EMT-Special Skill
Supraglottic Airway

Companion PowerPoint DOH 530-253
for
Required curricula:
Supraglottic Airway Endorsement for EMTs
DOH 530-138

Emergency Care Systems

THANK YOU

This training aid was developed by the Washington State EMS Education Workgroup under the oversight of the Prehospital Technical Advisory Committee.

Supraglottic Airway Endorsement

The purpose is to teach the proper placement of a supraglottic airway (SGA) device in the patient experiencing an airway or breathing emergency.

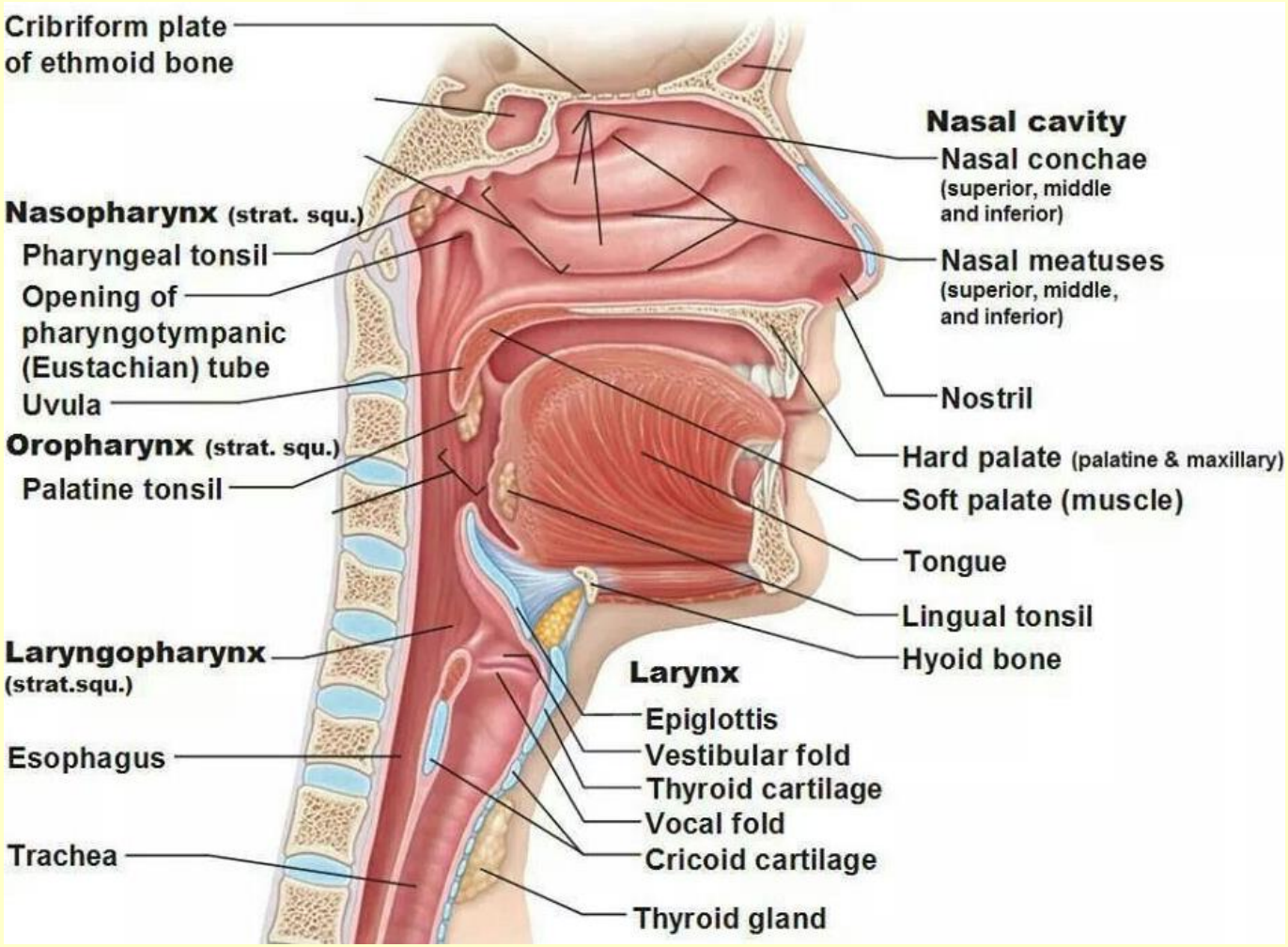
There are objectives the student must master to ensure the proper care of a patient experiencing an airway or breathing emergency

- Demonstrate proper airway management for a patient in respiratory failure or cardiac arrest
- Identify the need to place supraglottic airway (SGA) device
- Demonstrate the proper technique for placement of a supraglottic airway (SGA) device
- Explain the importance of continued monitoring of ventilations, waveform capnography, and airway patency

Why is it important?

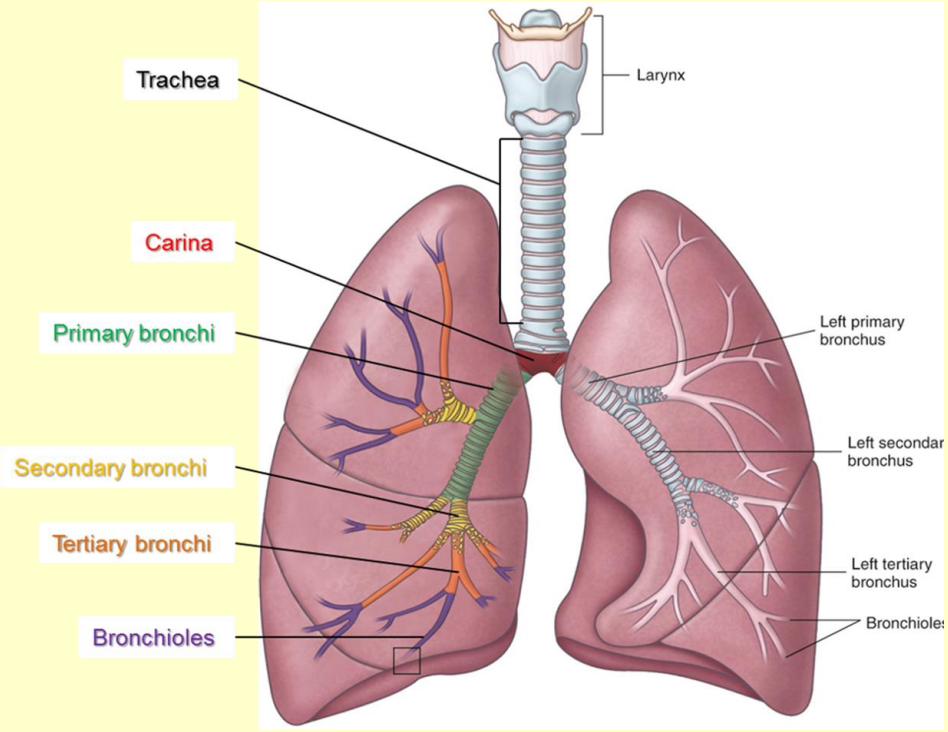
- Failure to manage the airway patency is a major cause of preventable death in the prehospital setting
- Maintaining the patient's oxygenation and supporting ventilation are critical steps to minimize the overall burden of injury and improve the likelihood of a good outcome
- Early detection, rapid intervention and continuous reassessment are paramount

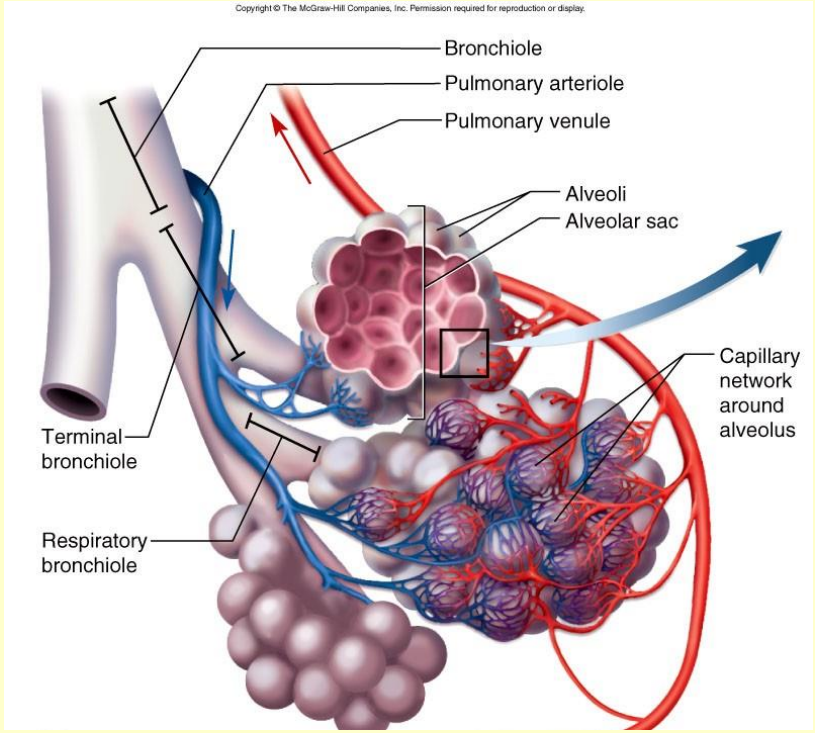
Anatomy of the Upper Airway



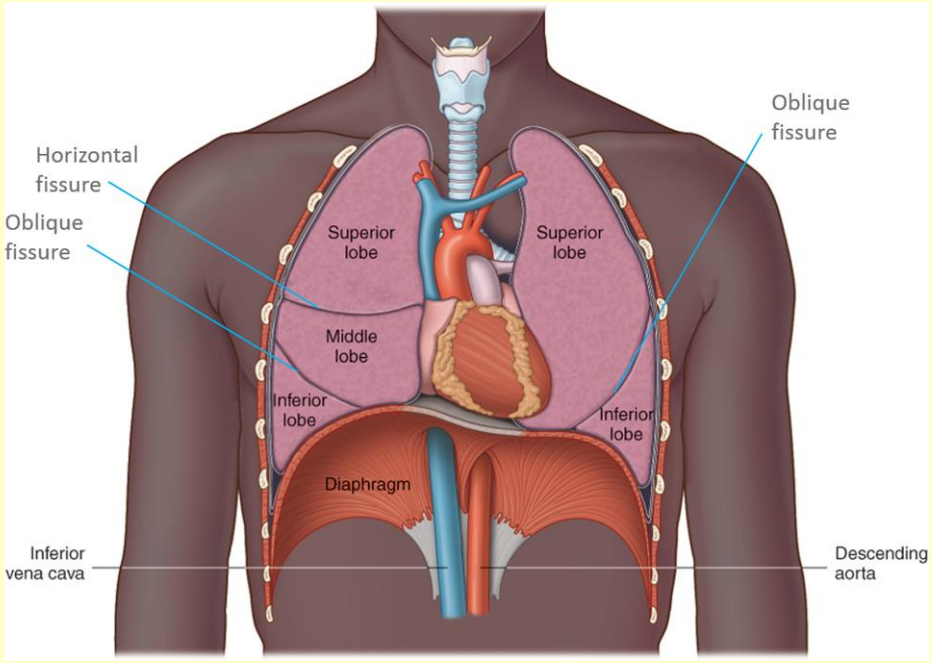
physio-pedia.com

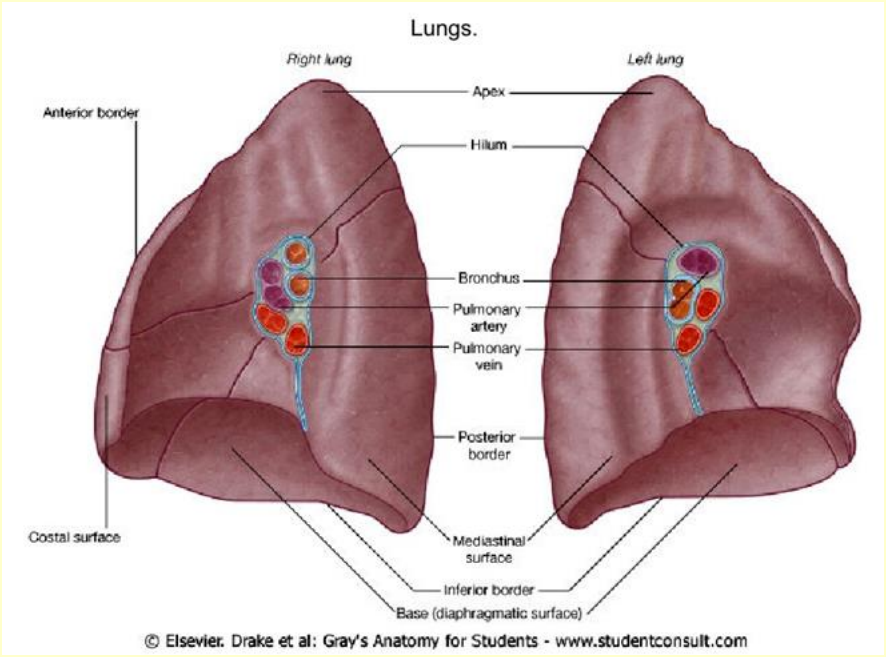
Anatomy of the Lower Airway





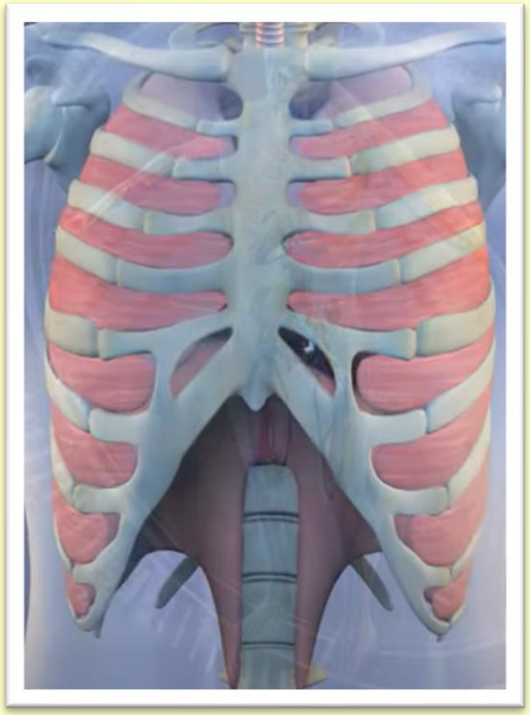
Anatomy of the Lower Airway

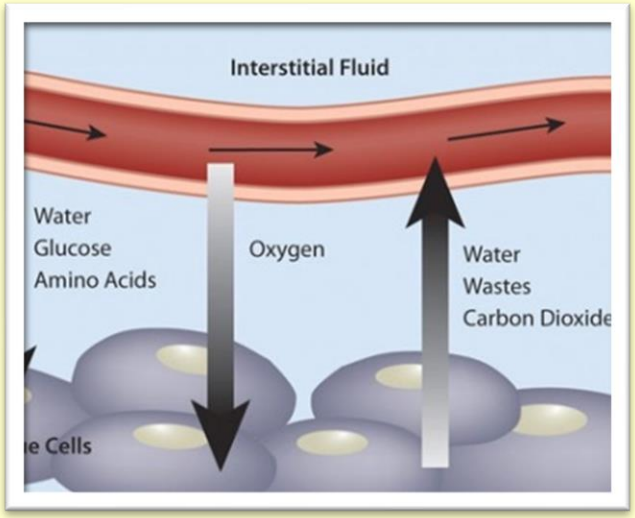




Physiology

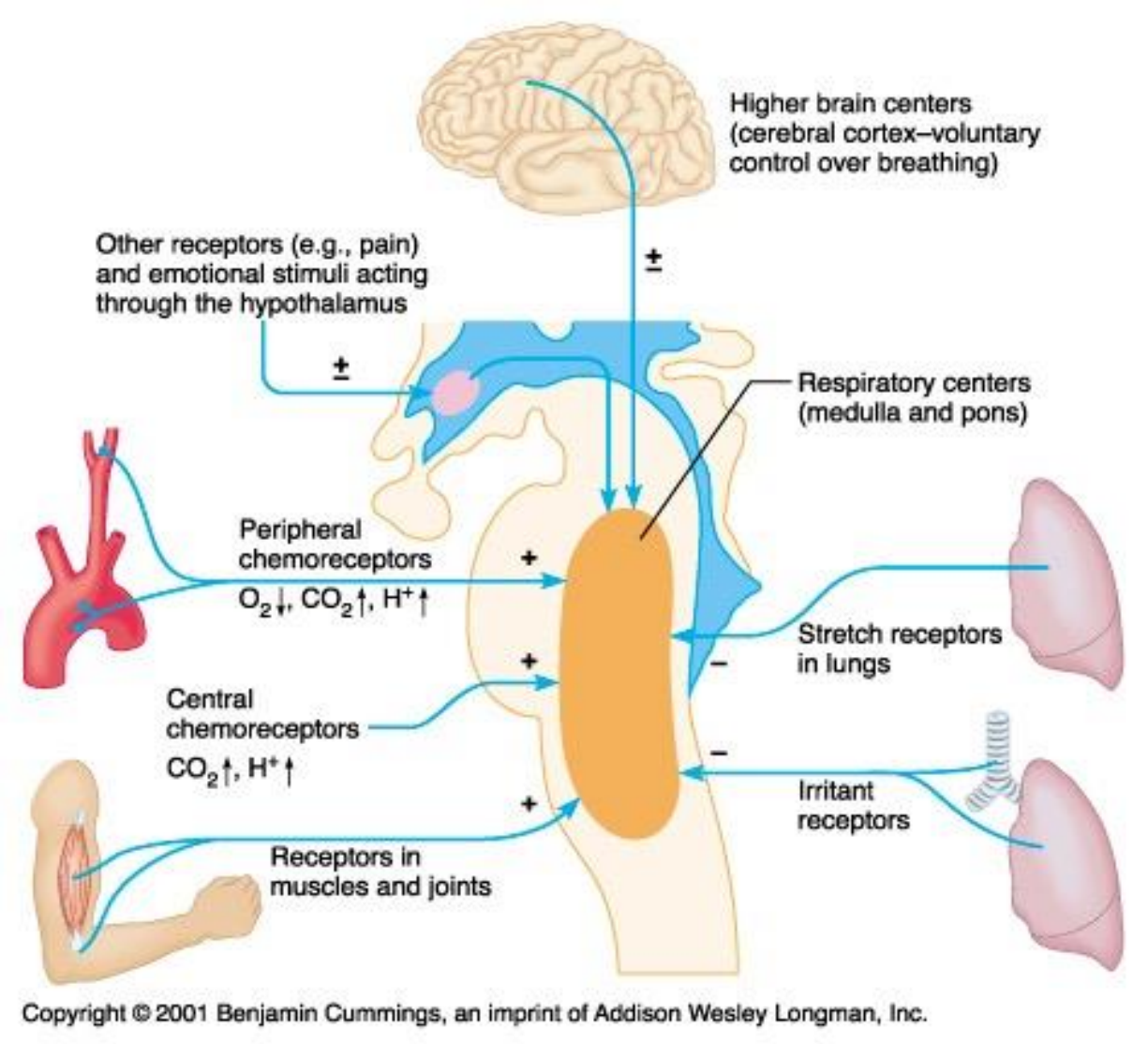
- Ventilation: mechanical movement
- Oxygenation: circulatory perfusion
- Respiration: gas exchange diffusion





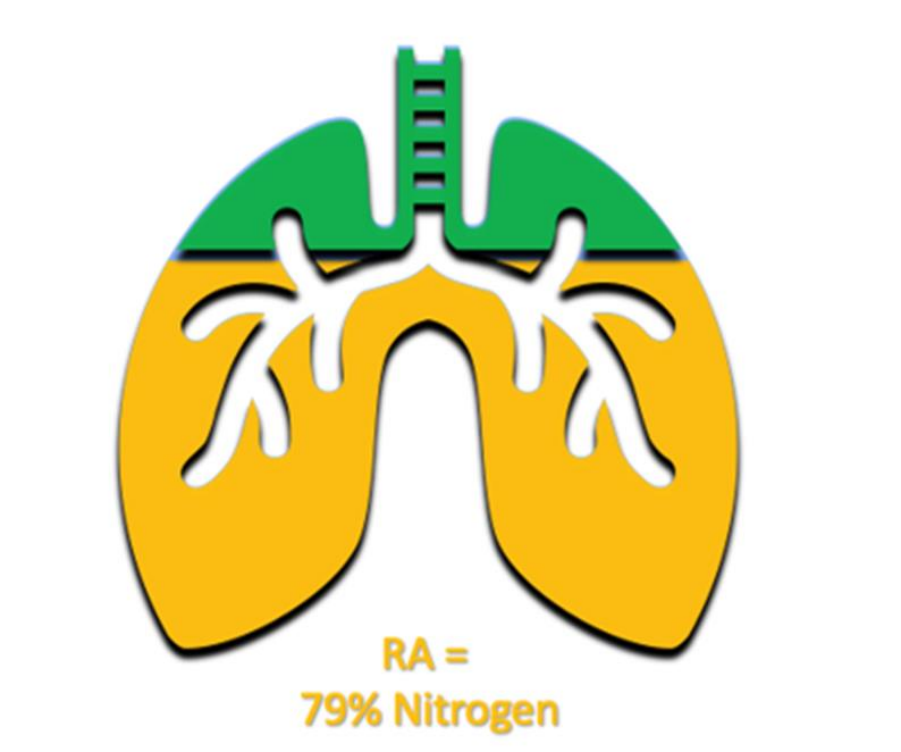
Physiology

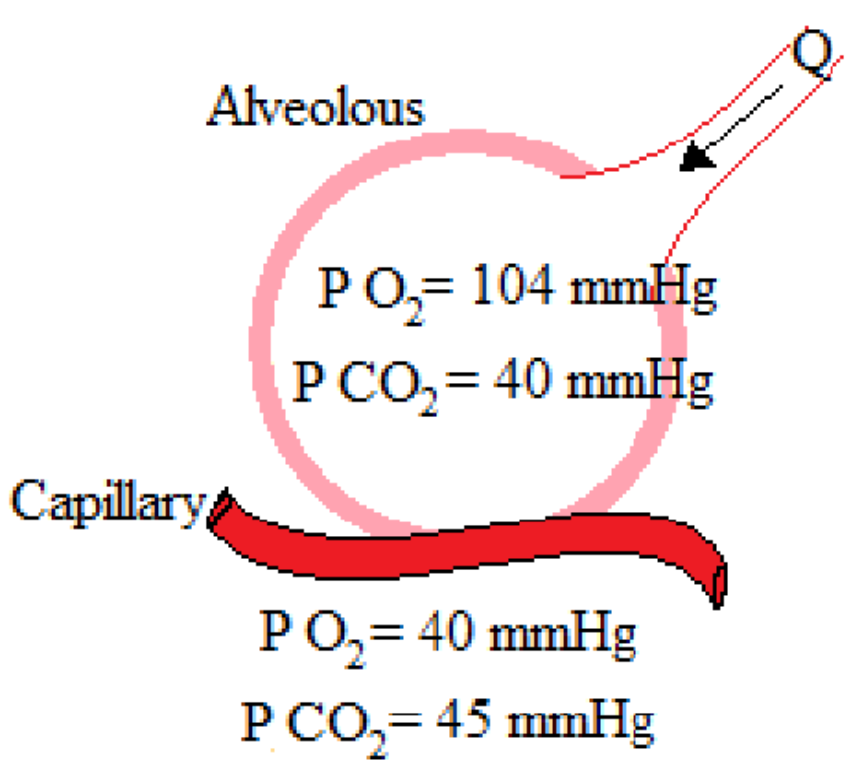
Regulatory Center



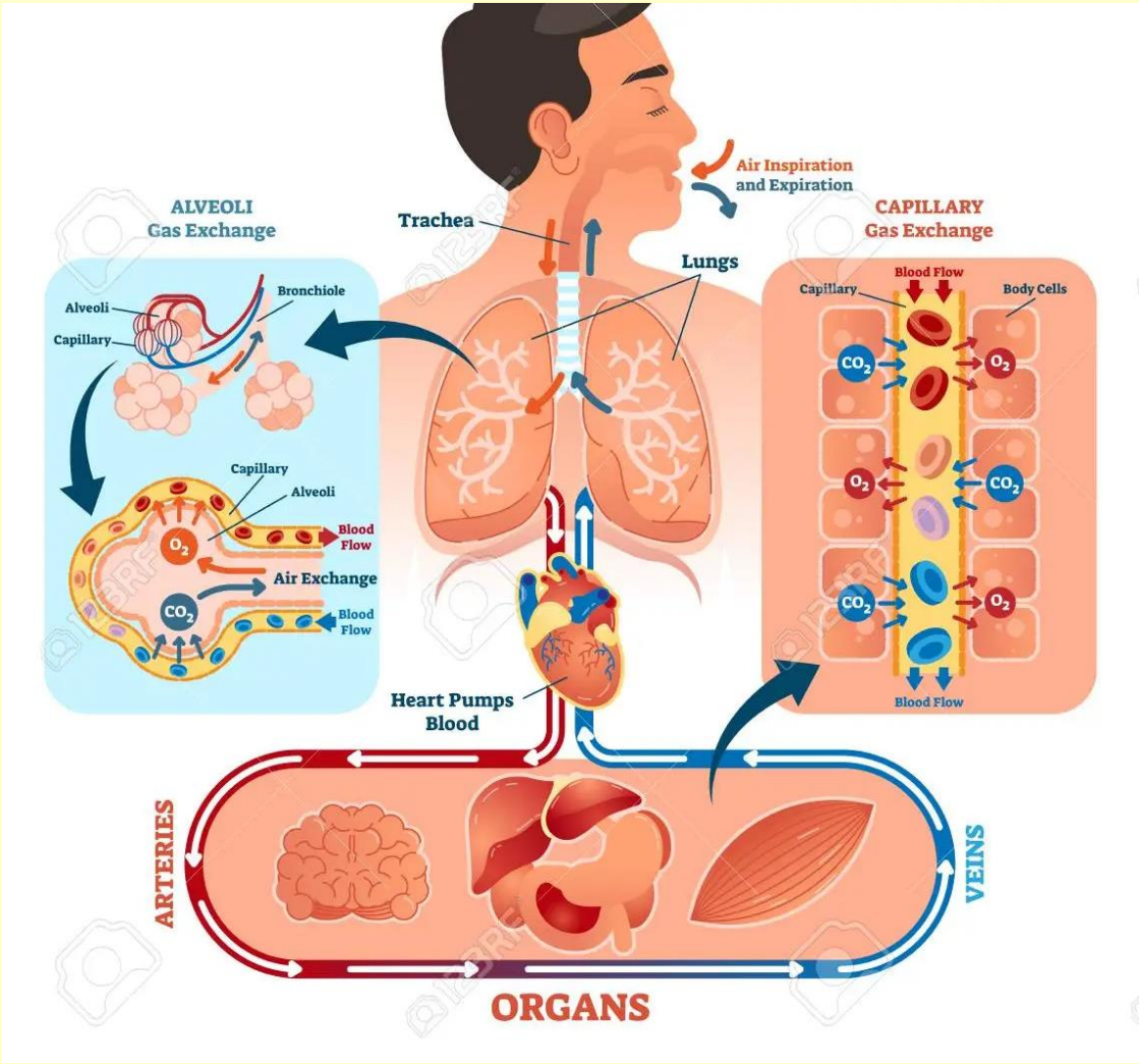
Measurement of Gases

RA = 20% Oxygen





Exchange of Gases



Courtesy: 123RF LLC, Chicago, IL, image 99658748

Assessment- Essential Parameters

- Patency
- Rate
- Regularity
- Effort
- Ventilation
- Oxygenation & Respiration

Assessing Patency, Oxygenation & Ventilation

- Visual signs and symptoms
- Auscultation techniques
- Palpation techniques

Inadequate Ventilation, Oxygenation or Respiration

- Dyspnea
- Hypoxia, Hypoxemia, Anoxia
- Hypoventilation, Hyperventilation
- Respiratory Rate/Pattern Changes

Causes of Hypoventilation

Obstruction

Foreign object

Infection

Trauma

Ventilation Impairment

TPTX

Flail chest

Pleural effusion

Restriction: kyphosis

Neurologic

OD

CO poisoning

ALS, Gullain-Barre, Botulism

Causes of Hyperventilation

Acidosis

Overdose

DKA

Hyperventilation syndrome

Caused by blowing off too much CO2

Can be emotional event

Pain

Underlying illness

Pulmonary embolism

Shock

Sepsis

Basic Airway Management

Infectious Disease Considerations

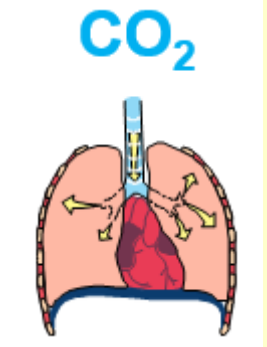
STANDARD PRECAUTIONS SHOULD INCLUDE GLOVES, EYE PROTECTION, FACE MASK AND HAND HYGIENE

VENTILATION WITH BVM OR SGA ARE AEROSOLIZING PROCEDURES

CPR WITH OR WITHOUT VENTILATION IS AEROSOLIZING

Recognize the Need for Basic Airway Management

- Assessment
- Measurement
- Oxygenation
- Measured by Pulse Oximetry
- Ventilation
- Measured by Capnography

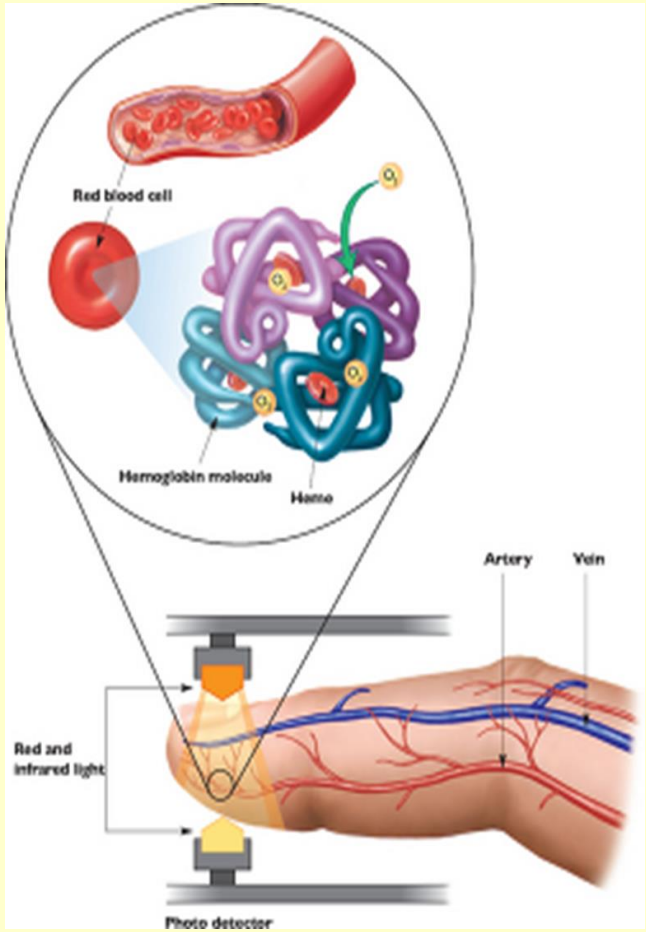


SpO_2 pleth

Waveform $ETCO_2$

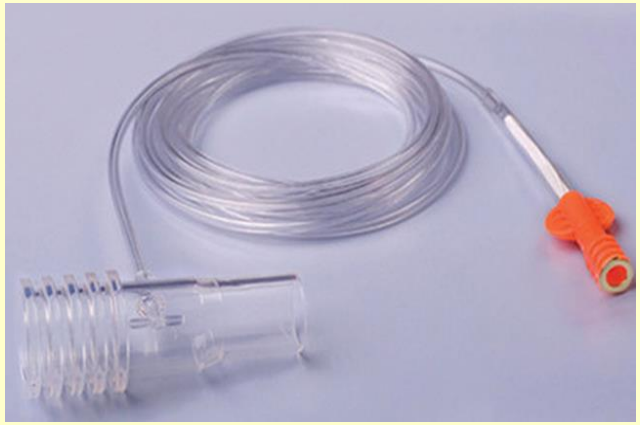
Recognize the Need for Basic Airway Management

- Pulse Oximetry
  - ✓ SpO_2 = % of oxygen saturated hemoglobin
  - ✓ Goal SpO_2 varies depending on the patient
  - ✓ Verify waveform!



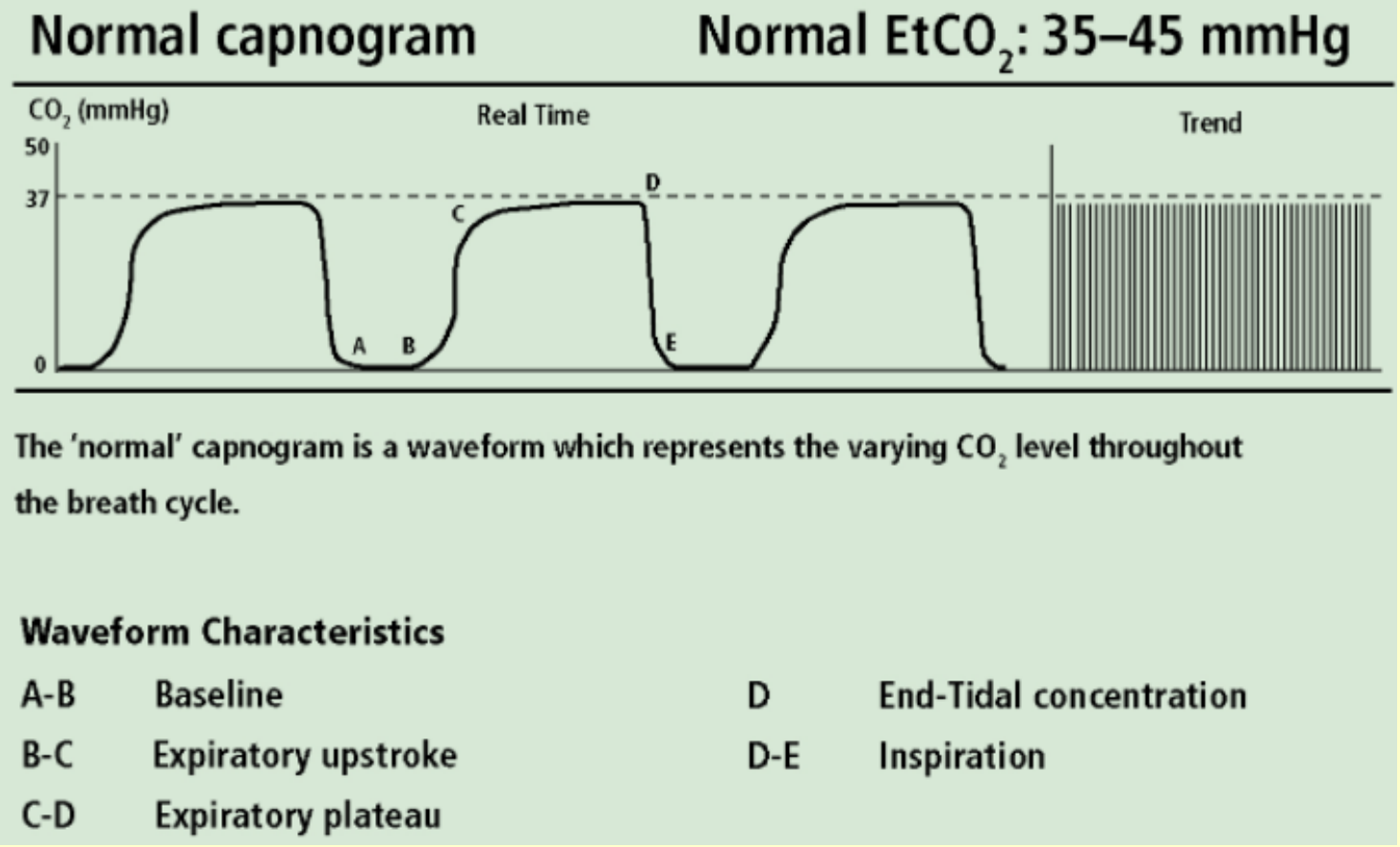
Recognize the Need for Basic Airway Management

- Capnography of End-Tidal CO_2
  - ✓ Is a measurement of ventilation
  - ✓ Detects exhaled CO_2 concentration in mmHg
  - ✓ Is not affected by motion artifact, etc



Recognize the Need for Basic Airway Management

- Waveform Capnography



Courtesy ZOLL Medical Corporation

Recognize the Need for Basic Airway Management

- Waveform Capnography

Sudden loss of waveform

- ET tube disconnected, dislodged, kinked or obstructed
- Loss of circulatory function

Decreasing $EtCO_2$

- ET tube cuff leak
- ET tube in hypopharynx
- Partial obstruction

CPR Assessment

- Attempt to maintain minimum of 10mmHg

Sudden increase in $EtCO_2$

- Return of spontaneous circulation (ROSC)

Bronchospasm ("Shark-fin" appearance)

- Asthma
- COPD

Hypoventilation

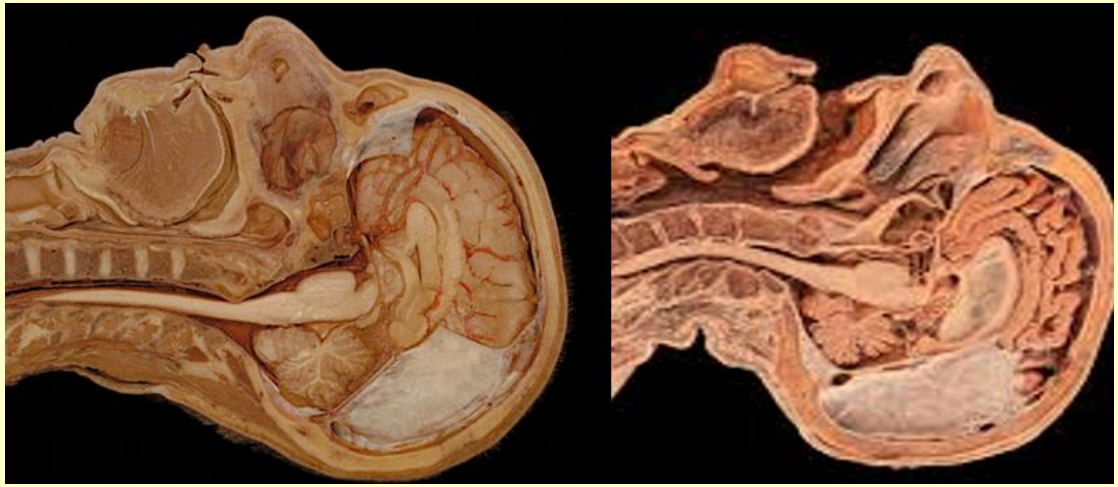
Hyperventilation

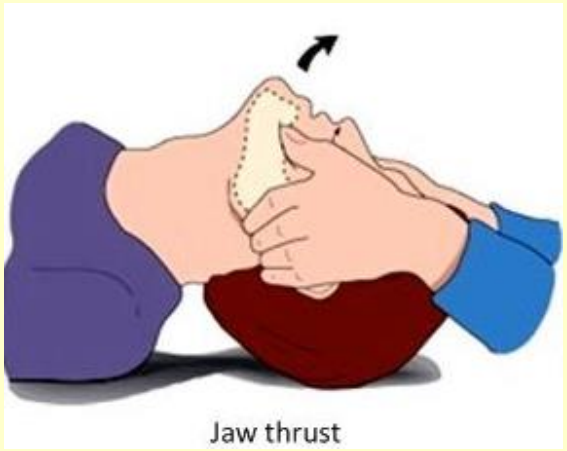
Decreased $EtCO_2$

- Apnea
- Sedation

Basic Airway Maneuvers

- Opening the mouth/airway
- Head-tilt / Chin-lift
- Jaw Thrust



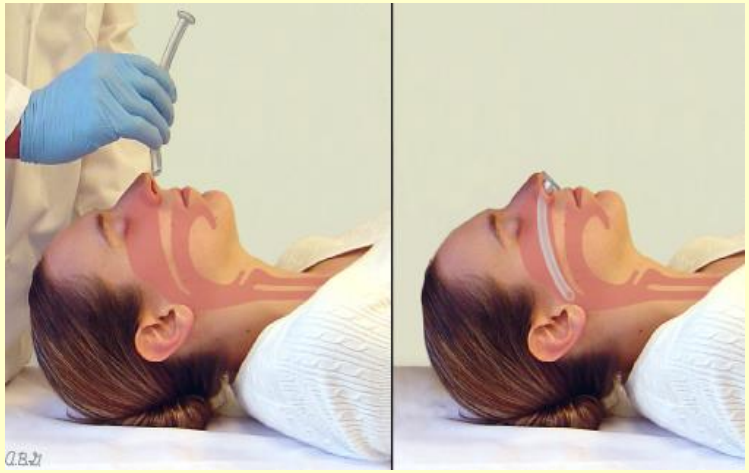


Basic Airway Adjuncts

Insertion of Basic Airway Devices

- Oropharyngeal Airway

- Nasopharyngeal Airway



Courtesy: UpToDate

Suctioning

- Purpose: To clear a path for gas exchange while preventing aspiration
  - ✓ A totally obstructed airway will provide no air exchange >> Be aggressive!

- Types of Suction Devices

Suctioning

- Techniques with the rigid tip and catheter tip

Suctioning

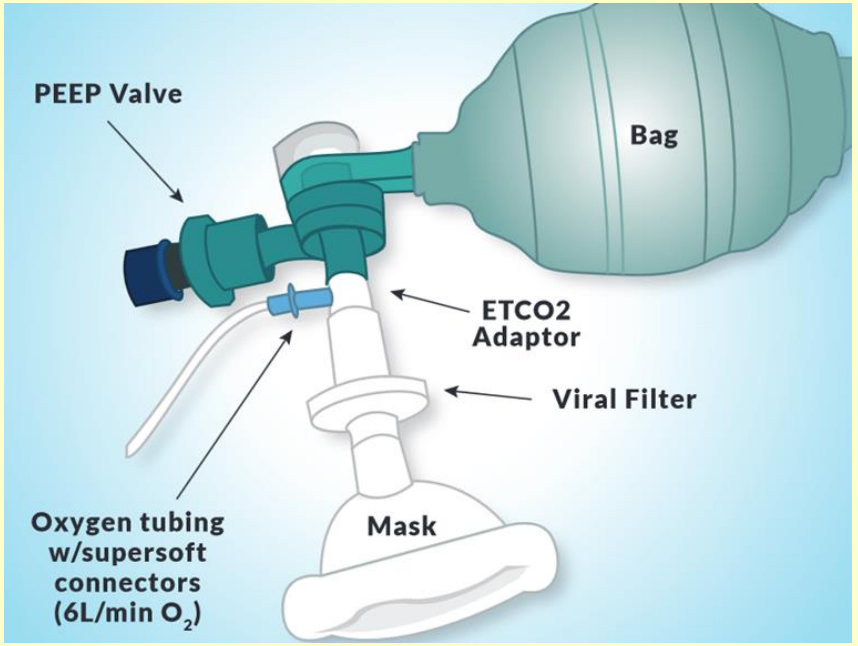
- Techniques with SGA in place

Bag-Valve-Mask (BVM)

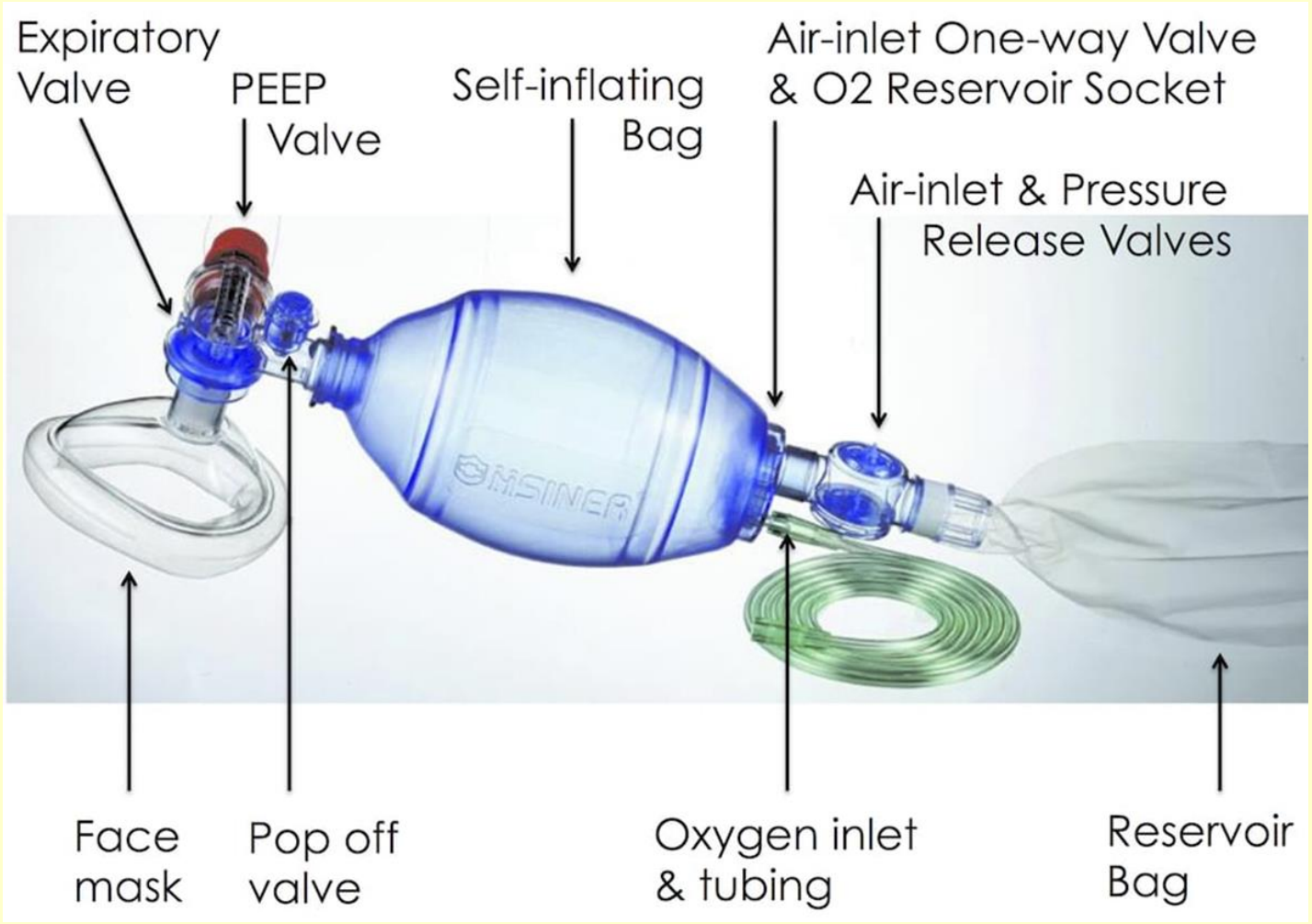
- Best If:
  - ✓ You have a good seal
  - ✓ Used with a PEEP valve
  - ✓ SQUEEZE the bag as some bags don't deliver O2 unless squeezed
- Use When:
  - ✓ Patient is not breathing spontaneously
  - ✓ Patient is breathing too slow
  - ✓ Tidal volume is low

Viral Filter for BVM

- A good seal with a viral filter can help reduce aerosolization of infectious diseases



Anatomy of the Bag-Valve-Mask



Positive-End-Expiratory-Pressure (PEEP)

- Increases end expiratory pressures
- Physiologic PEEP is 5 cm of water (cm H_2O)
- Increases alveolar recruitment in patients with shunting

Positive-End-Expiratory-Pressure (PEEP)

Bag-Valve-Mask Ventilation

- Mask seal - for best seal place the face mask on the face before you attach the bag, pull the mask apart and roll it on to the face

Bag-Valve-Mask Ventilation

- Two handed grip is the best way to perform BVM ventilation

Classic

Better

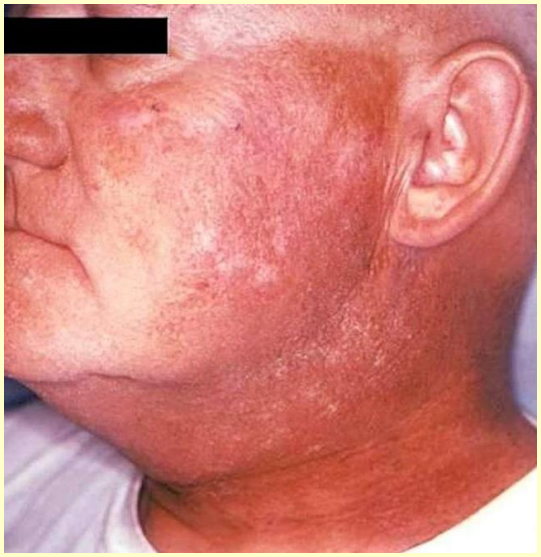
Best

Assess Difficult BVM Ventilation

- Radiation/Restriction
- Obesity/ Obstruction/ Obstructive Sleep Apnea
- Mask seal/ Mallampati/ Male gender
- Age
- No teeth

Radiation / Restriction

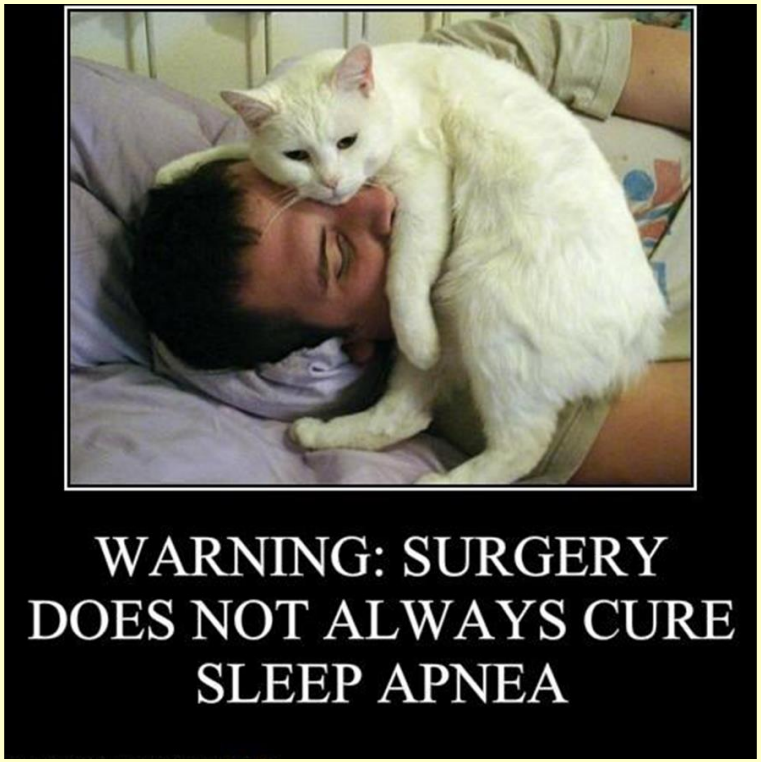
- Neck radiation is one of the strongest predictors of difficult ventilation



- Restriction refers to lungs that require higher pressures to ventilate

Triple ‘Os’

- Obesity
- Obstruction
- Obstructive sleep apnea

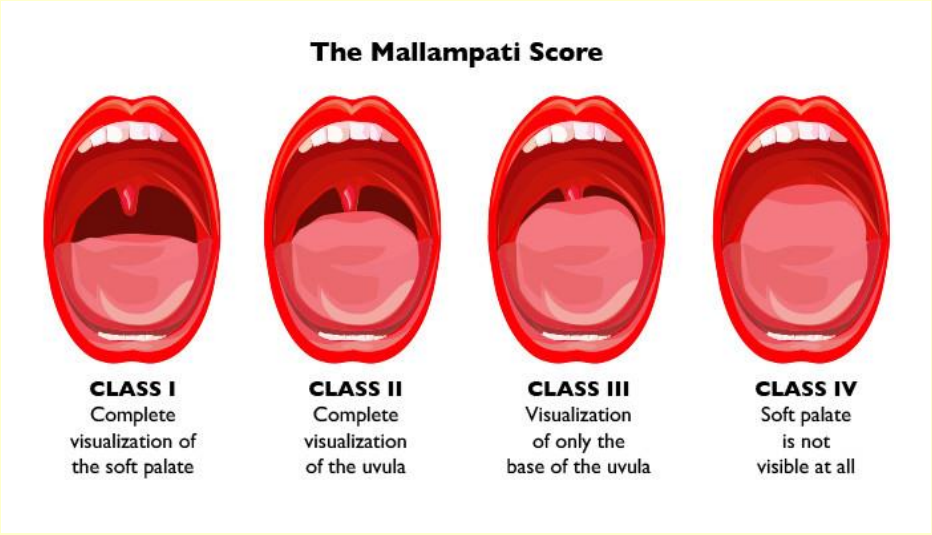


Triple ‘Ms’

- Mask Seal

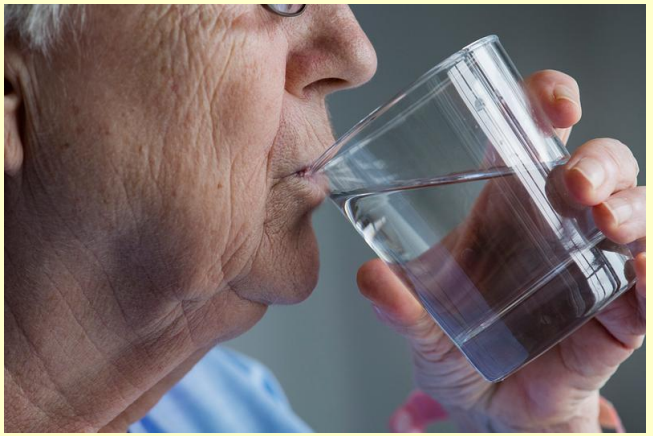
- Male gender

- Mallampati



Age

- Age over 55 is associated with higher risk of difficult BVM



- Loss of musculature and upper airway tissues

- Loss of elasticity of tissues

No teeth

- Leave dentures in during BVM
- Remove dentures for intubation
- May insert gauze in cheek to improve mask seal
- Roll lower lip down towards the chin and seal mask against inner mucosal surface

Airway Management with SGAs (& other Adjuncts)

- Some adjuncts authorized in the WA DOH/EMS 'Scope of Practice' for EMTs are not true 'SGAs'

i-gel

King LTS-D

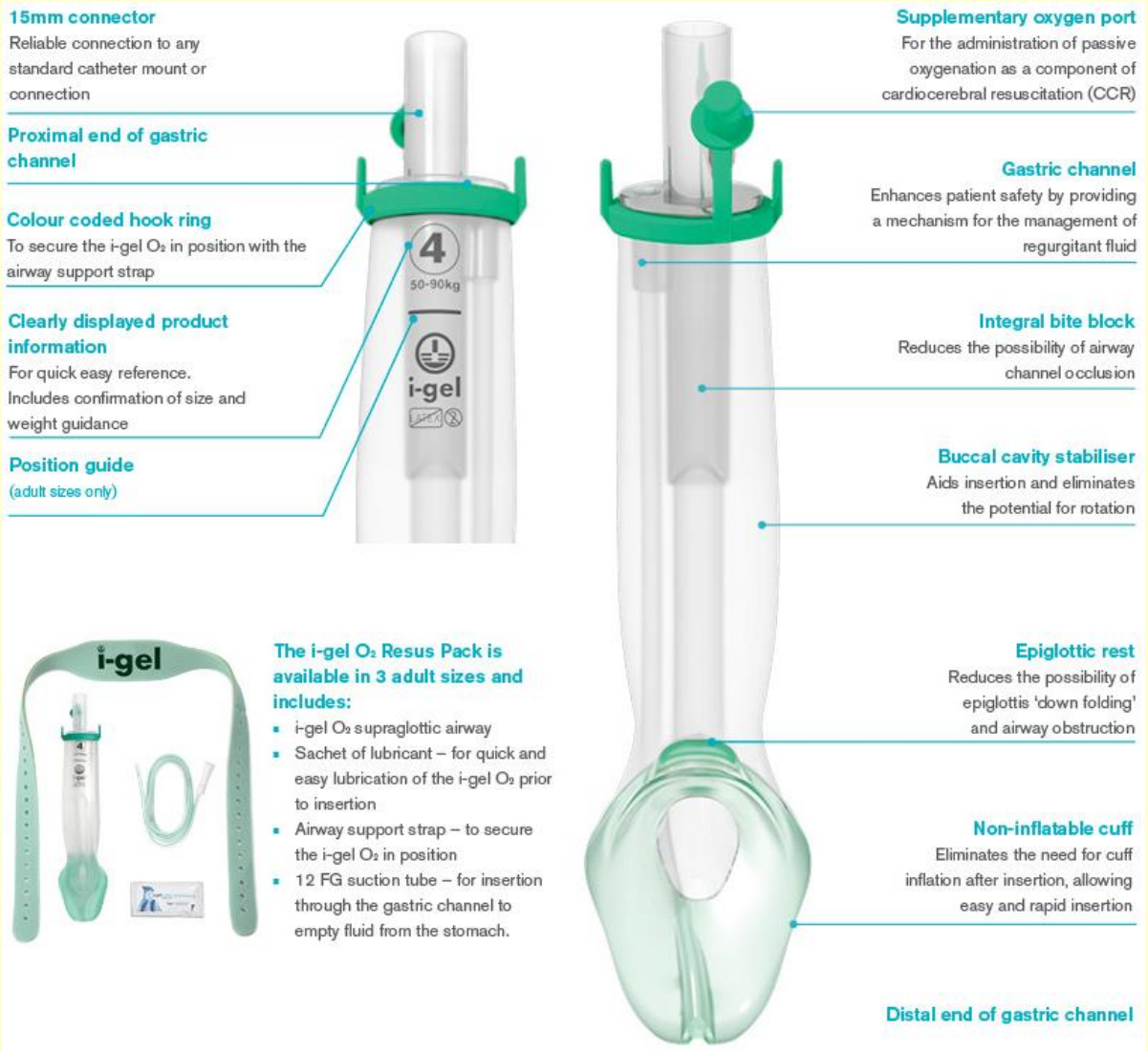
LMA Supreme

Airway Management with SGAs (& other Adjuncts)

- Indications
  - Failure to protect the airway
  - Cardiac arrest
- Contraindications
  - Awake patient
  - Intact airway reflexes
  - Caustic substance ingestion
  - Esophageal trauma or disease
- Complications
  - Aspiration
- Limitations
  - Airway swelling
  - Airway obstruction
  - High airway pressures

NREMT SGA General Insertion Technique

i-gel®


15mm connector
Reliable connection to any standard catheter mount or connection
Proximal end of gastric channel
Colour coded hook ring
To secure the i-gel O₂ in position with the airway support strap
Clearly displayed product information
For quick easy reference. Includes confirmation of size and weight guidance
Position guide
(adult sizes only)
4
50-90kg
i-gel
Supplementary oxygen port
For the administration of passive oxygenation as a component of cardiocerebral resuscitation (CCR)
Gastric channel
Enhances patient safety by providing a mechanism for the management of regurgitant fluid
Integral bite block
Reduces the possibility of airway channel occlusion
Buccal cavity stabiliser
Aids insertion and eliminates the potential for rotation
Epiglottic rest
Reduces the possibility of epiglottis 'down folding' and airway obstruction
Non-inflatable cuff
Eliminates the need for cuff inflation after insertion, allowing easy and rapid insertion
Distal end of gastric channel
i-gel
The i-gel O₂ Resus Pack is available in 3 adult sizes and includes:
i-gel O₂ supraglottic airway
Sachet of lubricant – for quick and easy lubrication of the i-gel O₂ prior to insertion
Airway support strap – to secure the i-gel O₂ in position
12 FG suction tube – for insertion through the gastric channel to empty fluid from the stomach.

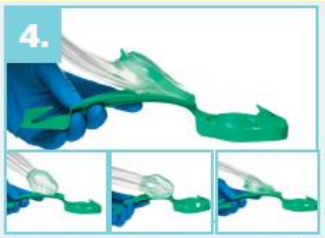
i-gel®

i-gel®

Open the i-gel package, and on a flat surface take out the protective cradle containing the device.

Remove the i-gel and transfer it to the palm of the same hand that is holding the protective cradle, supporting the device between the thumb and index finger.

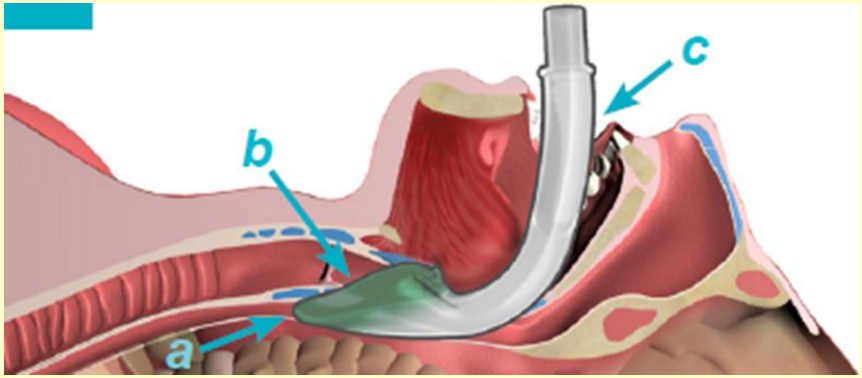
Place a small bolus of a water-based lubricant, such as K-Y Jelly®, onto the middle of the smooth surface of the protective cradle in preparation for lubrication.



Grasp the i-gel with the opposite (free) hand along the integral bite block and lubricate the back, sides and front of the cuff with a thin layer of lubricant.

Inspect the device carefully, confirm there are no foreign bodies or a BOLUS of lubricant obstructing the distal opening. Place the i-gel back into the protective cradle in preparation for insertion.

Remove the i-gel from the protective cradle or cage pack. Grasp the lubricated i-gel firmly along the integral bite block. Position the device so that the i-gel cuff outlet is facing towards the chin of the patient. The patient should be in the 'sniffing the morning air' position with head extended and neck flexed. The chin should be gently pressed down before proceeding. Introduce the leading soft tip into the mouth of the patient in a direction towards the hard palate. Glide the device downwards and backwards along the hard palate with a continuous but gentle push until a definitive resistance is felt.



The tip of the airway should be located into the upper esophageal opening (a).
The cuff should be located against the laryngeal framework (b).
The incisors should be resting on the integral bite block (c).

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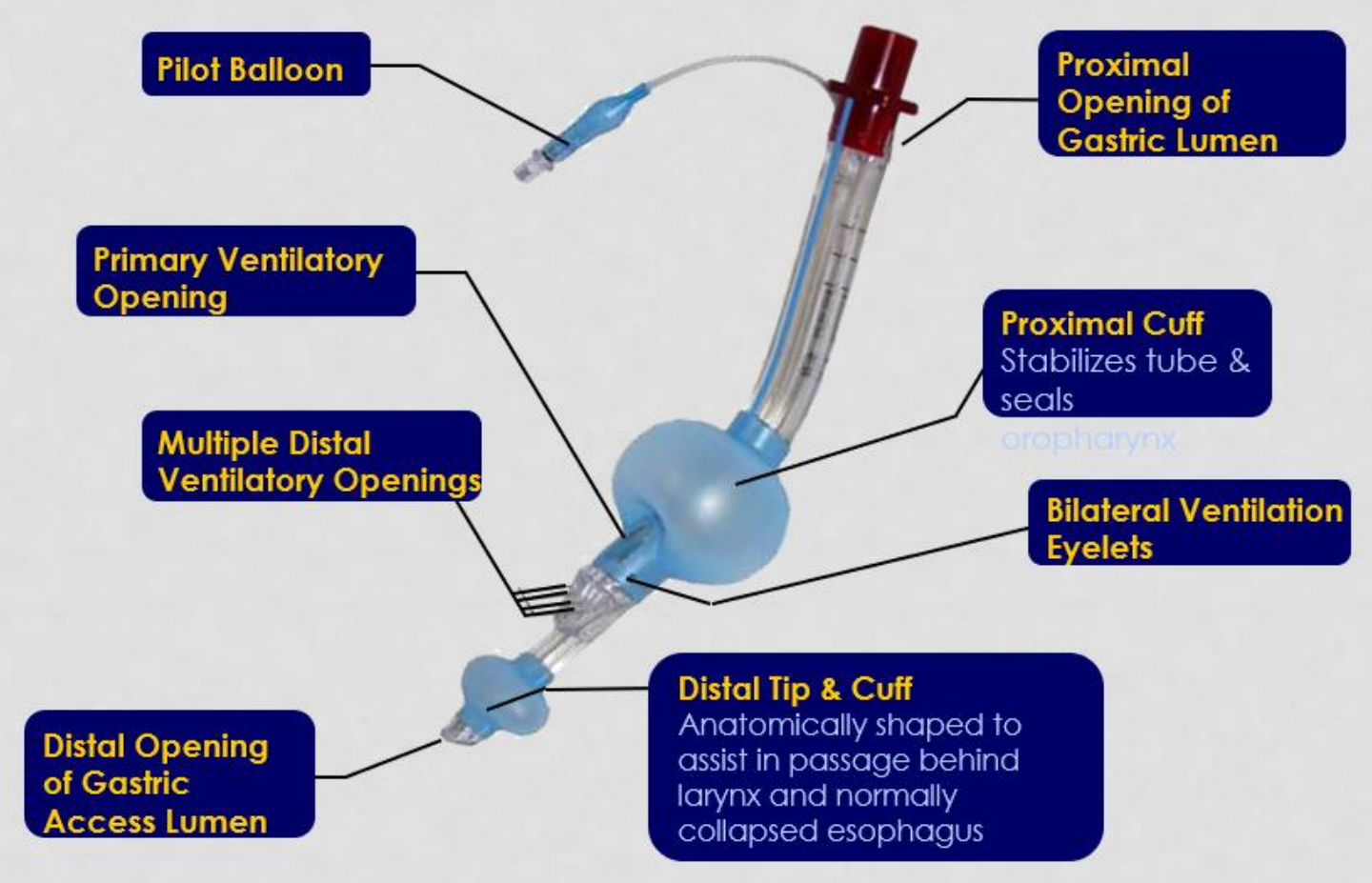
Pilot Balloon
Proximal Opening of Gastric Lumen
Primary Ventilatory Opening
Proximal Cuff
Stabilizes tube & seals
oropharynx
Multiple Distal Ventilatory Openings
Bilateral Ventilation Eyelets
Distal Tip & Cuff
Anatomically shaped to assist in passage behind larynx and normally collapsed esophagus
Distal Opening of Gastric Access Lumen

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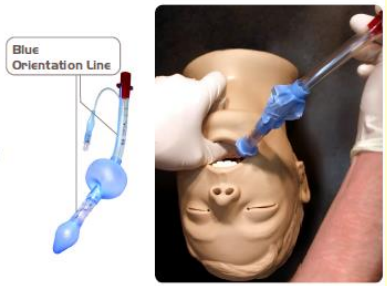
King LTS-D™

Insertion Guide, Step 1

Hold the KLTD/KLTSD at the connector with dominant hand.

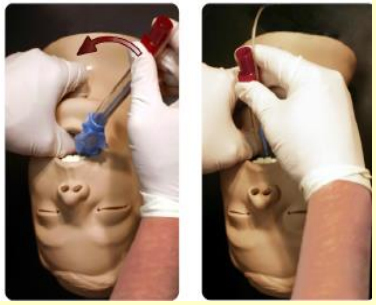
With non-dominant hand, hold mouth open and apply chin lift, unless contraindicated by C-spine precautions or patient position.

Using a lateral approach, introduce tip into corner of mouth.



Insertion Guide, Step 2

Advance the tip behind the base of the tongue while rotating tube back to midline, so that the blue orientation line faces the chin of the patient.



Insertion Guide, Step 3

Without exerting excessive force, advance tube until base of connector is aligned with teeth or gums.

Insertion Guide, Step 4

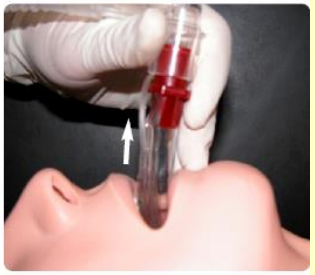
Inflate cuffs to 60 cm H_2O or to "just seal" volume.

EMS Kit: Inflate cuffs using the maximum volume of the syringe provided.

Insertion Guide, Step 5

Attach the breathing circuit/resuscitator bag to the KLTD/KLTSD.

While gently bagging the patient, withdraw the tube until ventilation is easy and free flowing (large tidal volume with minimal airway pressure).



Insertion Guide, Step 6

If necessary, add additional volume to cuffs to maximize seal of the airway.

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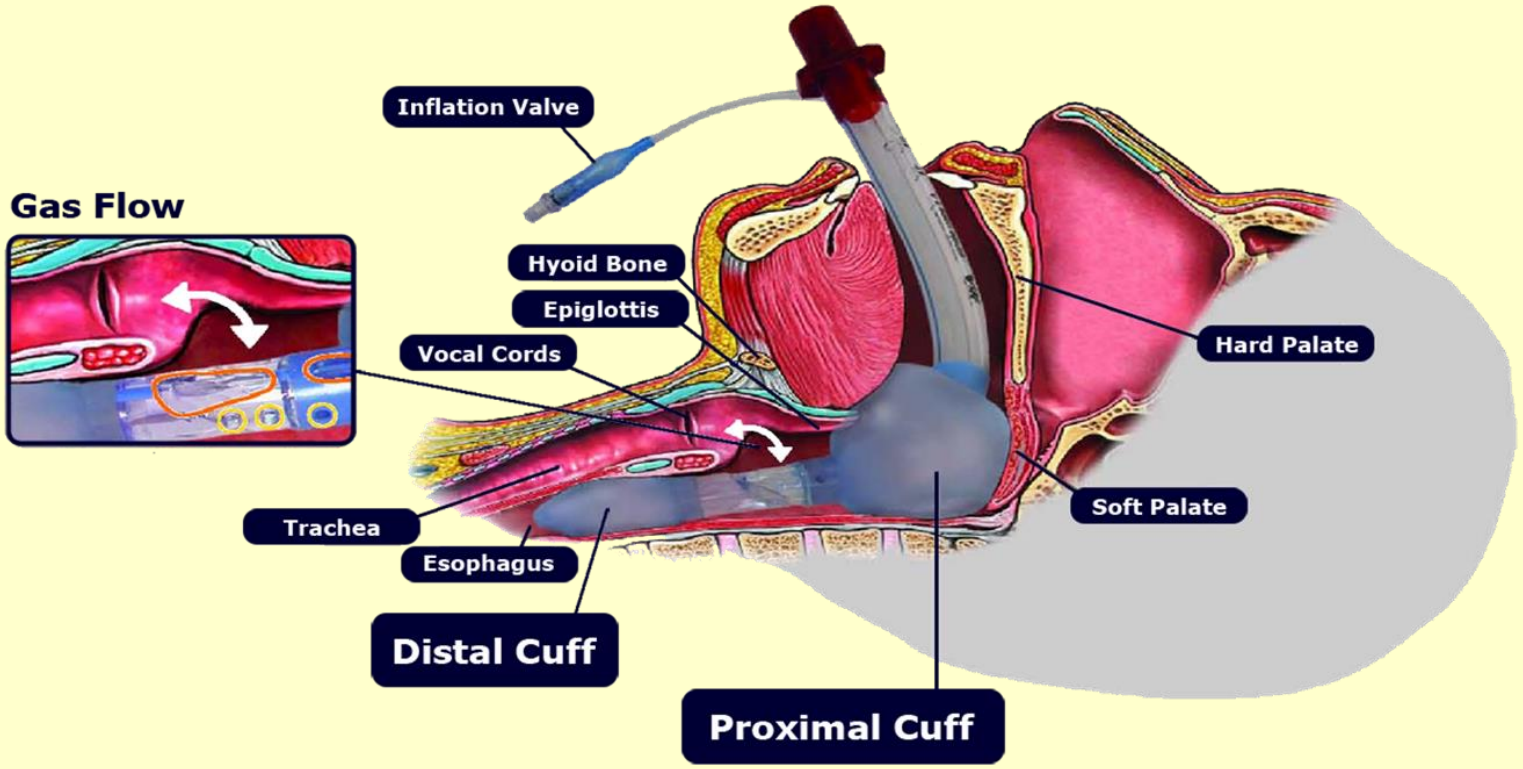
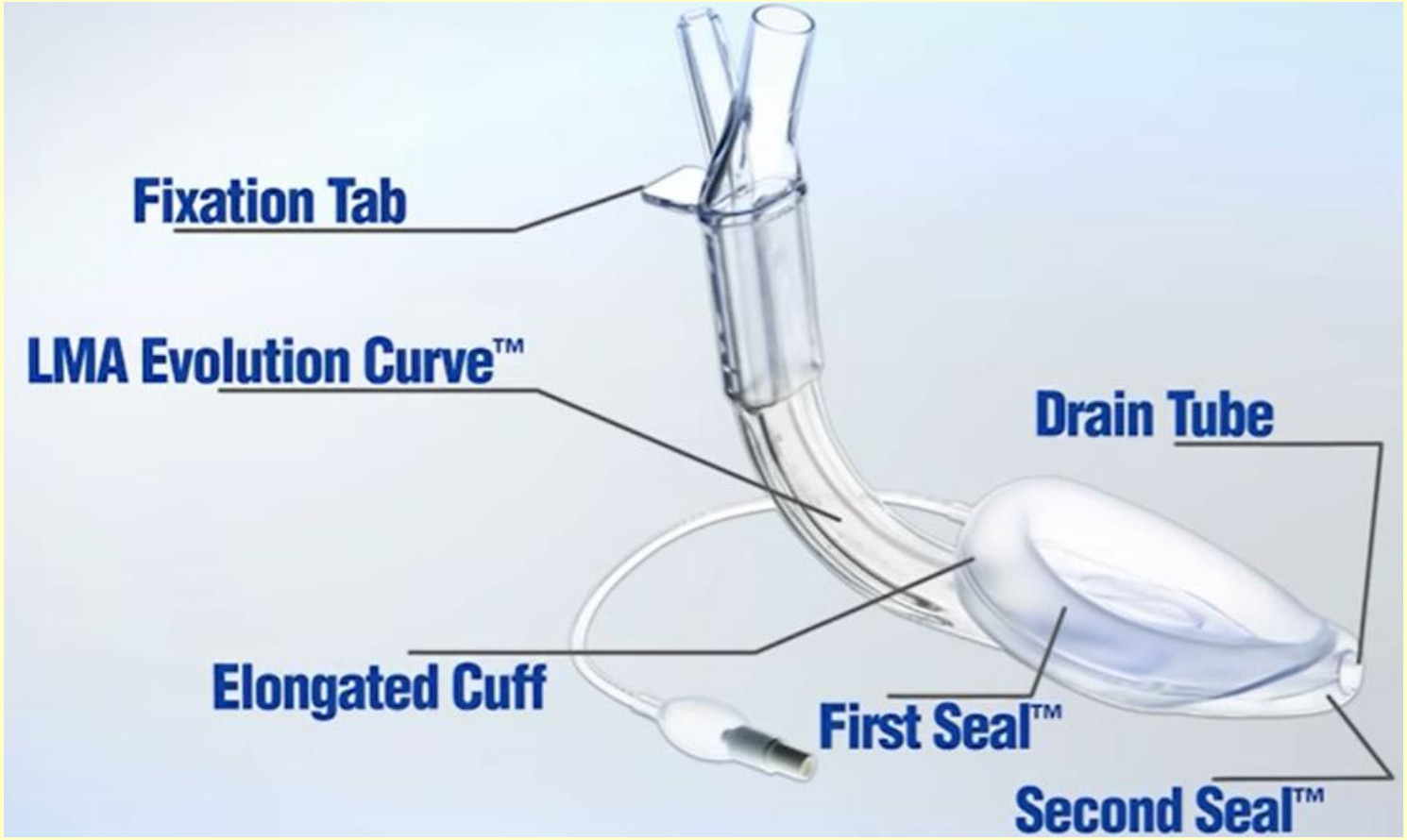

Gas Flow
Inflation Valve
Hyoid Bone
Epiglottis
Vocal Cords
Hard Palate
Soft Palate
Trachea
Esophagus
Distal Cuff
Proximal Cuff

LMA Supreme


Fixation Tab
LMA Evolution Curve™
Drain Tube
Elongated Cuff
First Seal™
Second Seal™

LMA Supreme

LMA Supreme

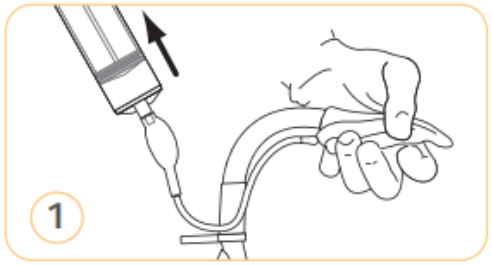


Figure 1: Fully deflate the mask for insertion. Attach a syringe. Compress the distal tip of the mask with thumb and index finger. Apply slight tension to the inflation line while removing all air until a vacuum is felt. Disconnect the syringe.

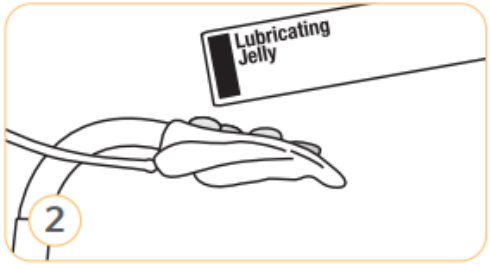


Figure 2: Generously lubricate the posterior surface of the cuff and airway tube.

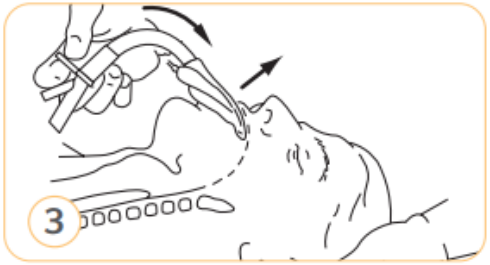


Figure 3: Place the patient's head in a neutral or slight "sniffing" position. Hold the LMA® Supreme™ Airway at the proximal end with the connector pointing downward to the chest and the tip of the distal end pointing toward the palate.

Figure 4: Press the tip of the mask against the hard palate. Maintaining pressure against the palate, continue to rotate the mask inwards in a circular motion following the curvature of the hard and soft palate.

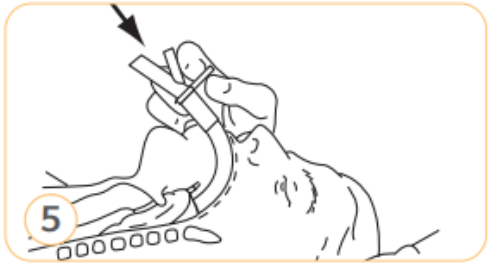


Figure 5: Continue until resistance is felt. The distal end of the mask should now be in contact with the upper esophageal sphincter. The device is now fully inserted.

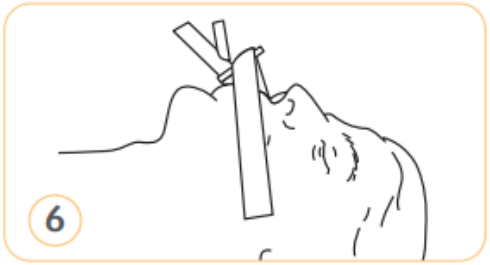
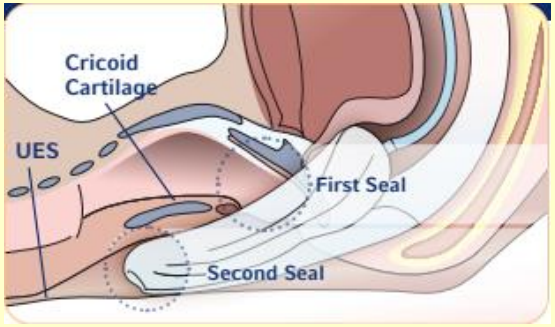


Figure 6*: Maintaining inward pressure, secure the mask into position by taping cheek to cheek across the fixation tab. This should be done prior to inflation. Inflate with the minimum amount of air needed to achieve an effective seal. The recommended intracuff pressure should not exceed 60 cm H_2O.

*Alternatively, taping can be done after the esophageal seal is confirmed. Inward pressure should be applied throughout inflation and ventilation, prior to taping in place.



LMA Supreme

Removal

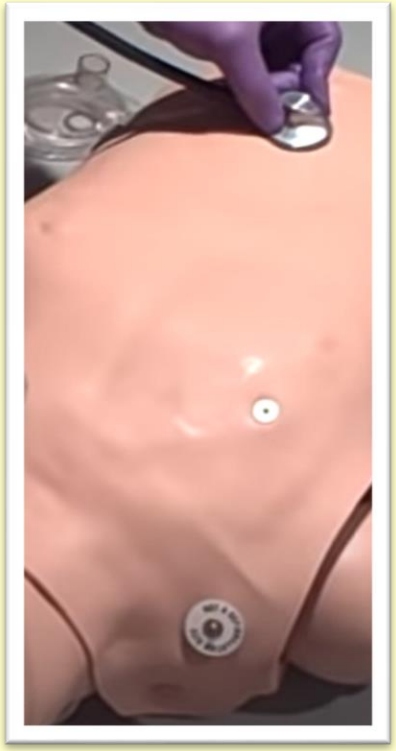
1. The LMA™ airway, together with the recommended bite-block, should be left in place until the return of consciousness. Oxygen should be administered using a “T” piece system and standard monitoring should be in place. Before attempting to remove or deflate the device, it is essential to leave the patient completely undisturbed until protective reflexes have fully returned. Do not remove the device until the patient can open the mouth on command.

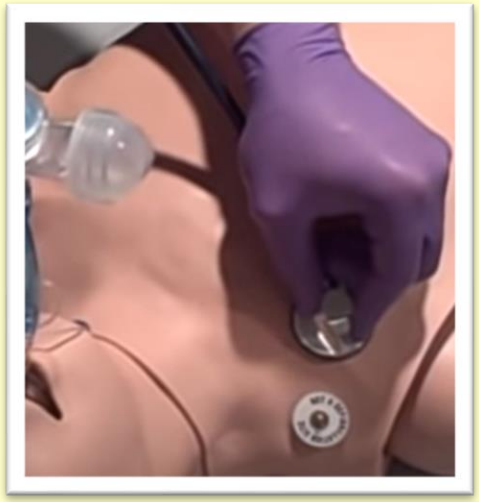
2. Look for the onset of swallowing which indicates reflexes are almost restored. It is usually unnecessary to perform suction because the correctly used LMA™ airway protects the larynx from oral secretions. Patients will swallow secretions on removal. Suction equipment should however be available at all times.

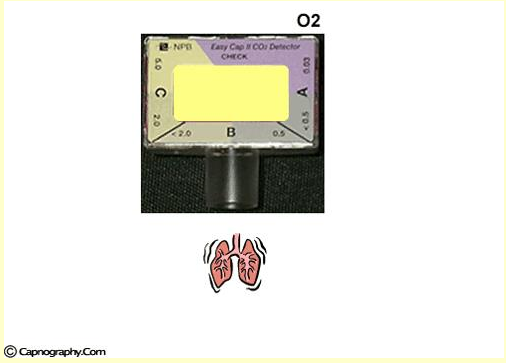
3. Deflate the cuff completely just prior to removal, although partial deflation can be recommended in order to assist in the removal of secretions. Fully deflate the cuff and simultaneously remove the device ONLY when the patient can open the mouth on command.

Confirm Placement

- Listen over the epigastrium for the absence of breath sounds
- Listen for presence of bilateral lung sounds
- Attach Easy Cap end-tidal CO_2 and assess color



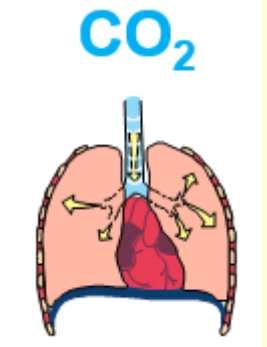




Confirm Placement and Evaluate

Evaluation & Ongoing Monitoring

- Reassessment is a continuous process
- Measurement
  - Oxygenation
    - Measured by Pulse Oximetry
  - Ventilation
    - Measured by Capnography

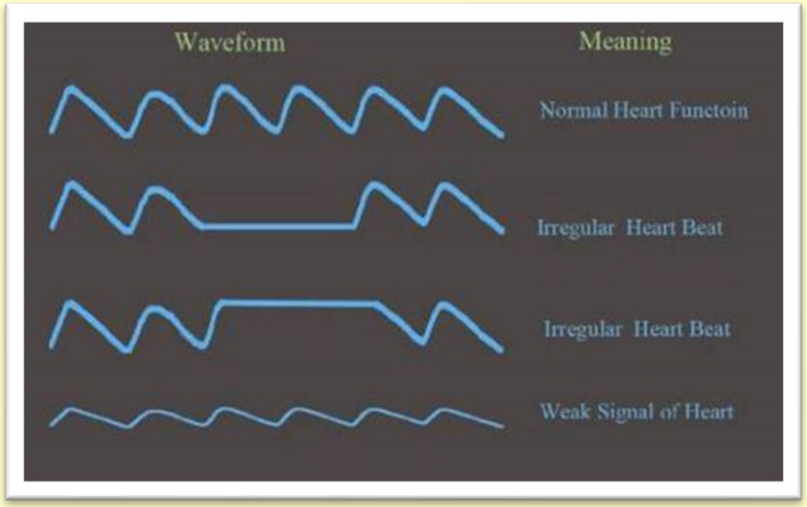


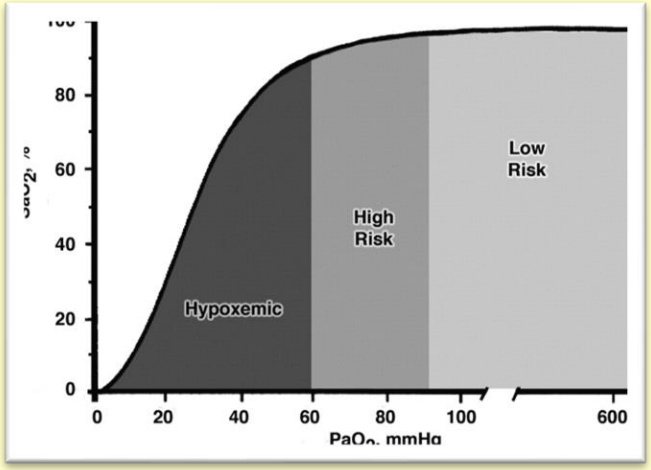
SpO_2 pleth

Waveform $ETCO_2$

Evaluation & Ongoing Monitoring

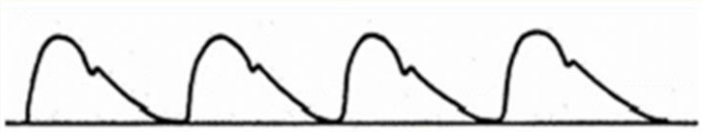
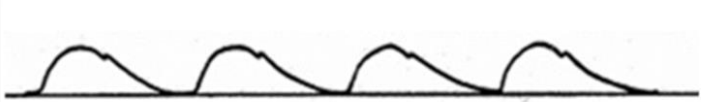
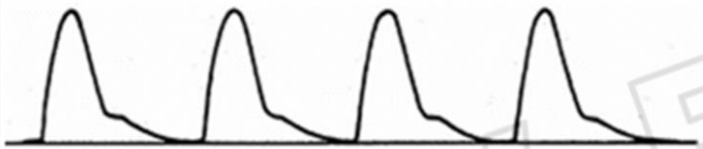
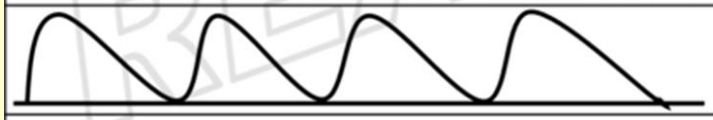
- Pulse Oximetry





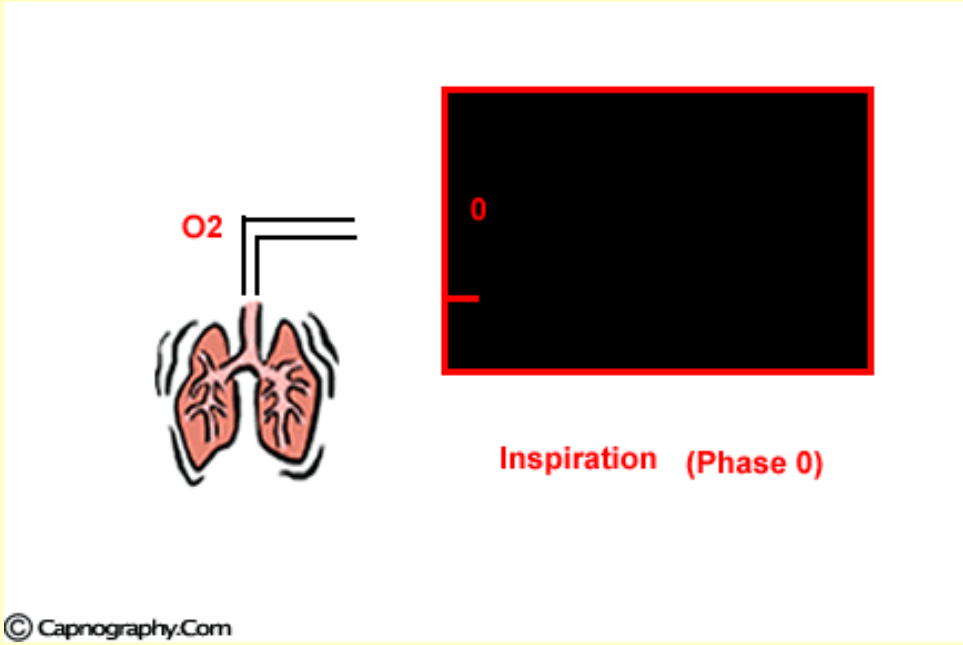
Evaluation & Ongoing Monitoring

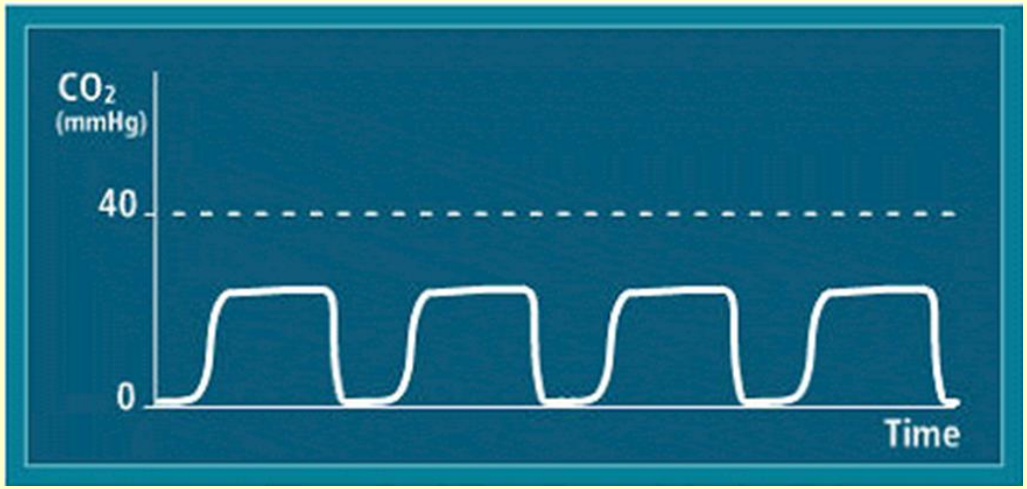
- Pulse Oximetry

Waveform	Pulse type	Physiological caus
	Normal	-
	Small and weak	Decreased stroke v Increased peripher resistance
	Large and bounding	Increased stroke v Decreased periphe resistance.
	*Pulsus alternanse*	Pulse amplitudes v
	No dicrotic notch	Increased arterial resistance
	Chaotic	Arrhythmia Motion artefact

Evaluation & Ongoing Monitoring

- End Tidal CO_2 capnography



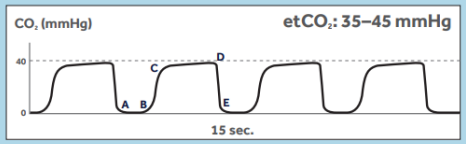


Evaluation & Ongoing Monitoring

- End Tidal CO_2 capnography

Normal capnogram

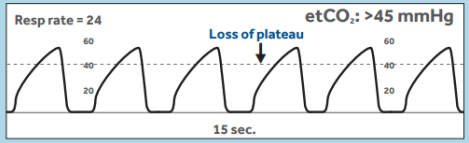
The normal capnogram is a waveform which represents the varying CO_2 level throughout the breath cycle.



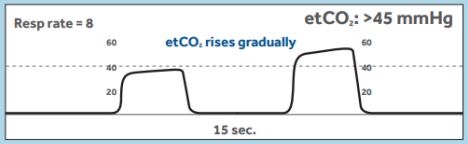
Waveform characteristics:

A-B: Baseline
B-C: Expiratory upstroke
C-D: Expiratory plateau
D: End-tidal concentration
D-E: Inspiration

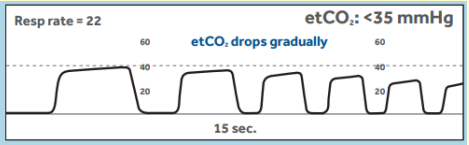
Bronchospasm/ asthma



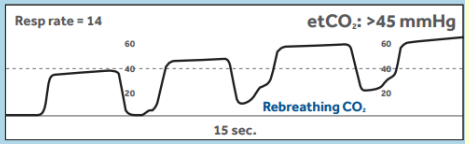
Increasing $etCO_2$ (hypoventilation)*



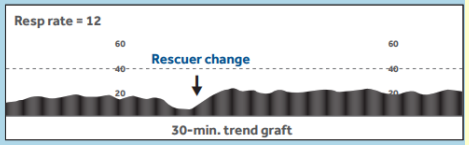
Decreasing $etCO_2$ (hyperventilation)*



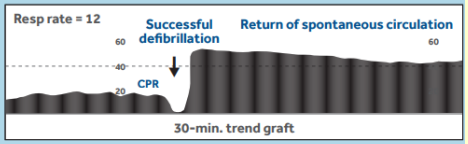
Rebreathing CO_2



Cardiac arrest



Return of spontaneous circulation



*Assumes adequate circulation and alveolar gas exchange

1. Krauss B, Hess DR. Capnography for procedural sedation and analgesia in the emergency department. Ann Emerg Med. 2007;50(2):172-181. Epub Jan. 12, 2007.

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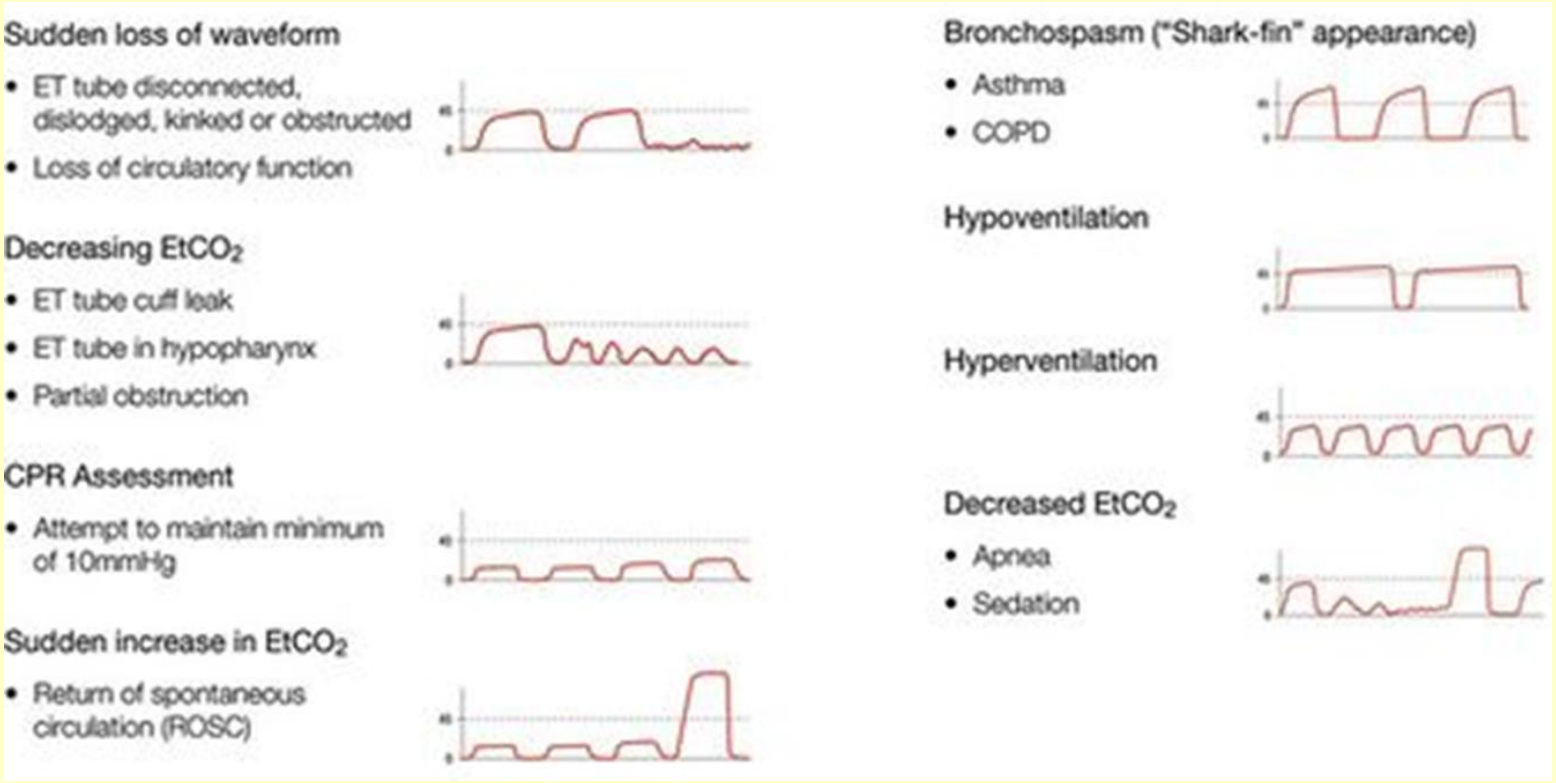
Medtronic

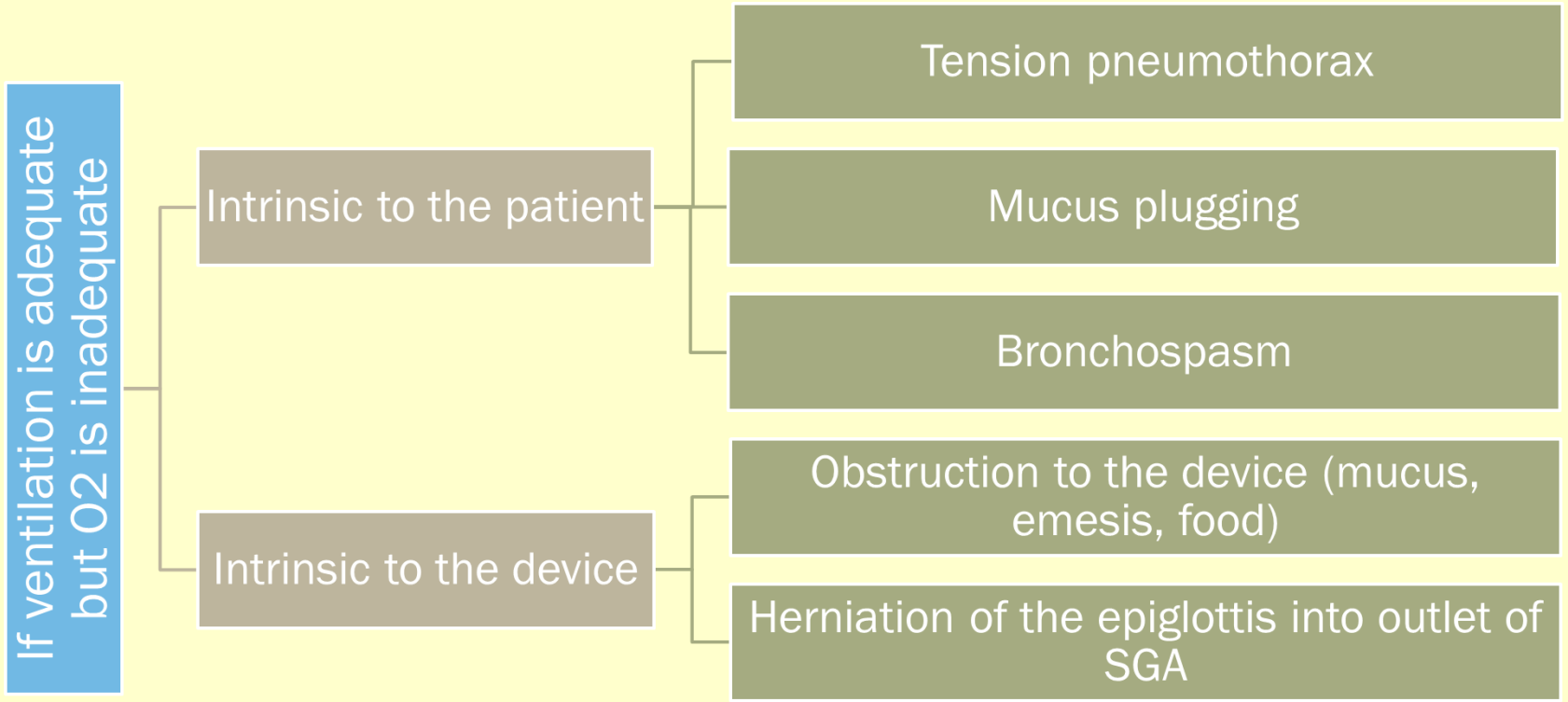
Evaluation & Ongoing Monitoring

- End Tidal CO_2 capnography



Evaluation & Ongoing Monitoring

- Troubleshooting the SGA



Evaluation & Ongoing Monitoring

- Case review

Automatic Transport Ventilators

- Have bag-mask device available in case ATV malfunctions
- Most models have adjustments for respiratory rate and tidal volume

Courtesy of Impact Instrumentation, Inc.

Questions

To request this document in another format, call 1-800-525-0127. Deaf or hard of hearing customers, please call 711 (Washington Relay) or email civil.rights@doh.wa.gov.

Acknowledgements/Credits/Resources

We want to acknowledge and give credit to the innumerable sources & resources used in the development of this not-for-profit WA DOH SGA training aid.