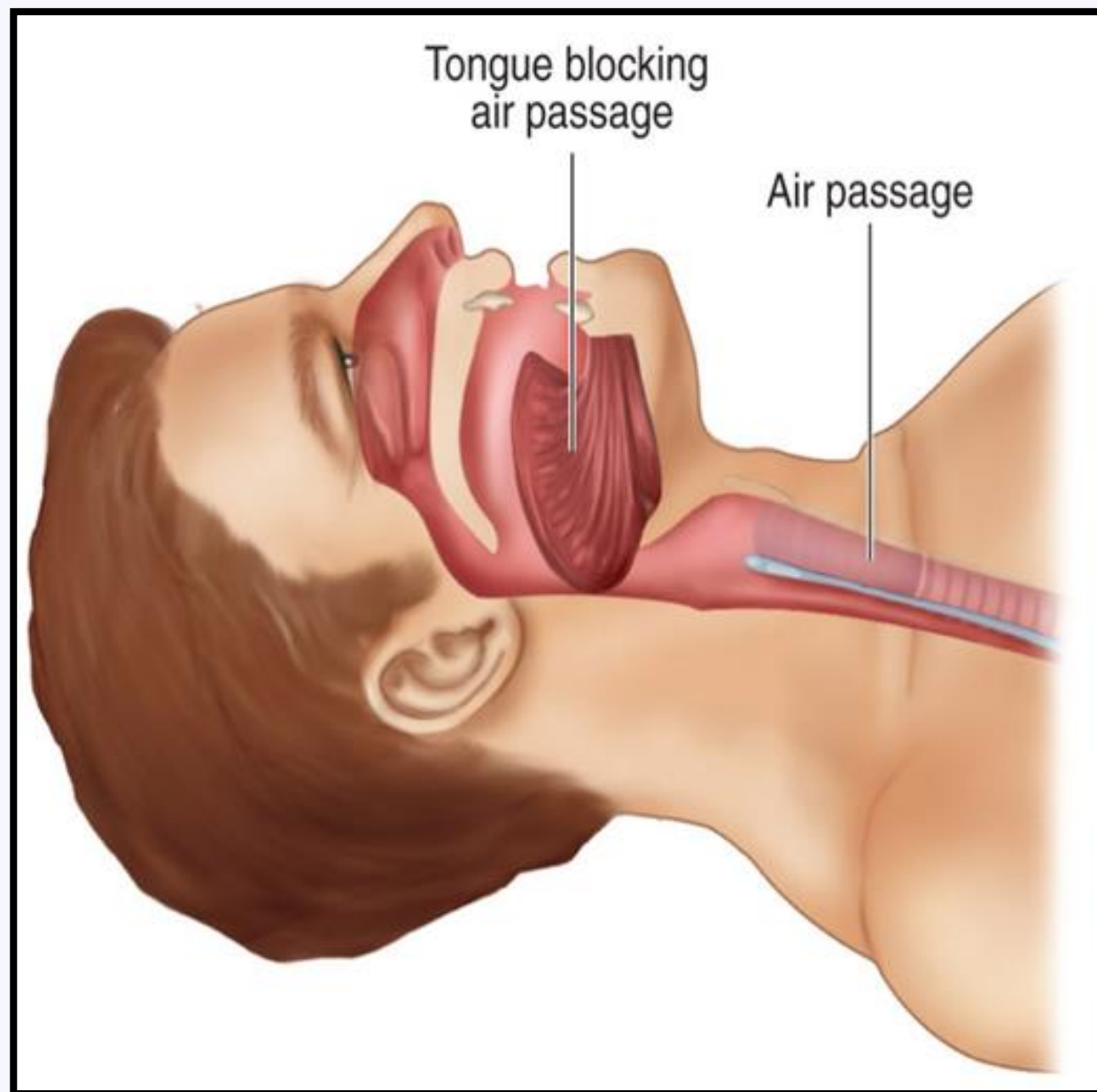
Aligning Axes of Upper Airway



- Head extension
- Neck flexion
- Pillow onto the shoulders
- 20-30 degree angle



SNORING SOUNDS STILL HEARD: ACTIONS?



- Unconscious patients should be moved as a unit.
- The most common airway obstruction is the tongue and epiglottis.
- Snoring respirations are characteristic sign

ACTIONS: MANUAL MANOEUVERS

HEAD TILT-CHIN LIFT MANEUVER



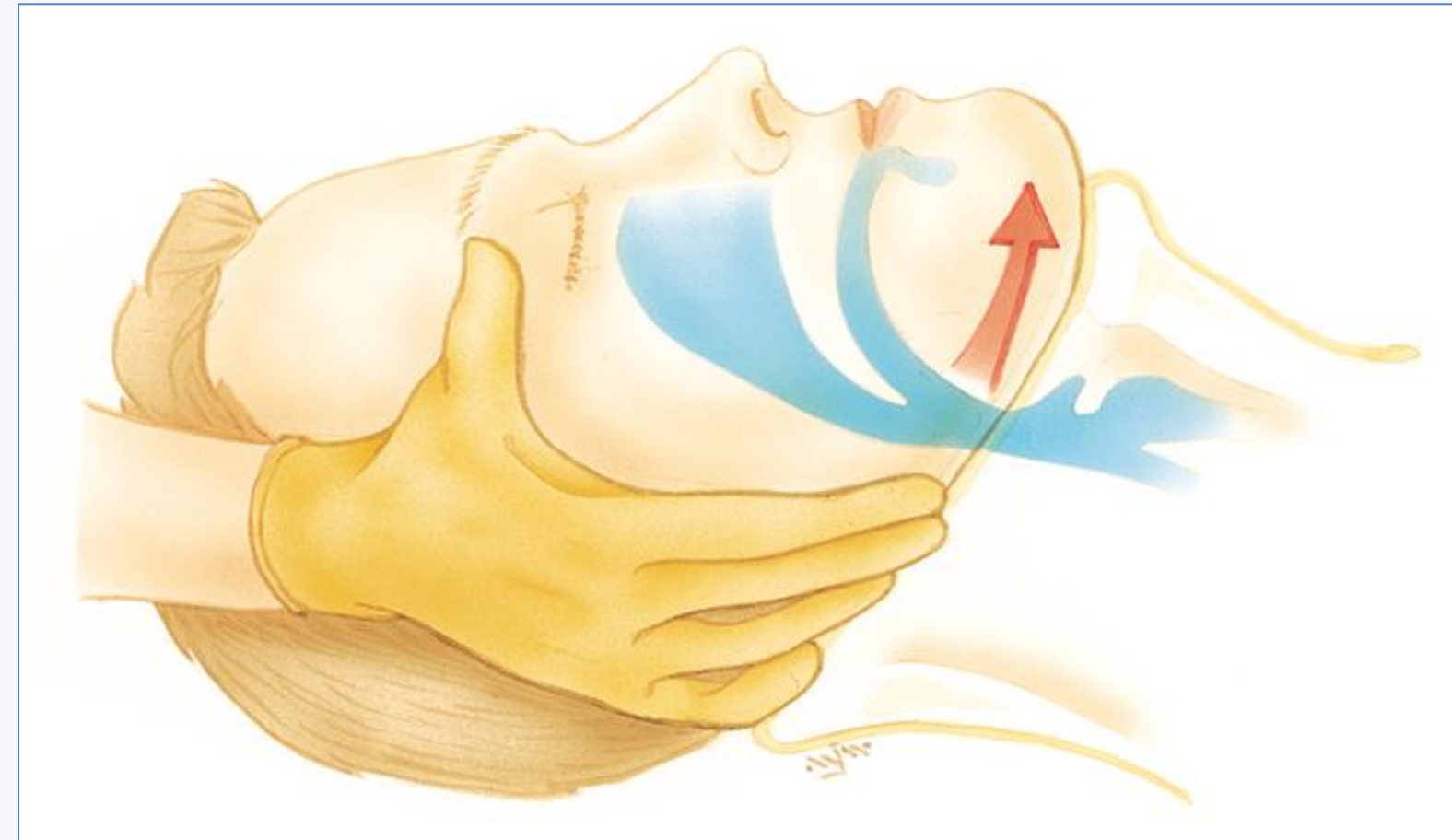
Follow these steps:

- Place **heel of one hand** on forehead, apply firm backward pressure with palm
- Place **fingertips of other hand** under lower jaw
- **Lift chin** upward, with entire lower jaw

ACTIONS: MANUAL MANOEUVERS



JAW-THRUST MANEUVER



If you suspect a **cervical spine injury**, use this maneuver

Follow these steps:

- Place your fingers behind the angles of the lower jaw
- Move the jaw upward
- Use your thumbs to help position the jaw



CRITICAL THINKING

- Snoring sounds heard when jaw thrust was released
- RR 8bpm, shallow breathing

Two questions must be answered

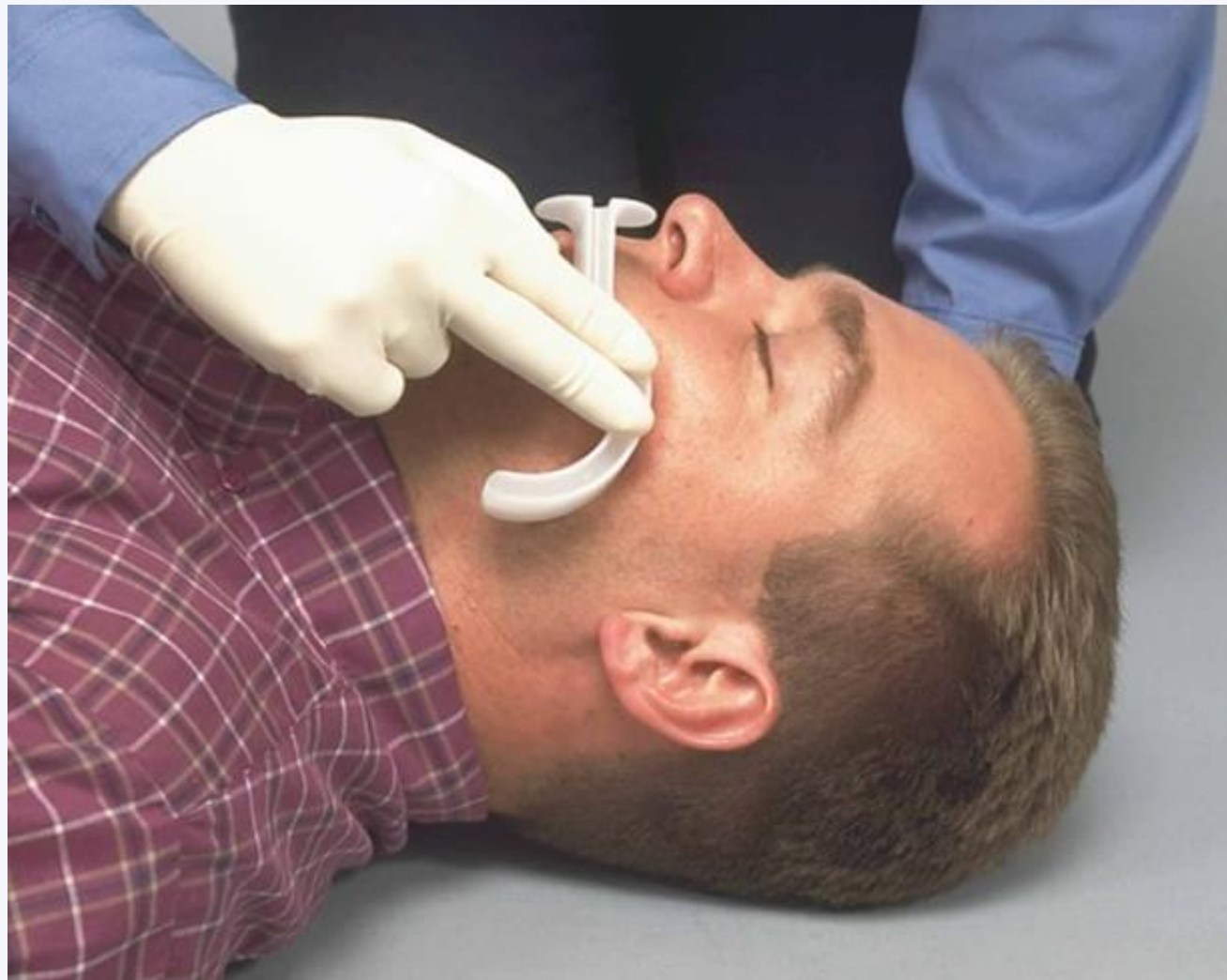
- | | |
|--------------------------|-----|
| • Was the airway open? | YES |
| • Will airway stay open? | NO |

Action : Artificial Airway





SIZING OROPHARYNGEAL AIRWAYS



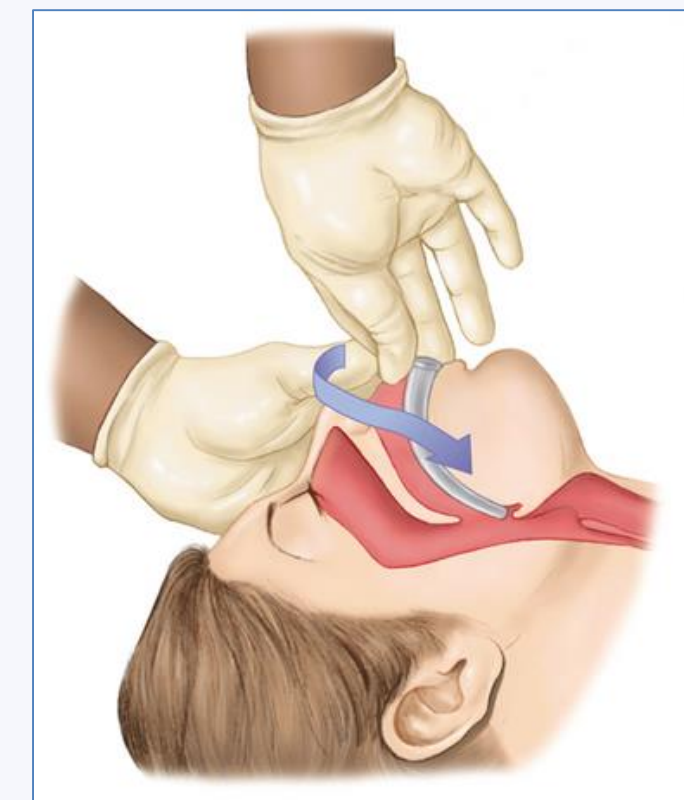
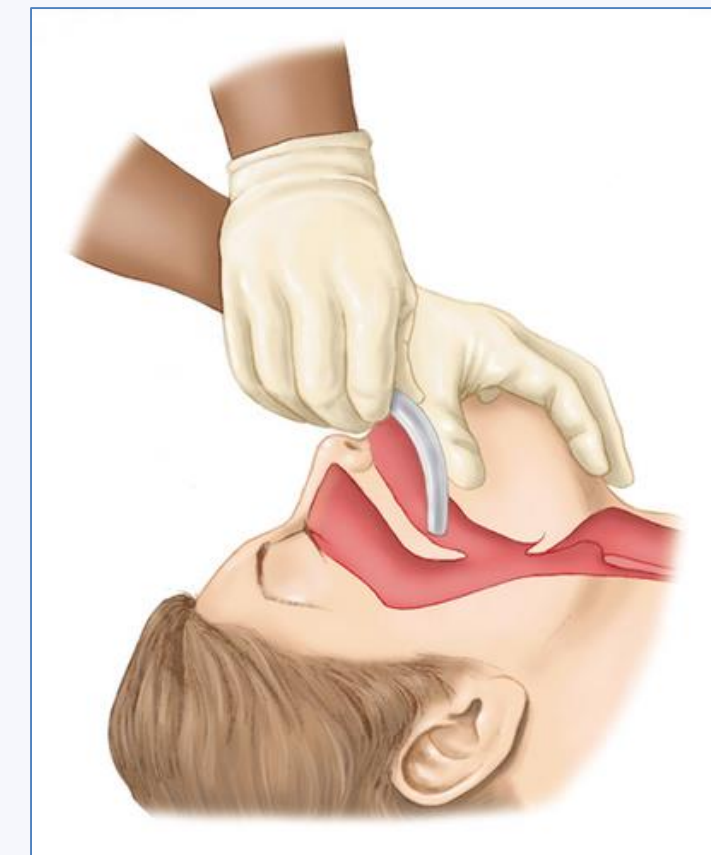
Guedel airway –
Parts – flange, bite portion,
air channel





INSERTING OPA

1. Insert until you meet resistance
2. Gently rotate the airway 180° so the tip is pointing down into the pharynx
3. Check that flange of the airway is against the lips
4. Monitor patient closely



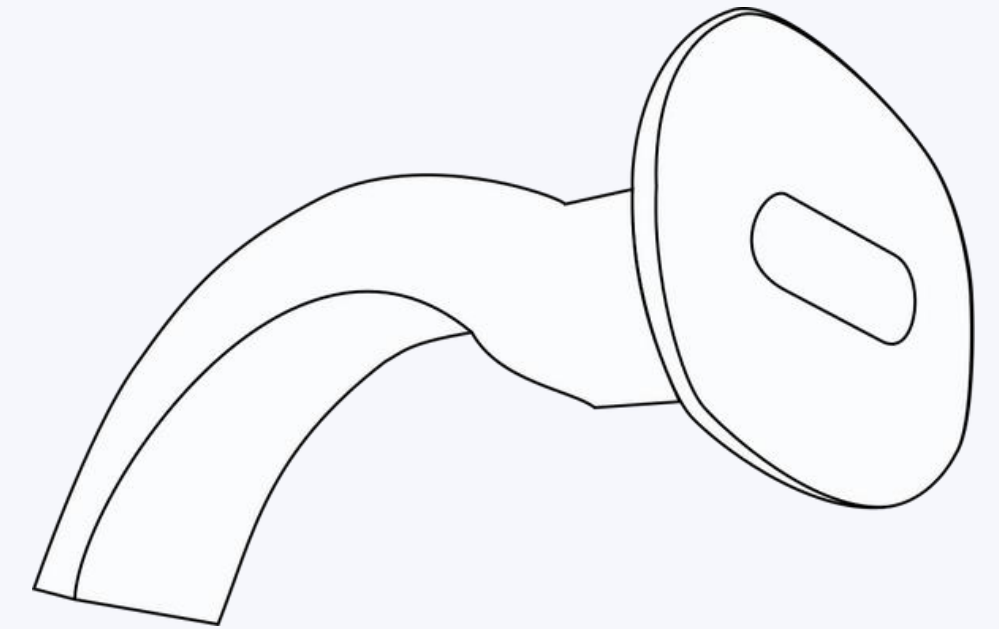
OROPHARYNGEAL AIRWAY

Uses –

- 1) To maintain open airway
- 2) Prevent endotracheal tube occlusion
- 3) Prevent tongue bite
- 4) Facilitate suction
- 5) Conduit for passing devices into oropharynx
- 6) Obtain a better mask fit

Contraindications –

- 1) Intact gag reflex
- 2) Oropharyngeal growth

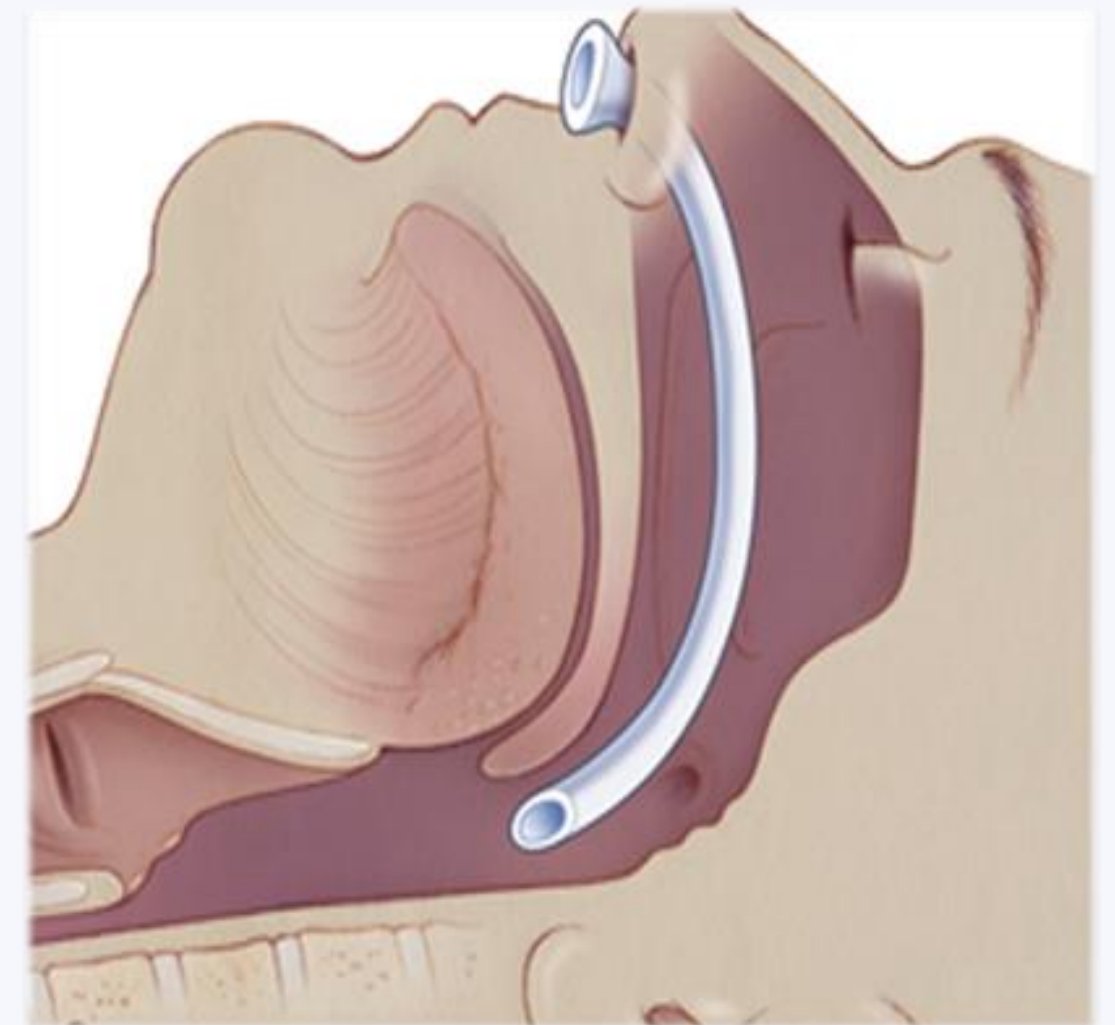


Critical Thinking: Patient starts to cough following OPA insertion, Action?



NASOPHARYNGEAL AIRWAY (NPA)

- Come in various sizes
- Must be measured
- Patient's nostril to the tip of the earlobe
- Typical adult sizes: 34, 32, 30, and 28 French





INSERTING NPA

1. Lubricate outside of tube with water-based lubricant before insertion



- Parts – flange, airway channel, bevel.

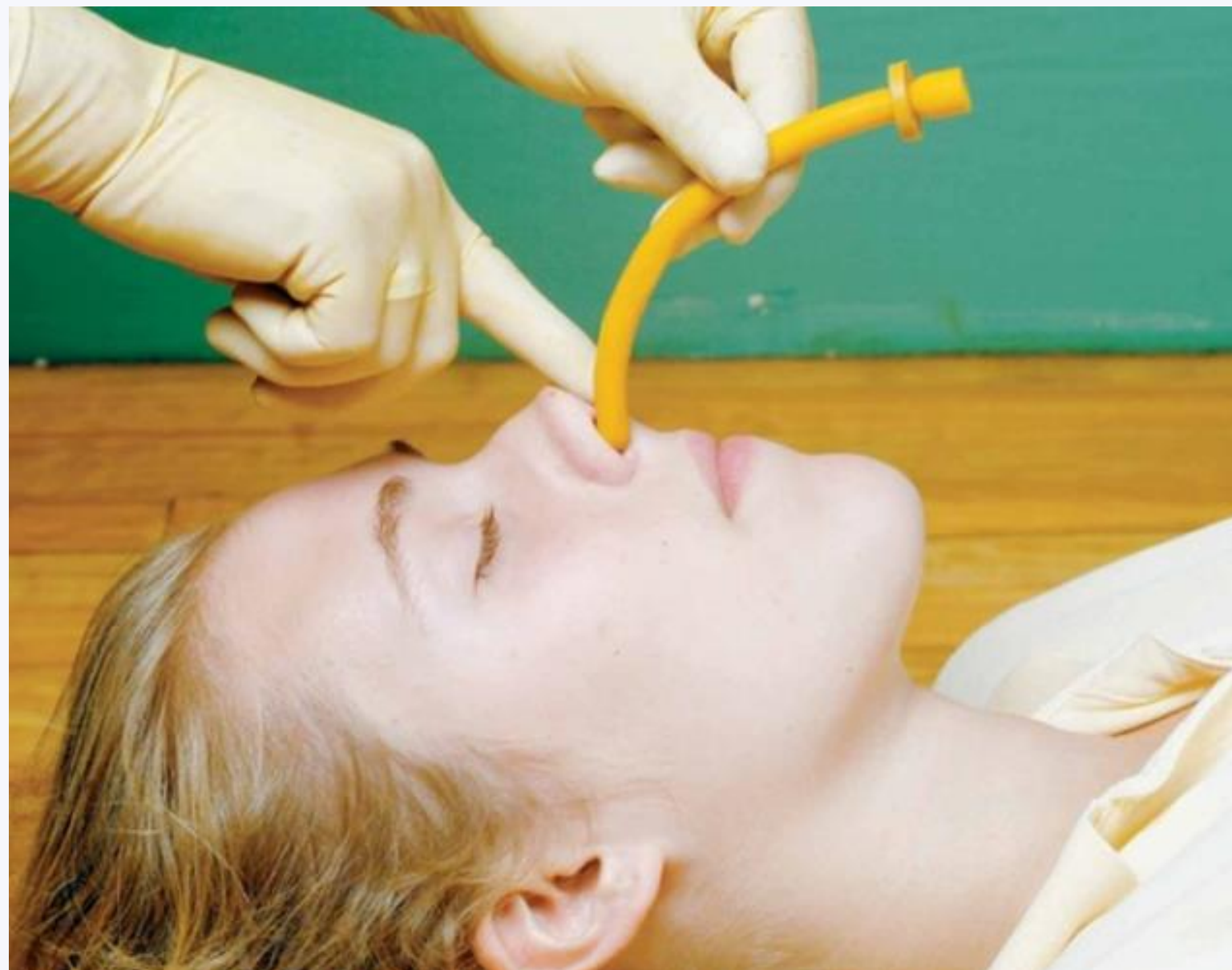
- Size - inside diameter in millimeters

- Patients little finger tip



INSERTING NPA

2. Push tip of nose upward; keep head in neutral position



3. Insert into nostril;
advance until
flange rests firmly
against nostril



NASOPHARYNGEAL AIRWAY



Advantages

- Nasal airway is better tolerated than an oral airway if the patient has intact airway reflexes.
- Loose or poor dentition.
- Trauma or pathology of the oral cavity
- It can be used when the mouth cannot be opened

Contraindications

- Anticoagulation
- Basilar skull fracture
- Nasal pathology, sepsis, or deformity of the nose or nasopharynx
- History of epistaxis requiring medical treatment



1. Airway Obstruction
2. Trauma
3. Tissue Edema
4. Ulceration and Necrosis
5. Central Nervous System Trauma
6. Dental damage
7. Laryngospasm and Coughing
8. Retention, Aspiration, or Swallowing
9. Devices caught in the airway
10. Equipment failure
11. Latex allergy
12. Gastric distention

COMPLICATIONS OF ARTIFICIAL AIRWAY





CRITICAL THINKING

After nasopharyngeal airway insertion

- Snoring sounds stopped
- Gurgling sounds in the throat heard

Two questions

- | | |
|------------------------|----|
| • Is the airway open? | NO |
| • Is the airway clear? | NO |

How do you proceed to protect the airway?



AIRWAY COMPROMISE: PATENCY?

Types of Airway Obstructions?

- Acute
 - Foreign bodies
 - Vomit
 - Blood
- Occurring over time
 - Edema from burns, trauma, or infection
 - Decreasing mental status



Case 1: Start suctioning airway with flexible catheter

- Portable or fixed unit should have:
 - Wide-bore, thick-walled, non-kinking tubing
 - Water supply for rinsing the tips
- Designed to be used when a rigid tip cannot be used & for suctioning the nasopharynx
- Can be used in various sizes identified by a number “French”
- Larger the number, bigger the bore



TECHNIQUES OF FLEXIBLE SUCTION CATHETER USE

- Measured in a similar way as OPA
- Length of the catheter that should be inserted into patient's mouth equals the distance between the corner of patient's mouth and earlobe
- Place tip or catheter where you want to begin suctioning
- Suction on the way out



CASE 1: CRITICAL THINKING

Start suctioning airway with flexible catheter, but still large food particles in throat.

Two questions must be answered

- **Is the airway clear? NO**
- **What next?**



WHAT ARE THE CLINICAL SIGNS OF AIRWAY COMPROMISE: PROTECTION?

- Blood/Pus in the upper airway
- Food/secretions in the upper airway
- Persistent vomiting
- Loss of protective airway reflexes





USE RIGID PHARYNGEAL SUCTION TIP

- Also called “Yankauer Tip”
- Larger bore than flexible catheters
- Suction only as far as you can see
- Do not lose sight of the distal end
- Careful insertion helps prevent gag reflex or vagal stimulation

Two questions must be answered

• Is the airway clear?

NO



WHEN IS SUCTION NOT POSSIBLE?

When patients have secretions or vomitus that cannot be suctioned easily-

- Remove the catheter from the patient's mouth.
- Log roll the patient to the side.
- Clear the mouth carefully with a gloved finger.



CASE 1: CRITICAL THINKING

Following suctioning and clearing airway with large food particles in throat

SPO2-83%



PRECAUTIONS WHILE SUCTIONING

Never suction the mouth or nose for more than 15 seconds at one time for adult patients, 10 seconds for children, and 5 seconds for infants.

- Suctioning can result in hypoxia
- Ventilate 30 secs /Oxygenate 100% for 2 minutes
- Continue this alternating pattern until all secretions have been cleared





CASE 1: CRITICAL THINKING

- ABCDE approach
- Connect Monitors-SpO₂, ECG, NIBP
- Suction Ready
- Oxygen Mask

Why Connect Monitors/Oxygen?



WHY CONNECT MONITORS/ OXYGEN?



Complications of Suctioning

<ul style="list-style-type: none">• Hypoxia• Bronchospasm• Dysrhythmias• Bradycardia and hypotension due to vagal stimulation	<ul style="list-style-type: none">• Increased intracranial pressure• Local edema• Hemorrhage• Tracheal ulceration• Tracheal infection
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CASE 1: CRITICAL THINKING: SPO2-88%, ACTION?



OXYGEN-DELIVERY EQUIPMENT

- Nasal cannulas
- Non-rebreathing masks
- Bag-mask devices

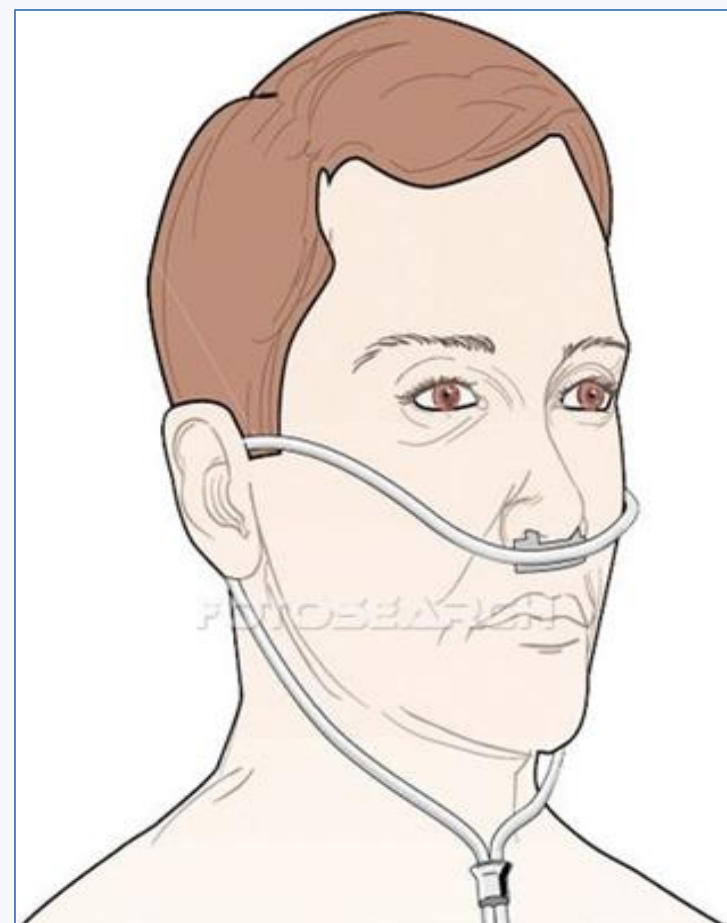




OXYGEN

Nasal Cannula

- 2-6 litres per minutes (lpm)
- 25-30% oxygen delivered



Simple Mask

- 6-10 lpm
- 35-60% oxygen delivered





NON-REBREATHING MASKS

- The preferred way to give oxygen in the prehospital setting
- To patients who are breathing adequately but are suspected of having hypoxia
- Combination mask and reservoir bag system





NON-REBREATHING MASKS

- Make sure the reservoir bag is full before placing the mask on the patient.
- Adjust the flow rate so the bag does not collapse when the patient inhales
 - Usually 10 to 15 L/min, 80-90% FiO₂
- When oxygen therapy is discontinued, remove the mask.



PULSE OXIMETRY

The 5th Vital Sign

- Gives percent of hemoglobin saturated
- Measure of blood oxygenation
- Does NOT measure adequacy of ventilation (pCO₂)
- Unreliable in hypotensive patients
- Normal Values
 - 90% - 100% = Normal
 - < 90% = hypoxia
 - **Hypoxia must be corrected**





CASE 1: CRITICAL THINKING

Patient opens eyes only to painful simulation SpO₂-91% with NRM, RR-8 bpm, shallow, BP 90/60mmHg.

How do you clinically assess an airway for compromise or threats to airway integrity?





TECHNIQUES FOR THE COMPROMISED AIRWAY

- Bag-Valve-Mask Ventilation(BVM)
- Endotracheal Intubation
- Alternate techniques for the difficult airway





BAG-VALVE-MASK (BVM / AMBU) VENTILATION

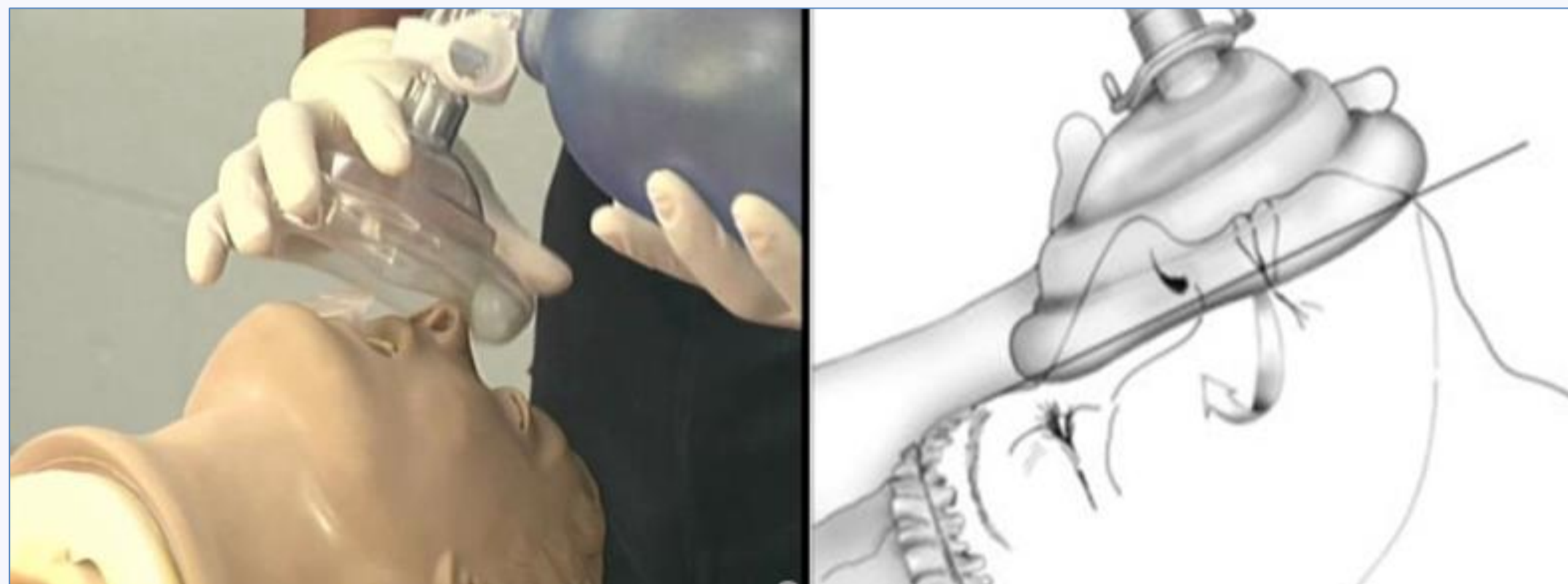
- The most important airway skill
- Always the first response to inadequate oxygenation and ventilation, after opening the airway





PROPER MASK SIZING

- Bridge of nose to chin
- Mask should cover nose and mouth
- Mask should not cover eyes



BAG MASK VENTILATION



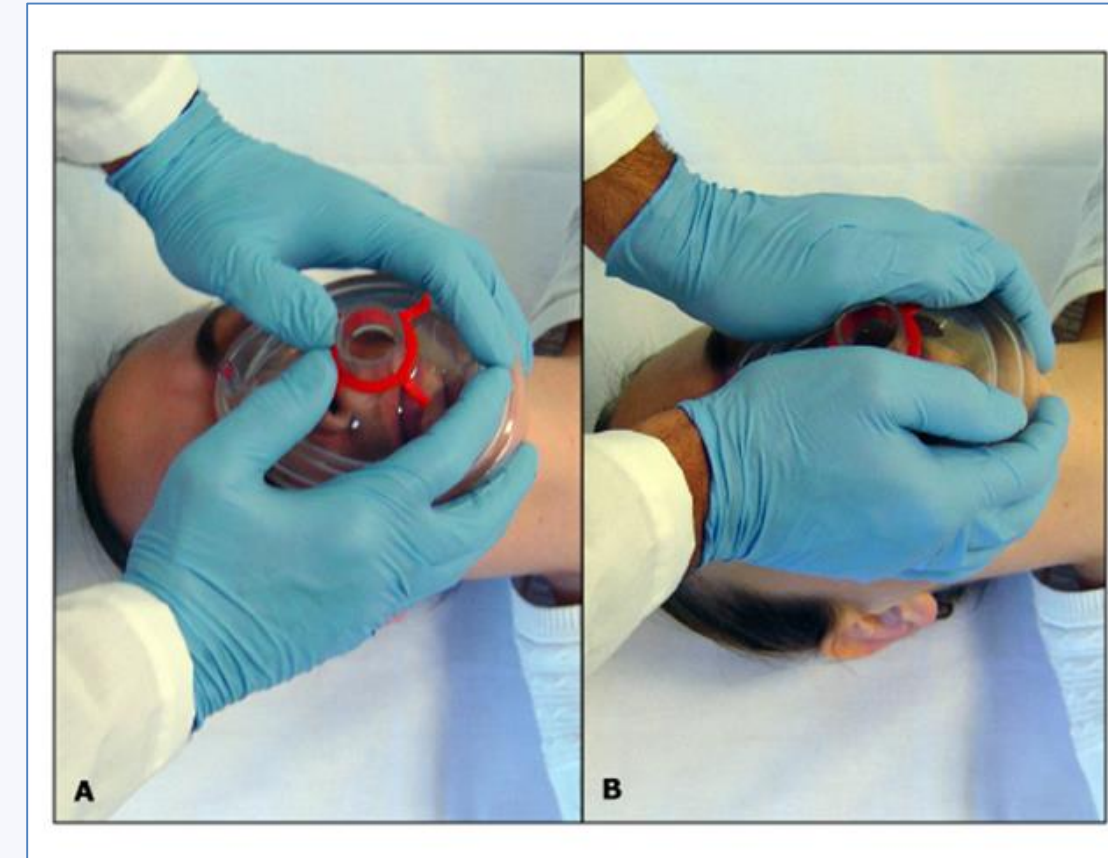
ONE-HANDED TECHNIQUE



Three facial landmarks that must be covered by mask:

1. Bridge of the nose
2. Two malar eminences
3. Mandibular alveolar ridge

TWO-HANDED TECHNIQUES



Small tidal volumes

Squeeze steadily – don't force air too quickly

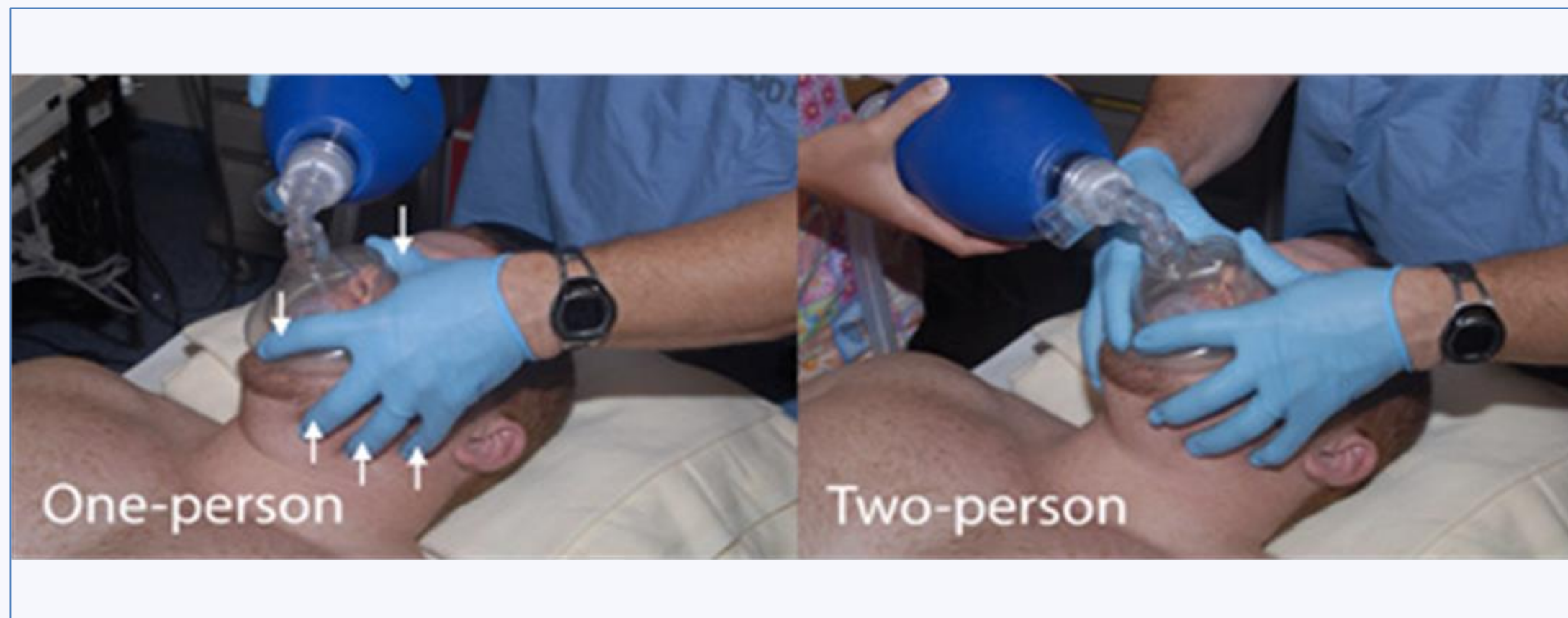
10-12 breaths/minute

Assess for rise and fall of chest



BVM (AMBU) VENTILATION: ASSESSMENT OF EFFICACY

- **Look:** watch the chest rise and fall
- **Listen:** hear bilateral air entry
- **Feel:** Feeling the easy compliance of the bag
- **Pulse oximetry:** improved oxygenation





PATIENTS WHO ARE DIFFICULT TO USE THE BVM (AMBU) “MOANS”

- **Mask Seal**
 - Facial hair, deformity, blood
- **Obesity / Obstruction**
 - Cancer, lesions, excess tissue
- **Age**
 - Young children and elderly can be difficult to ventilate
- **No teeth**
 - Teeth keep face from caving in during BMV
- **Stiff / Snoring**
 - Lung resistance issues (edema, COPD)



FREQUENT ERRORS WITH BVM

- Failure to recognize its importance
- Forget to bag (focused on ETT)
- Give up on bagging too early
- Bag but don't assess the efficacy
- Failure to assign one person to airway management only

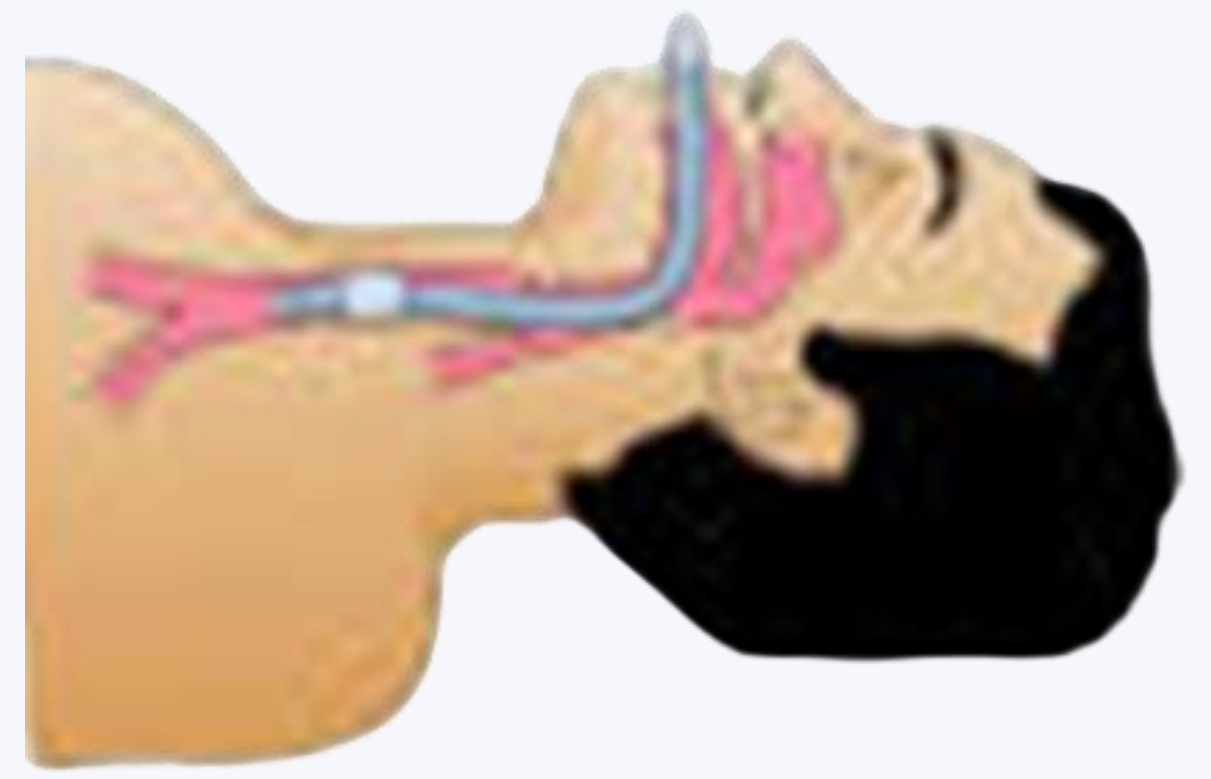


WHAT ARE THE INDICATIONS FOR ACTIVE AIRWAY INTERVENTION?

- Patency - relief of obstruction - failure to maintain airway patency
- Protection from aspiration (coma with GCS < 8)
- Hypoxic/ hypercapnic respiratory failure not easily reversible by noninvasive means
- Airway access for pulmonary toilet, drug delivery in arrest, therapeutic hyperventilation if high ICP
- Severe Shock



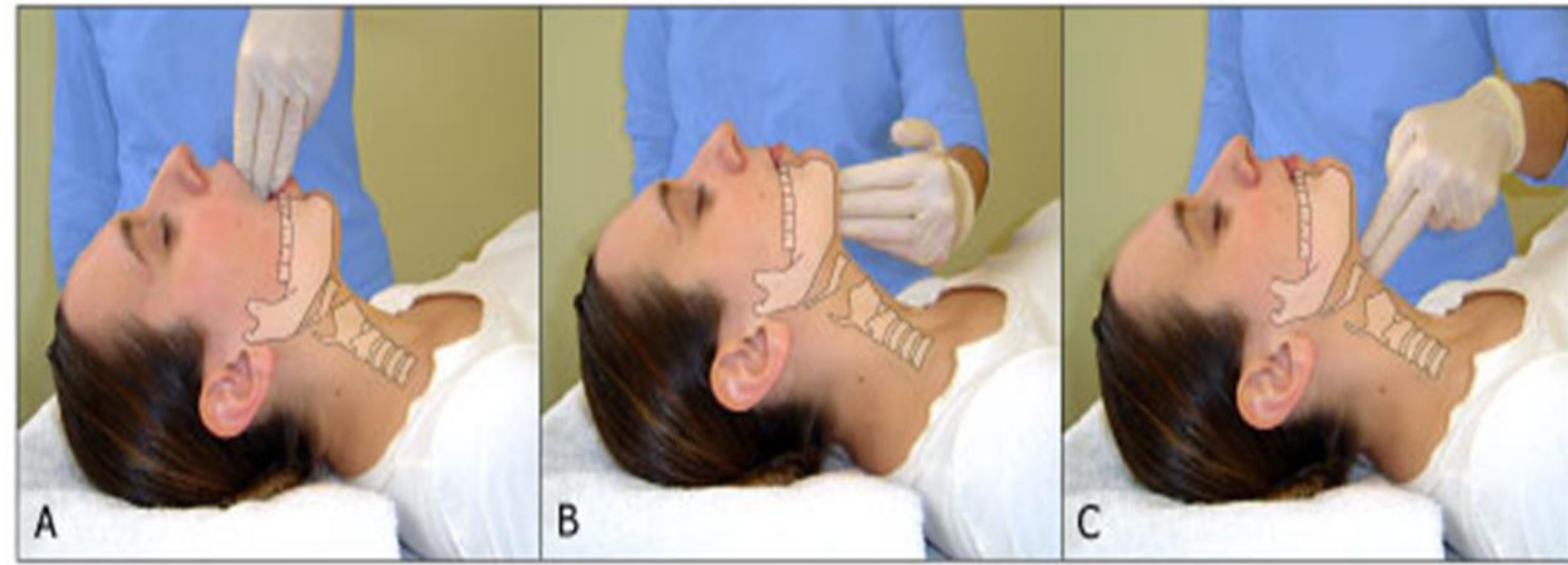
Is there impending respiratory failure?
Prepare for intubation & support of ventilation.





ASSESSMENT FOR DIFFICULT INTUBATION: Evaluate: 3-3-2 Rule

Mouth opening Tip of mentum to hyoid bone Thyromental distance



Access to airway and obtaining glottic view

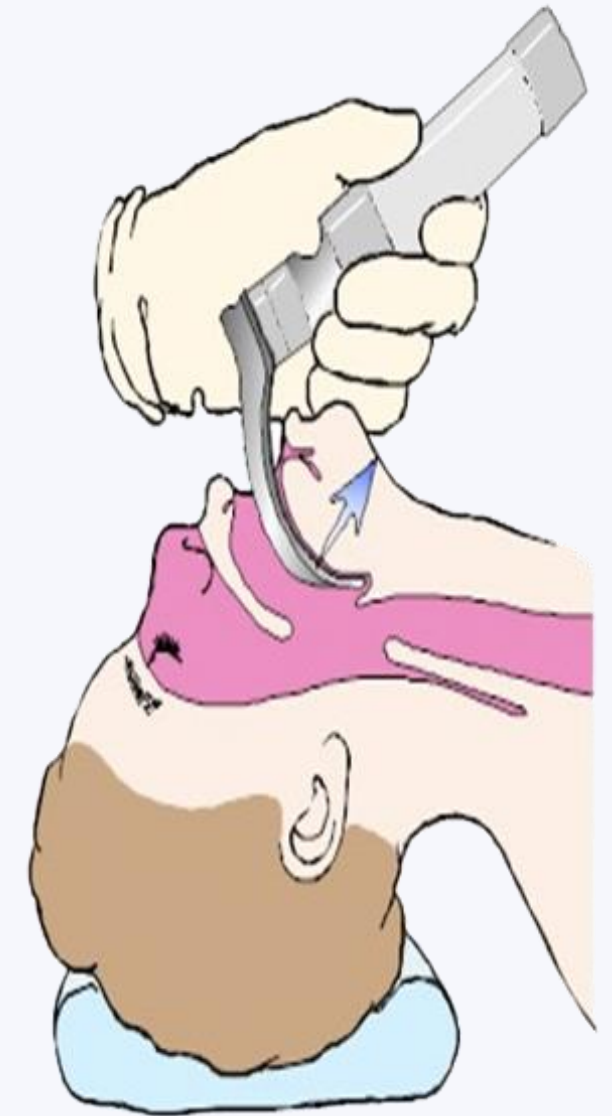
Can tongue be deflected to accommodate laryngoscope

Predicts location larynx to base of the tongue. If larynx high angles difficult

PREDICTS LOCATION LARYNX TO BASE OF THE TONGUE. IF LARYNX HIGH ANGLES DIFFICULT

Preparation includes:

1. Suction ready
2. Ambu bag assembled and ready
3. Laryngoscope blade and light checked
4. Oxygen connected and flowing
5. Check inflation of endotracheal tube cuff
6. Syringe attached to inflation port and loaded with 10cc of air





LARYNGOSCOPY



- Blade inserted with laryngoscope handle pointed at the patient's feet.
- Tongue and jaw are distracted downward to insert the blade.
- Minimal force required

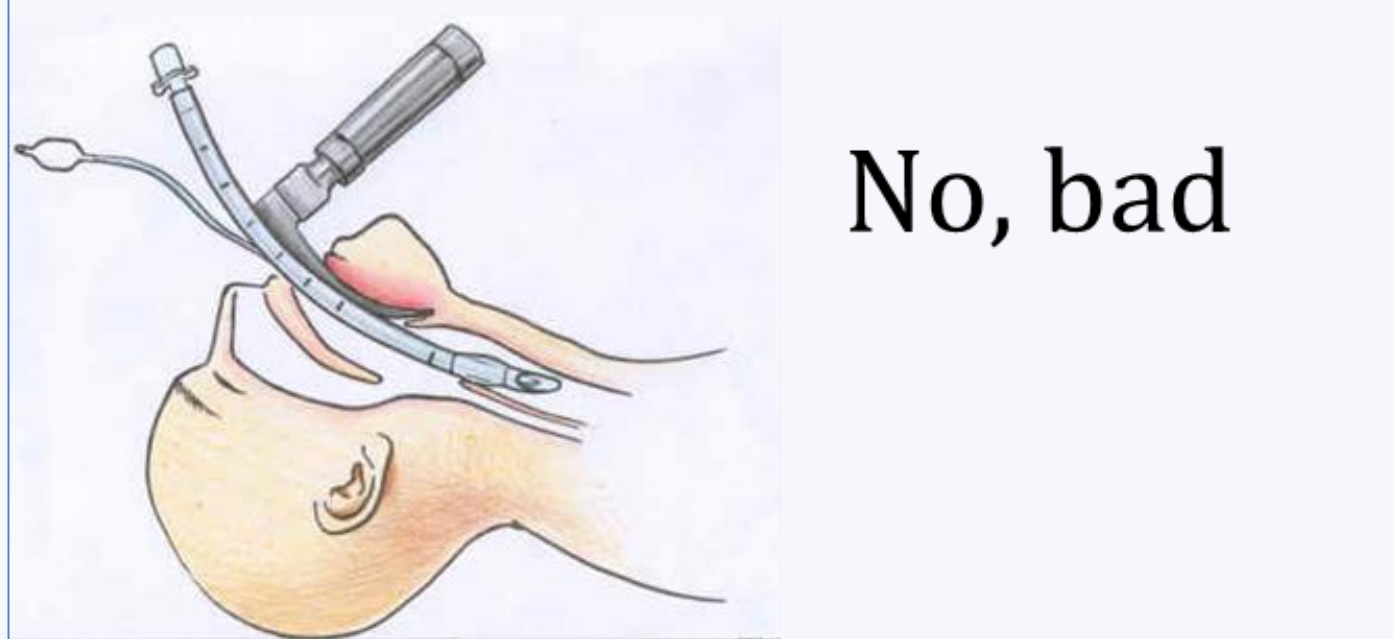
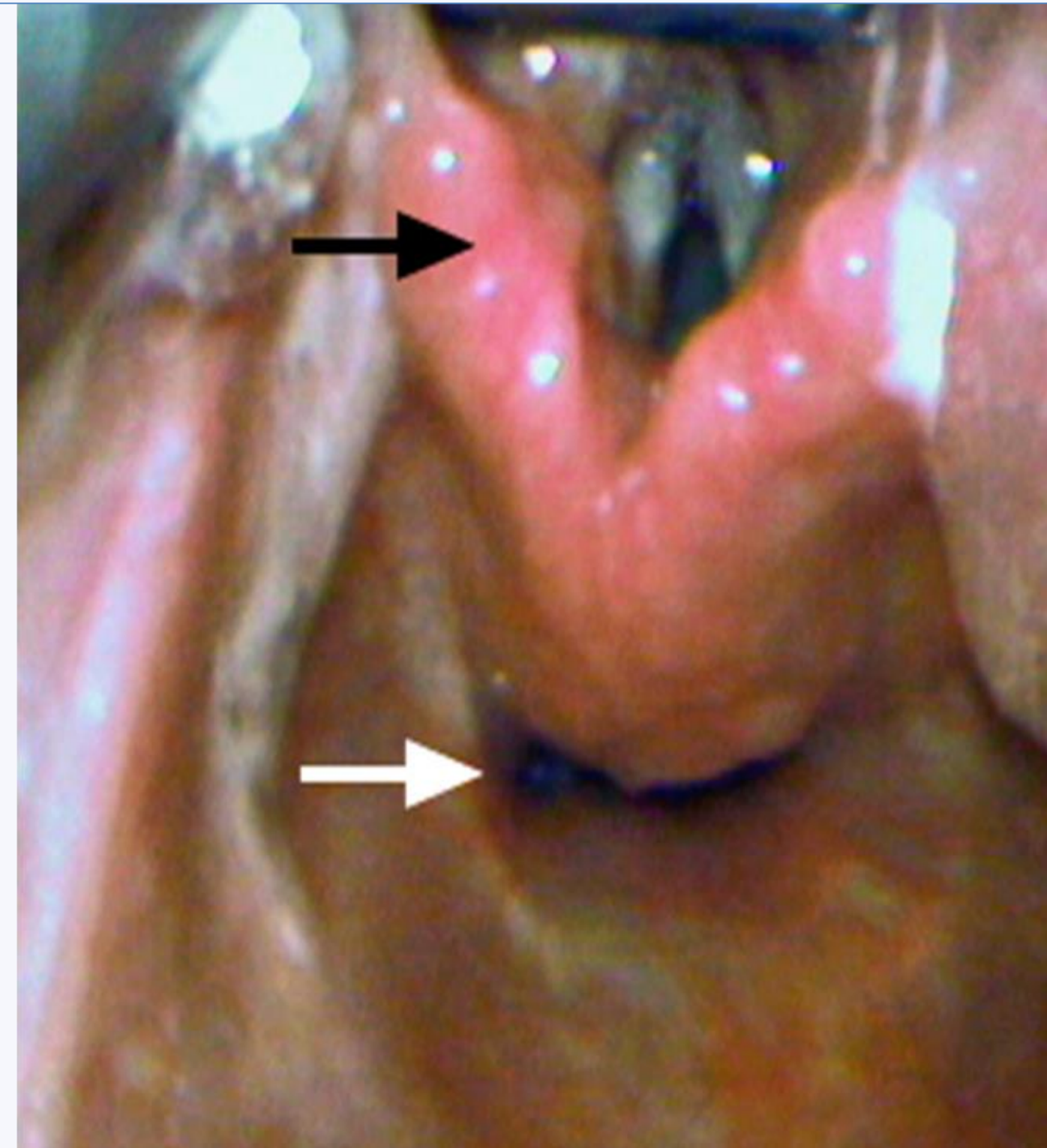
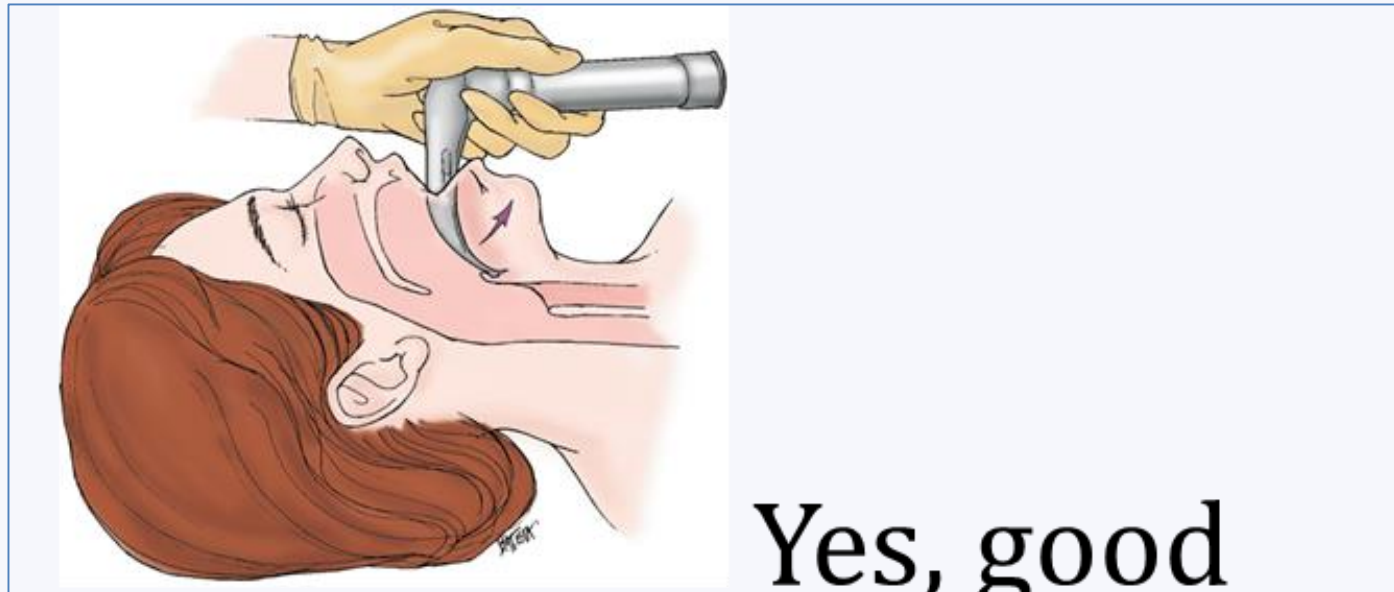


- Tip of blade gets around base of tongue, permitting change in angle of lifting and better mechanical advantage.
- Epiglottis edge lifted off pharyngeal wall. (Epiglottis often camouflaged against mucosa of posterior pharynx).



- With full insertion of curved blade into vallecula the angle of lifting changes to ~40 degrees from the horizontal.
- Now the lifting force can be increased as needed.
- ***Tip position (not force) is the main determinant of glottic exposure.***

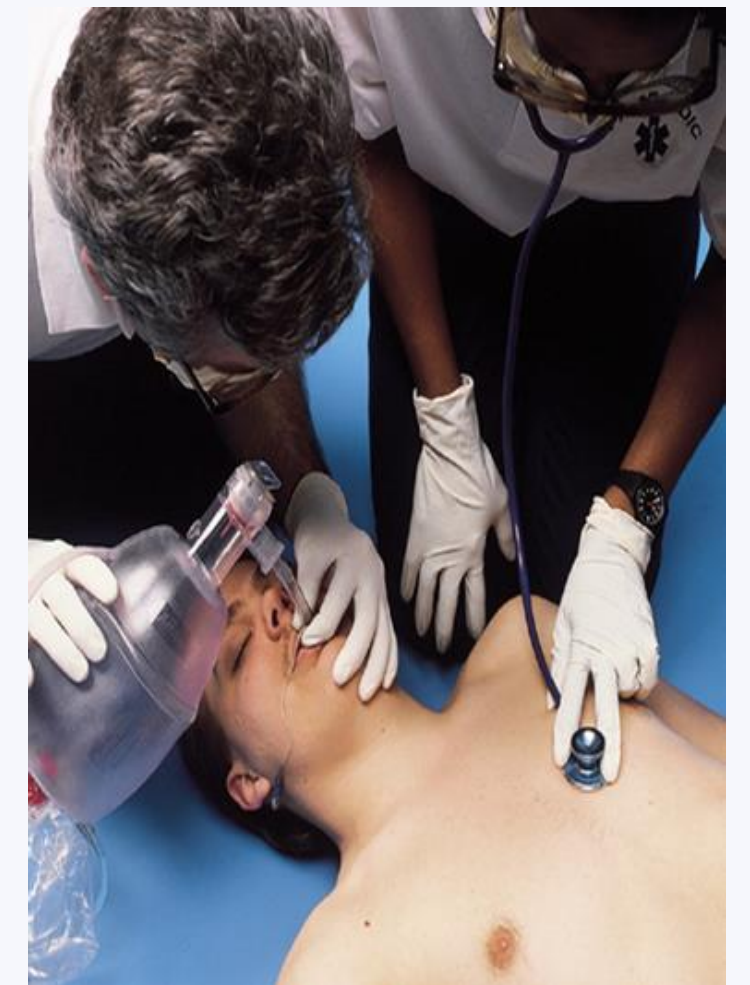
INSERTING ENDOTRACHEAL TUBE





ET INTUBATION – TECHNIQUE

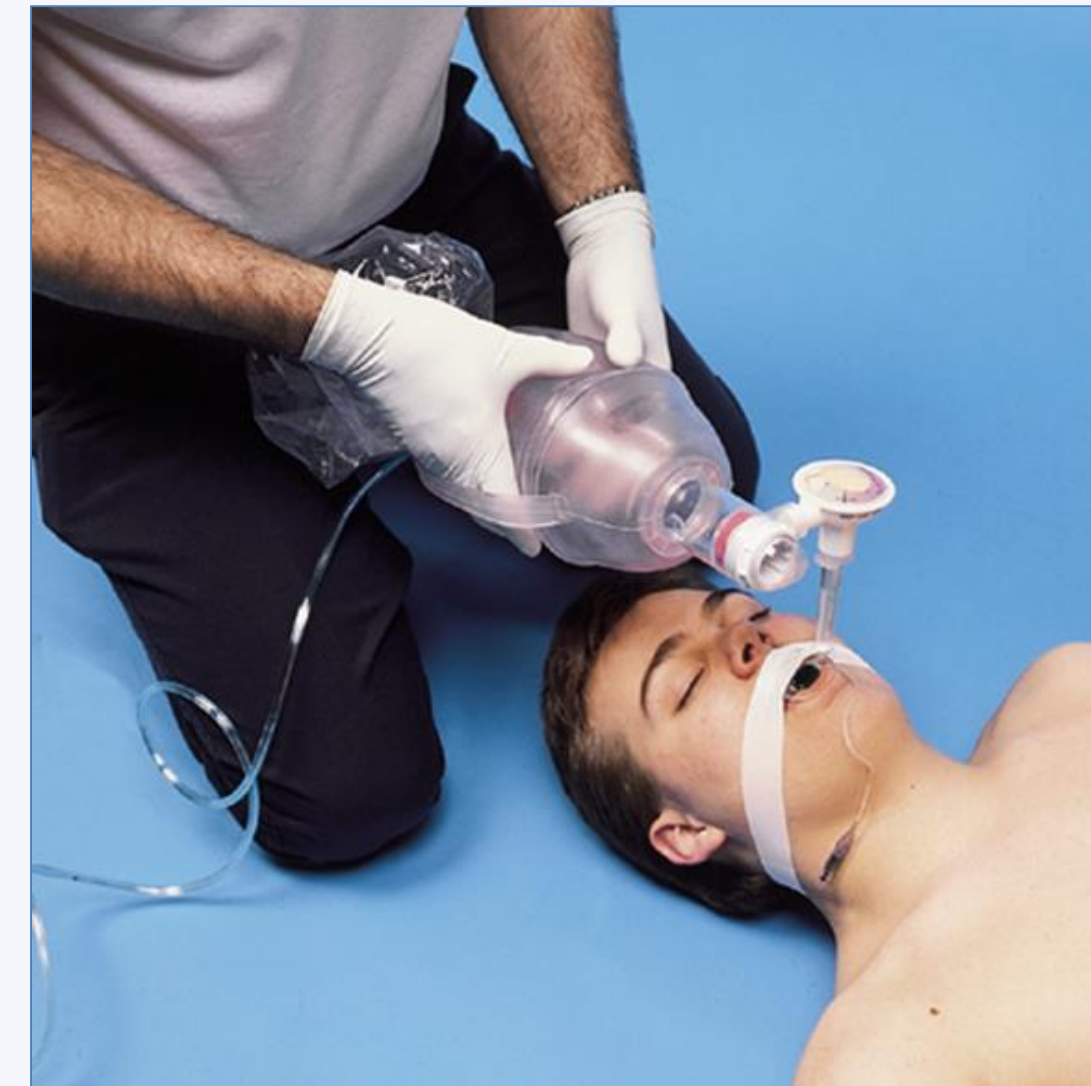
- Ventilate the patient
- Auscultate
 - Epigastrium first
 - Midaxillary and anterior chest line on right and left sides
 - Observe chest rise and fall
- Verify placement by at least one additional method
 - ETCO₂
 - Esophageal detector
 - Chest x-ray
- Note cm marking of tube at teeth





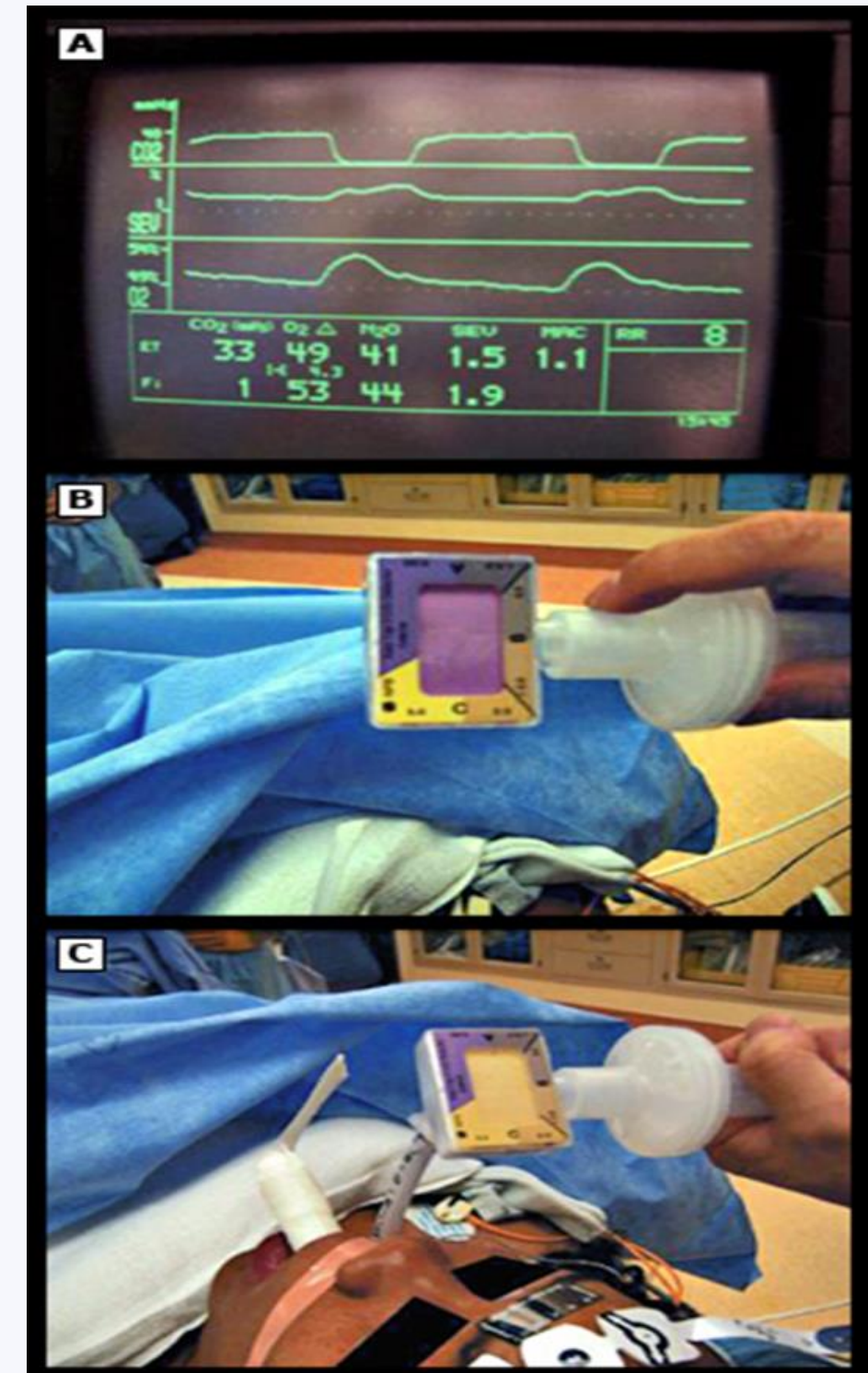
ET INTUBATION – TECHNIQUE

- Secure ET tube with commercial tube-holder (preferred) or tape.
- Provide ventilatory support with supplemental oxygen.
- After securing the tube, observe and record tube depth at the patient's teeth.



PROOF OF PLACEMENT

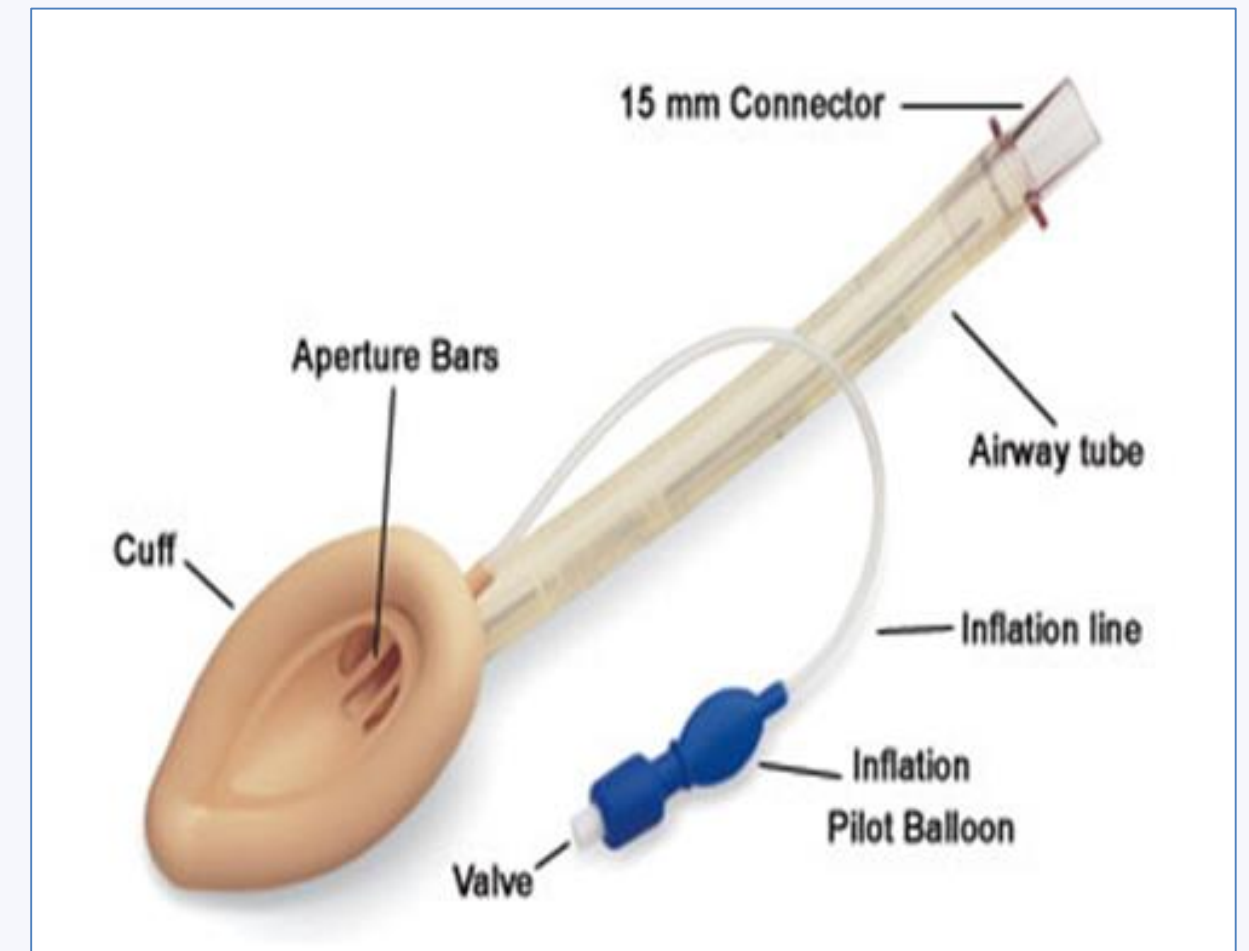
- Unrecognized esophageal intubation is devastating.
- Clinical indicators alone **cannot** be relied upon.
- Capnography gold standard.
- Beware-
 - Esophageal intubation may give transient color change. Need >5 breaths.
 - Cardiac arrest patients can give false negative color changes. (Other methods = syringe test)





UNSUCCESSFUL INTUBATION

- 2 person Bag Mask ventilation
- Maximize neck flexion/ head extension
- Move tongue out of line of site
- Maximize mouth opening
- Look for landmarks and adjust blade
- BURP maneuver
- Increasing lifting force



**CALL FOR HELP:
CONSIDER LMA,
SURGICAL AIRWAY**



LMA INSERTION TECHNIQUE

- Open the mouth and press the tip of the cuff upward against the palate and flatten the cuff against it
- Use index finger to guide LMA, pressing backward along the palate towards ears until resistance is felt
- The tip now rests in the hypopharynx





CONTD...

- Use other hand to press down on LMA tube while removing index finger
- Inflate with 2-4 ml air to seal (60 cm H2O maximum)
- Don't hold the tube while inflating the balloon, it moves outward a little as it seats properly





NEEDLE CRICOTHYROTOMY

Indications

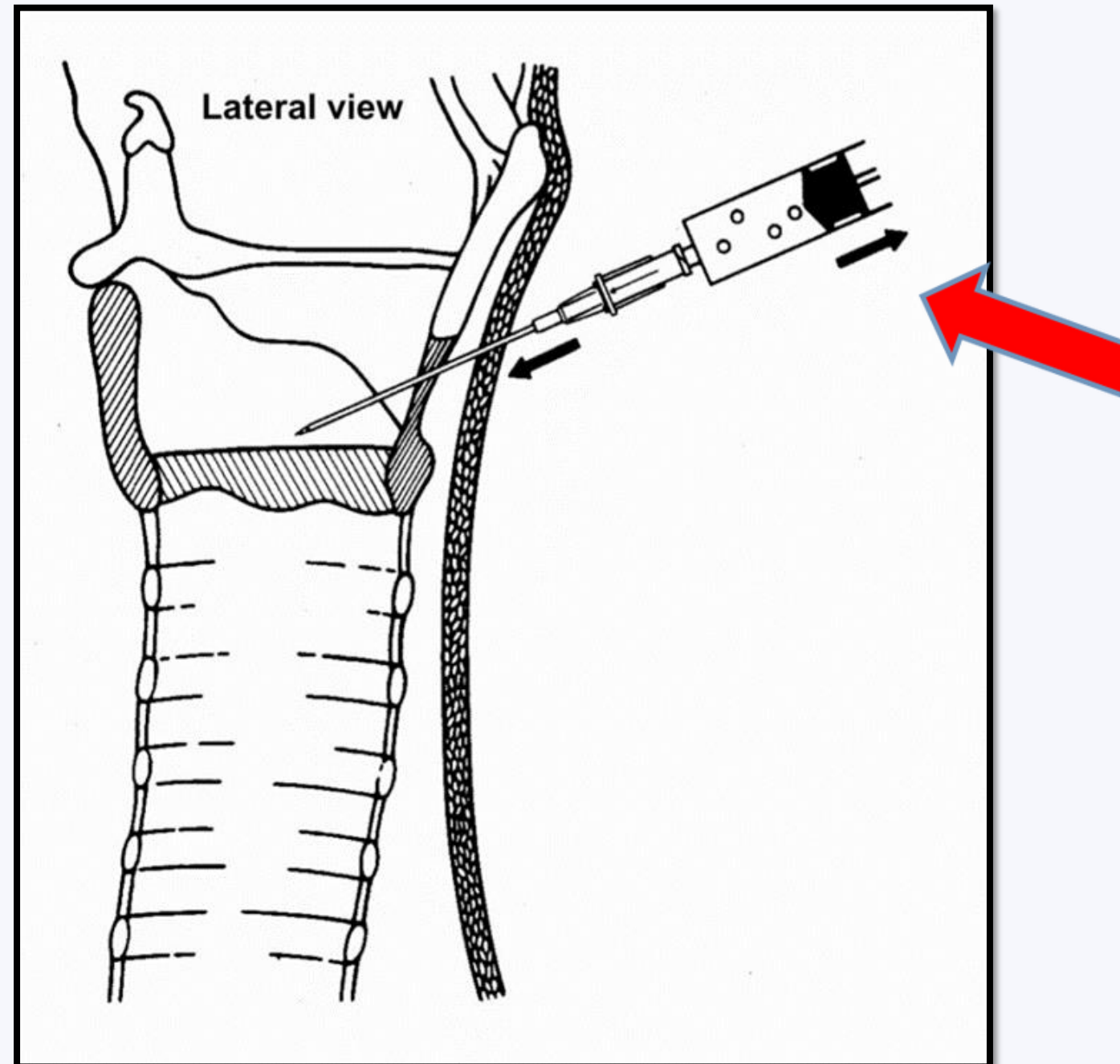
1. Upper Airway Obstruction with inability to ventilate or intubate
2. Anticipated difficult intubation – Cricothyrotomy intubation may be difficult to perform
3. Procedures involving the airway
4. Cervical Spine Injury





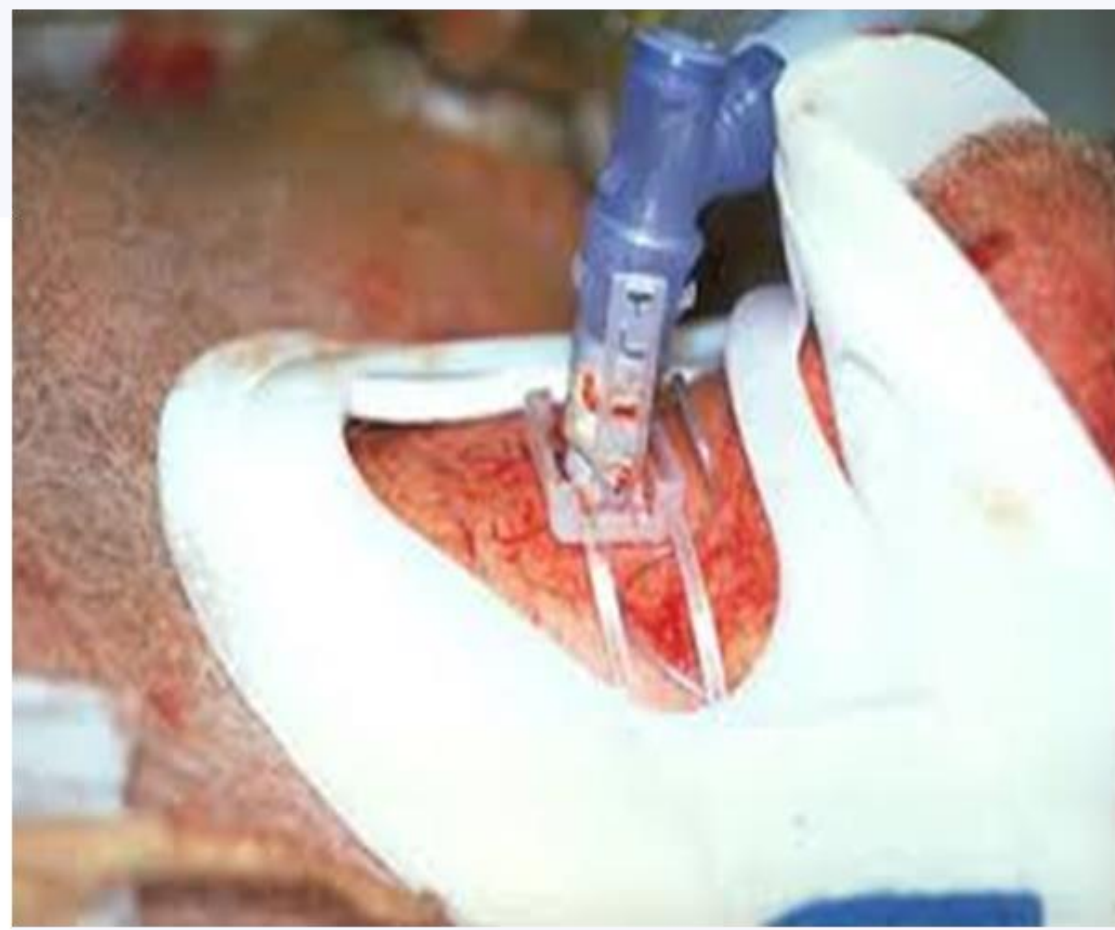
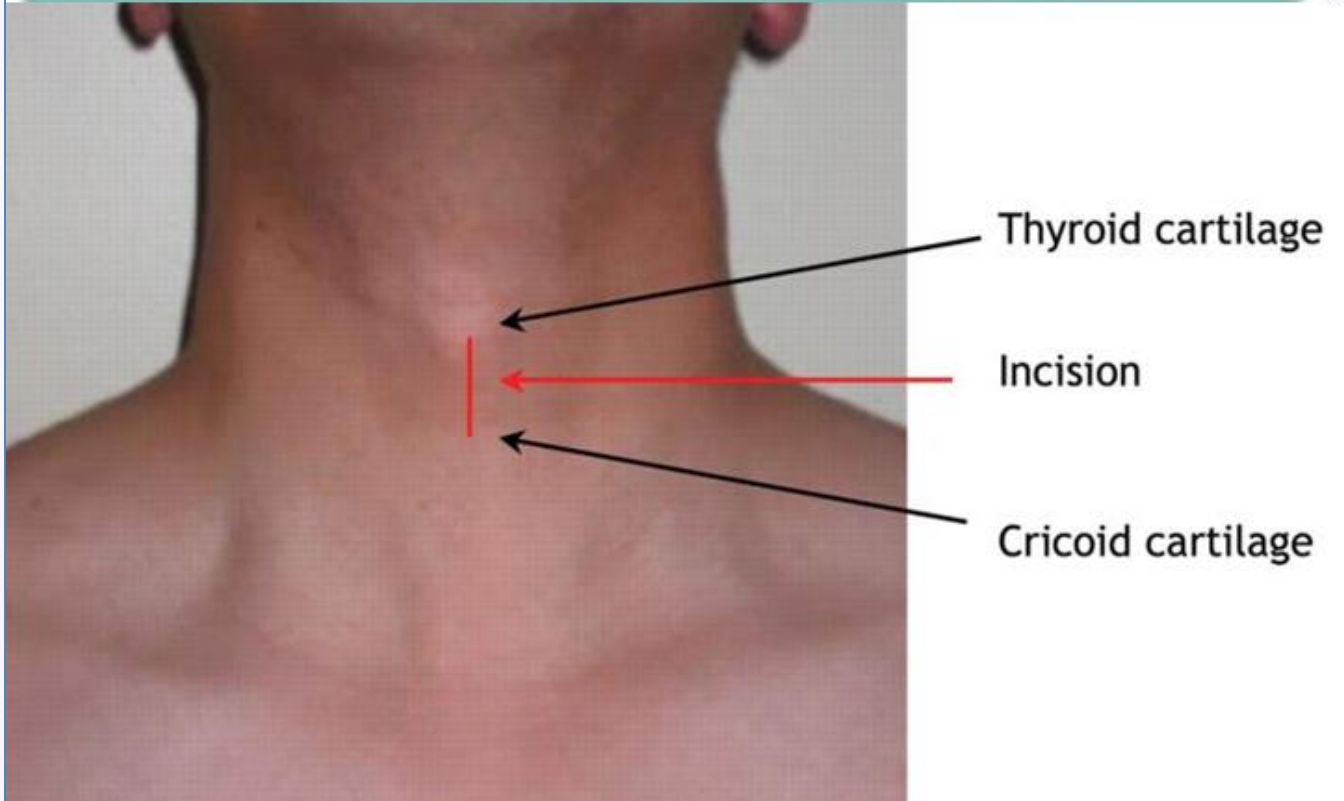
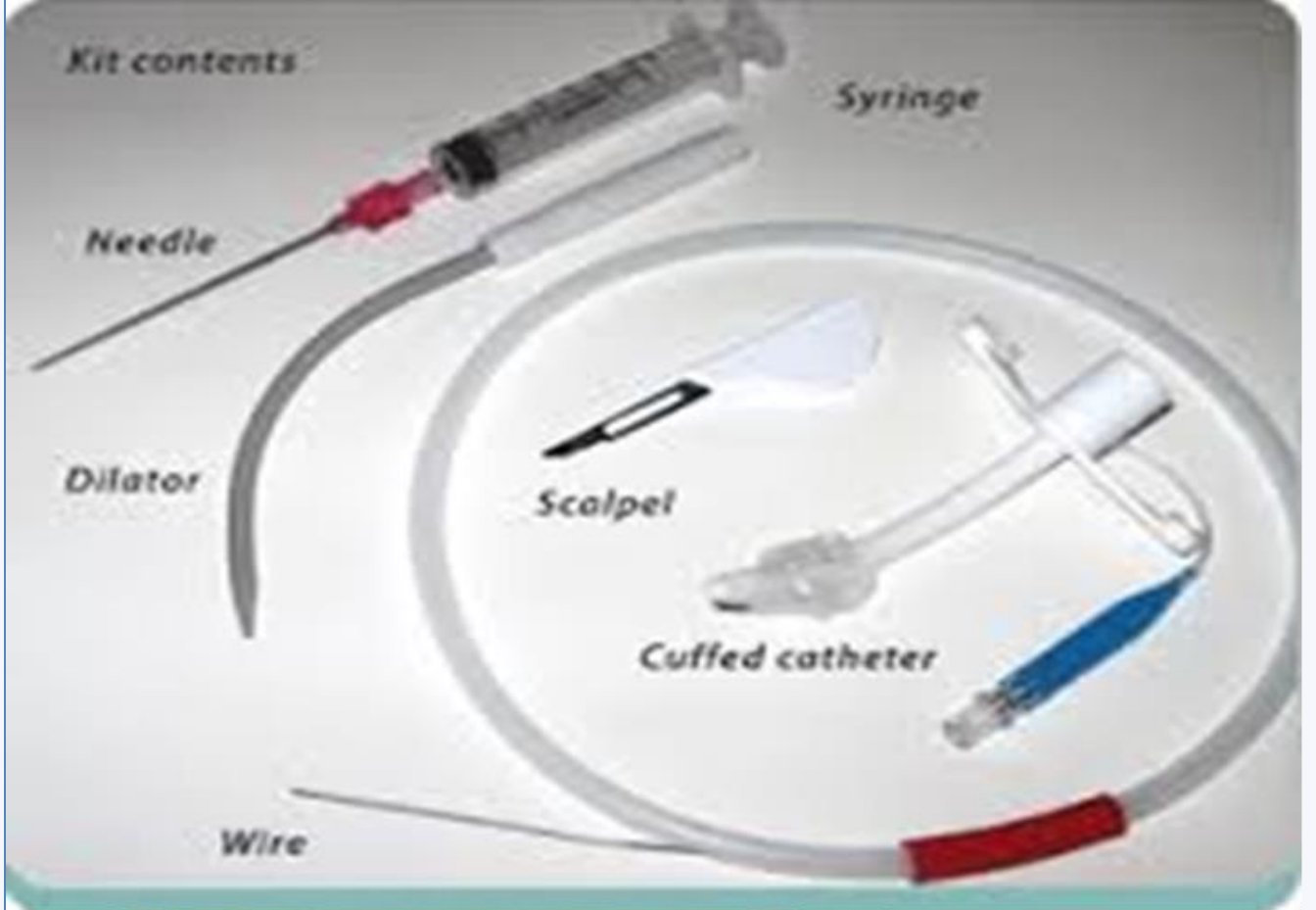
NEEDLE CRICOTHYROTOMY

Entry by 14 Fr. introducer and 16 G needle.



The position is confirmed by air aspiration.

SURGICAL CRICOTHYROIDOTOMY





CRICOTHYROTOMY

Contraindications

1. Intrathoracic Airway Obstruction
2. Inability to Locate the Cricothyroid Membrane
3. Complete Airway Obstruction
4. Paediatric patients
5. Laryngeal pathology
6. Decreased compliance



TAKE HOME MESSAGE

“Patients do not die from lack of intubation they die from lack of oxygenation”. Ventilate with bag-mask device connected to an oxygen source and transfer to a definitive care centre.





Thank You

