Tucson Medical Center

Base Hospital

# BASE HOSPITAL AIRWAY PROTOCOL INDEX

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Tucson Medical Center
Base Hospital

# AIRWAY MANAGEMENT
# STANDARD OPERATIONAL GUIDANCE

## Purpose

To define the indications and procedure for ventilation and oxygenation, for apnea, respiratory failure, inability to protect airway, or hypoxia

## Standard Operational Guidance (SOG)

1. These reference documents and Standard Operational Guidance protocols will be used:
   - SAEMS Airway Management Procedure Protocol
   - TMC Continuous Positive Airway Pressure (CPAP) SOG
   - TMC Policy 18.01.17 (ETDLAD)
   - TMC KING LTS-D SOG
   - TMC Combitube SOG
   - TMC ATV SOG

## Treatment Guidance

1. The ECMT should have situational awareness as there are many options for airway management. The prehospital provider should be ready to individualize treatment, as every case is different. Non-invasive management should be attempted using the SAEMS Airway Management Procedure prior to moving forward.
2. These guidelines assume the treating EMCT professional is skilled in the various procedures appropriate for their scope of practice. Advanced procedures should only be attempted if clinically indicated after less invasive measures fail or are futile to attempt. Individual cases may require modification of these protocols. Airway management decisions and actions should always be thoroughly documented in the patient care report.
3. Continuous Positive Airway Pressure has been shown to rapidly improve vital signs, gas exchange, reduce the work of breathing, decrease the sense of dyspnea, and decrease the need for endotracheal intubation in patients who suffer from shortness of breath from asthma, COPD, pulmonary edema, CHF, and pneumonia. Use TMC CPAP SOG for direction.
4. The following principles should be followed to allow optimum assessment and care of the airway without unnecessary intervention.
   - Use the least invasive method of airway management appropriate to the patient
   - Use a method of airway management with which you are procedurally comfortable
   - Use meticulous suctioning to keep the airway clear of debris
   - Monitor continuously to be sure that oxygenation/ventilation is as effective as intended and as needed
   - Understand the difference between these various aspects of airway management:
     - Patency: how open and clear is the airway, free of foreign substances, blood, vomitus, and tongue obstruction
     - Ventilation: the amount of air the patient is able to inhale and exhale in a given time, promoting exhalation of carbon dioxide. Use waveform capnography if equipped
     - Oxygenation: the amount of oxygen the patient is able to convey



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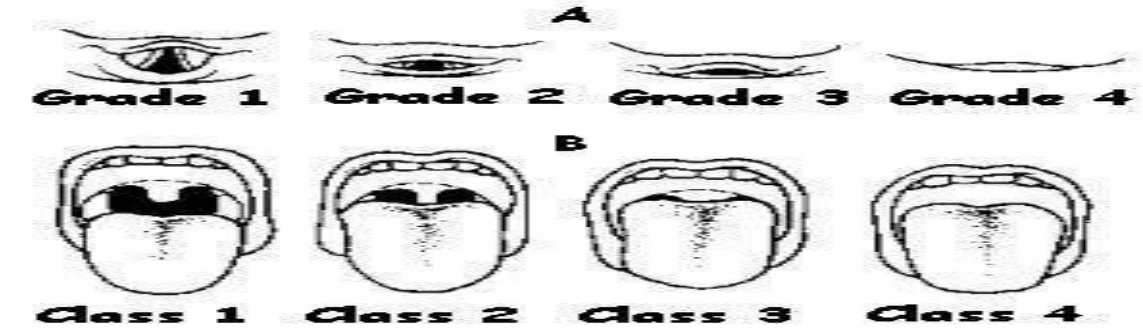
5. Assessment for difficult airway characteristics should precede intubation attempt(s). Several methods of evaluating airway are related to anatomy. One commonly used mnemonic in emergency airway care is “LEMON”,
   - **L**ook externally (heavy perioral facial hair, mis-shaped or missing dentition)
   - **E**valuate 3-3-2
     - Can at least three fingers be placed in the vertical axis of the mouth)
     - Can at least three fingers be placed in the space between the chin apex and the top of the neck
     - Can at least 2 fingers fit between the top of thyroid cartilage and the top of the neck
   - If yes to all three answers predicts lesser anatomical difficulty in establishing intubation
6. Mallampati scoring: View of posterior pharyngeal structures correlated to anticipated laryngeal view.




   - The LEMON criteria, including Mallampati scoring, are easiest to apply to compliant patients without acute respiratory distress and without need for emergent intubation.
   - By nature, these are NOT the patients that EMS professionals are tasked with managing. However, the concepts expressed in these criteria can help in predicting more difficult invasive airway management.
   - EMS professionals should always work in developing plan B approaches in airway management to anticipate and be capable of effective care when facing obstacles to usually successful airway management methods
7. Confirmation of ETDLAD placement, or Oral Endotracheal Placement: The following sequence is to be used (and its use documented) to verify and maintained.
   - Visualization of endotracheal tube passage between the vocal cords
     - Use of a Colorimetric, Capometer, or Waveform Capnography
     - End-tidal carbon dioxide (EtC02) detection shall be confirmed within 60 seconds of endotracheal tube placement.
     - Auscultating the epigastrium


**Colorimetric**

1. Colorimetric devices provide continuous, semiquantitative end-tidal CO2 monitoring. A typical device has 3 color ranges:
   - Purple
   - Tan
   - Yellow
2. Normal end-tidal CO2**,** the device should turn yellow when the endotracheal tube is inserted in patients with intact circulation.
3. Limitations of colorimetric devices include:
   - Confirmation of endotracheal tube placement in non-cardiac arrest patients is not always reliable
   - The membrane can turn 'yellow' when the device is contaminated with acidic substances such as gastric acid, lidocaine, or epinephrine
   - The device will not provide a reading if it is clogged with secretions or broken

**Waveform Capnography**

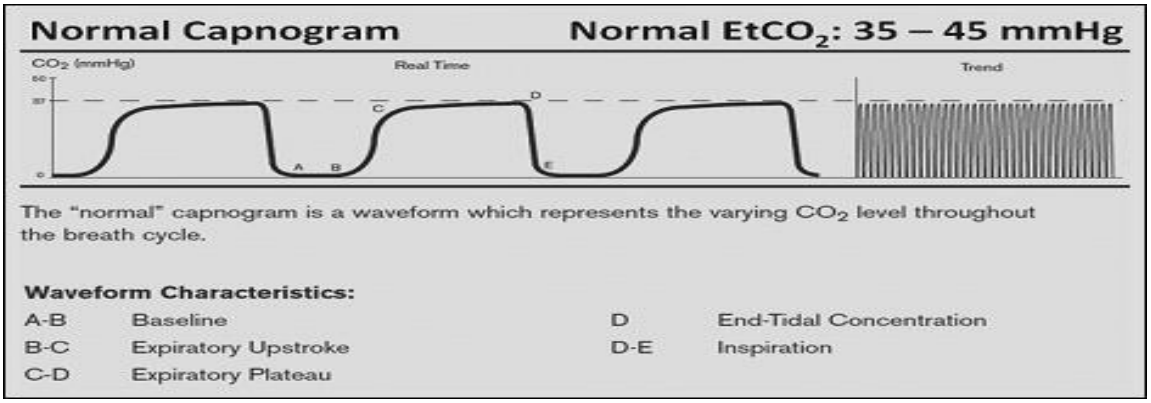
1. Normal waveform indicating correct endotracheal placement reflects a rapid upstroke with the beginning of exhalation, the exhalation plateau ending at the point of EtC02, measurement, and a rapid down stroke with the beginning of inhalation. Any waveform that does not show rhythmic rise and fall correlating with assisted ventilations indicates incorrect tube placement and the tube must be withdrawn.
2. **Critical Comment:** When CO2 is **NOT** detected, three factors must be quickly assessed:
   - Loss of airway - Apnea? Esophageal endotracheal tube placement/migration? Obstruction?
   - Circulatory collapse - Cardiac arrest? Massive pulmonary embolism? Exsanguination?
   - Equipment failure - Disconnected or malfunctioning bag-valve or ventilator?

**Interpreting Capnography**

1. The figure below shows a normal capnography waveform display. There are 4 phases of the waveform that require analysis:
   - The flat **A** – **B** baseline segment (Respiratory Baseline) represents the beginning of exhalation of CO2. Free gas that is contained in dead space from the conduction airways (trachea, bronchi). This value normally is zero.
   - The **B** – **C** segment (Expiratory Upstroke), a sharp rise, represents exhalation of a mixture of dead space gases and alveolar gases.
   - The **C** – **D** segment represents the alveolar plateau, characterized by exhalation of mostly alveolar gas.
   - Point **D** is the end-tidal (EtCO2) value that is recorded and displayed by the monitor, (peak concentration of CO2 occurring at the end of expiration).
   - The **D** – **E** segment (Inspiratory Downstroke), a sharp fall, reflects the inhalation of gases that are CO2. Free (room air or supplemental oxygen).

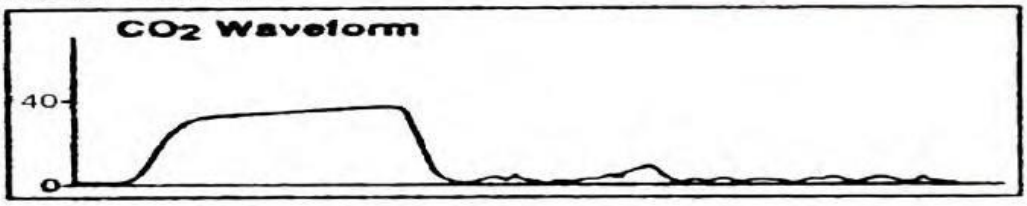
- Alterations of the normal capnograph or EtCO2 values are the result of changes in metabolism, circulation, ventilation, or equipment function.

**2.** A normal range for EtCO2 is **35 – 45 mmHg**, similar to the range of CO2 in arterial blood:



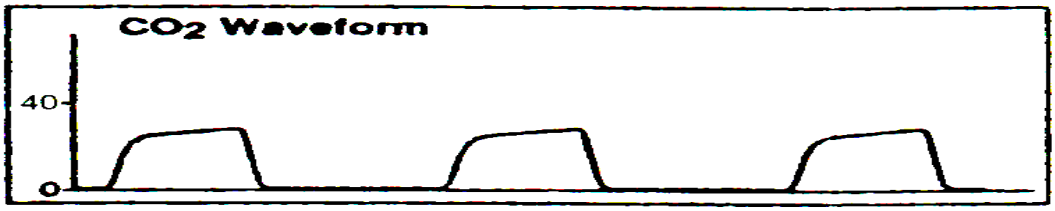

**3.** Possible causes of abnormal waveforms:

Sudden loss of ETCO2 to zero or near zero:



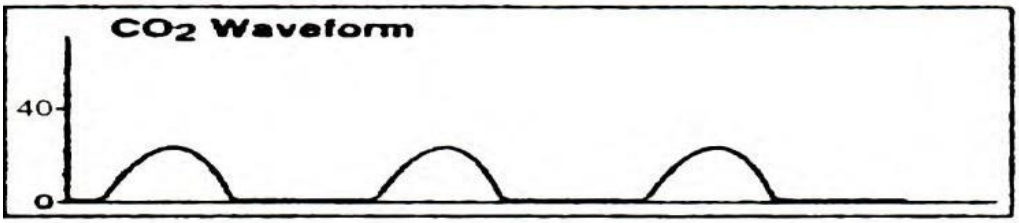

- Endotracheal tube in esophagus
- Incorrect supraglotic airway device being utilized for assisted ventilations
- Apnea
- Endotracheal tube or supraglotic airway device not connected to capnography detector.
- Total obstruction/mucus plugging
- Capnography malfunction

Sustained low ETCO2 with good alveolar plateau:



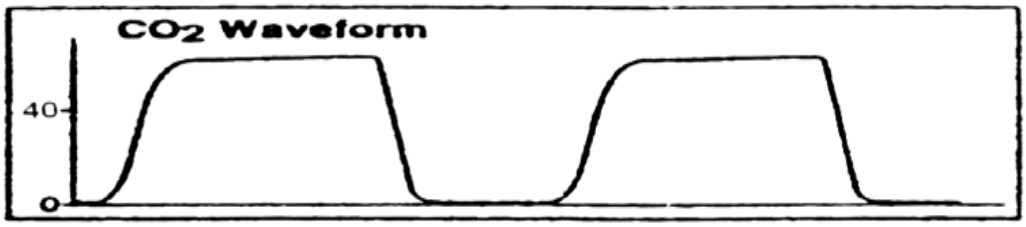

- Hyperventilation (due to underlying illness/injury or excessive assisted ventilations)
- Hypothermia (decrease in metabolism)

Sustained low $ETCO_2$ without alveolar plateau:



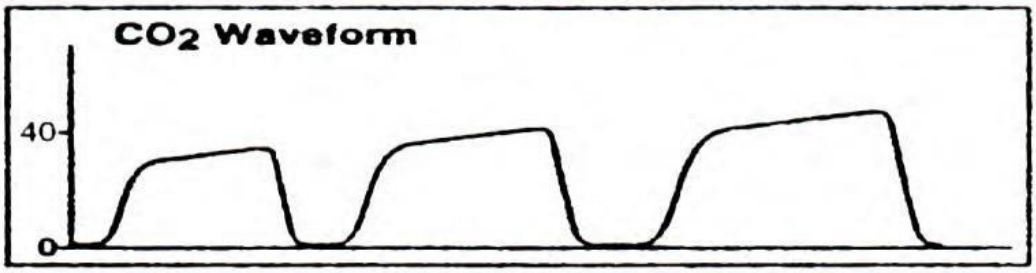

- Bronchospasm of asthma or COPD exacerbation
- Incomplete obstruction/mucus plugging

Elevated $ETCO_2$ with good alveolar plateau:



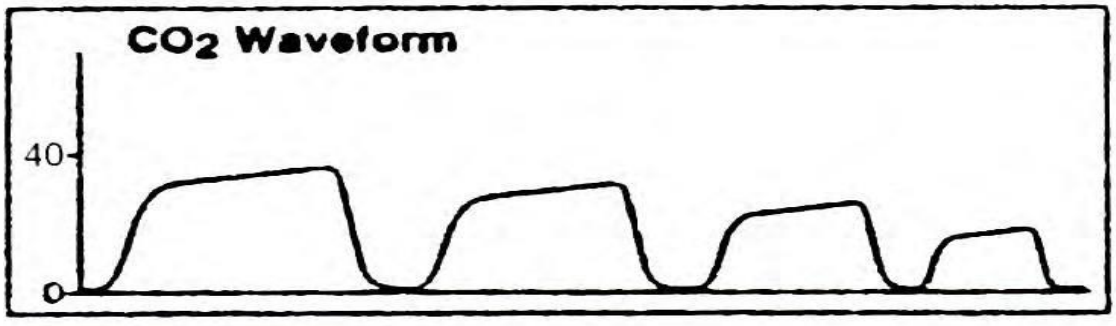

- Hypoventilation (due to underlying illness/injury or inadequate assisted ventilations)
- Hyperthermia, pain, shivering (increase in metabolism)

Gradually increasing $ETCO_2$:



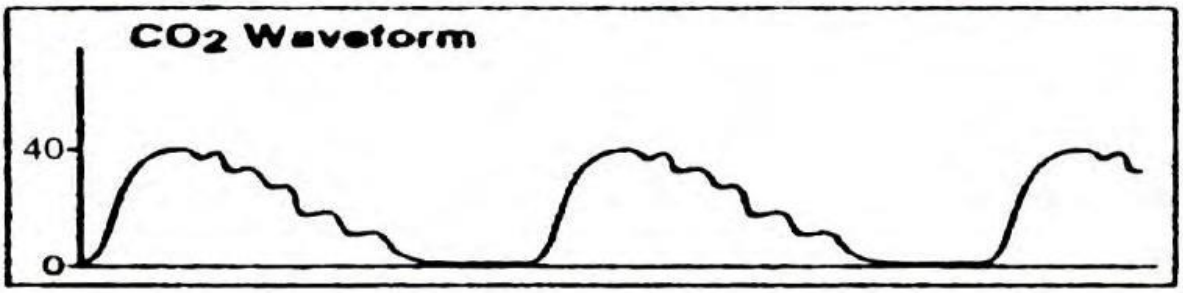

- Hypoventilation (due to underlying illness/injury or inadequate assisted ventilations)
- Rising body temperature, increasing pain (increasing metabolism)

Exponential decrease in $ETCO_2$:



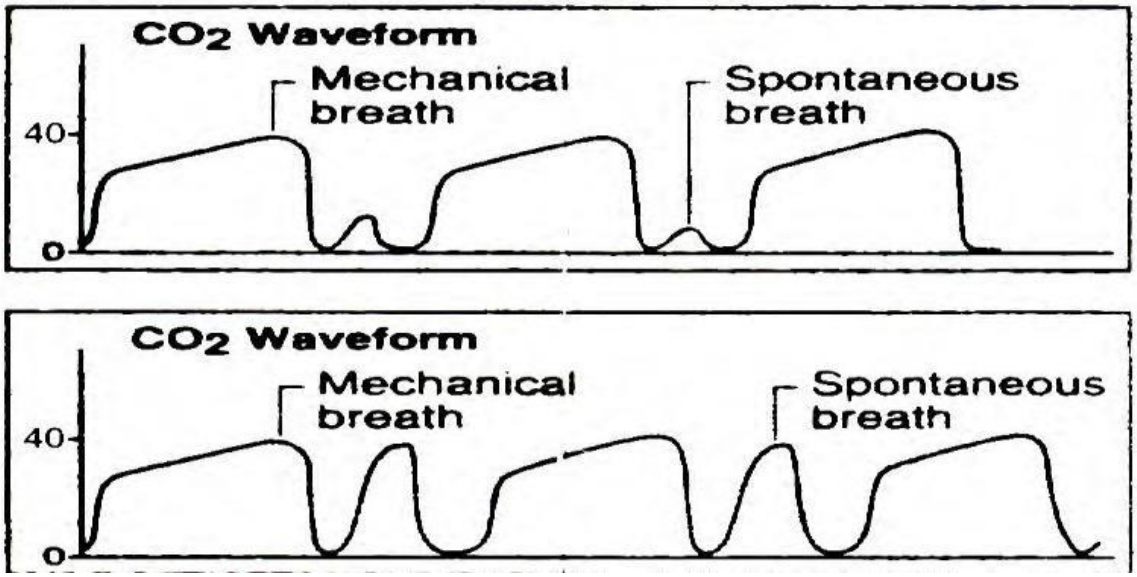
- Cardiopulmonary arrest
- Pulmonary embolism
- Sudden hypotension, massive blood loss, cardiopulmonary bypass

Cardiogenic oscillations:




- Cardiogenic oscillations are caused by changes in thoracic volume secondary to expansion and contraction of the myocardium with each heartbeat. They are usually seen in patients with small tidal volumes and slow respiratory rates, and are of little physiologic consequence

Spontaneous breathing during mechanical ventilation:




- Spontaneous breathing efforts may be evident on the CO2 waveform display. The patient on the top demonstrates poorer quality spontaneous breathing effort than the patient on the bottom

**Documentation**

1. Follow documentation instructions within the SAEMS Airway Management Protocol.
2. Airway management decisions and actions should always be thoroughly documented in the patient care report.

3. Follow documentation instructions within the CPAP SOG.
4. Follow documentation instructions within the TMC KING LTS-D SOG, TMC Combitube and TMC ATV SOG.

**Precautions and Comments**

1. Utilize BLS methods for maintaining airway patency, good ventilations and reassess.
2. Assess patient's oxygenation and ventilatory status BEFORE utilizing advanced airway methods.
3. The King LTS-D and Combitube are the Supraglottic Airways approved by the TMC Administrative Medical Director. The King LTS-D is the preferred advanced life support airway for use.
4. Cricothyrotomy is the airway of LAST RESORT when all other methods of establishing and maintaining the airway have been attempted and have failed.

# Automatic Transport Ventilator Use During Interfacility and Scene Transports

## Purpose

To define the indications and procedure for use of an automatic transport ventilator.

## Standard Operational Guidance

Paramedics shall use automatic transport ventilators (ATV) according to the following procedures and guidelines.

1. Approval of Tucson Medical Center Base Hospital Medical Director.
2. Personnel must be properly trained in the use of the ventilator as outlined in the AzDHS guidelines and according to the provider agency, manufacturer, and this and other appropriate policies.
3. The ATV will be familiar to the paramedic and must be thoroughly trained and regularly retrained in the device's use. Such training shall occur annually and shall be documented.
4. Treatment provided and transferring physicians orders are within the paramedic's scope of practice.
5. The ATV is approved for use on patients weighing more than 16 Kg. (35 lbs.)
6. The Paramedic is responsible for all airway management and must frequently reassess endotracheal tube placement. Bilateral breath sounds are to be checked after each patient movement.
7. If the ATV failure occurs and cannot be corrected, or patient's condition deteriorates due to respiratory compromise, the paramedic is to discontinue use of the ATV and initiate ventilation by bag valve mask or bag valve mask ETT and notify the Medical Direction Authority Hospital or Administrative Base Hospital of situation.
8. A non-invasive BP monitor device shall be utilized. Vital signs will be monitored and documented every 15 minutes and immediately if there is any change in patient status or adjustment of the ATV setting. Vital signs shall also include pulse oximetry, $EtCO_2$ (capnography or waveform capnography are preferred) and cardiac monitoring which shall be maintained throughout transport.

## Indications

1. Any patient requiring ventilatory assistance in conjunction with advanced airway adjuncts.
2. Any patient requiring ventilatory assistance in conjunction with basic airway adjuncts.
3. Any patient requiring ventilatory assistance in conjunction with manual airway maintenance.



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# Automatic Transport Ventilator Use During Interfacility and Scene Transports

## Contraindication

1. Blunt or penetrating chest trauma that have had a needle thoracotomy, unless the patient has a chest tube in place on the affected side.
2. Patients weighing less than 16 Kg. (35 lbs.)
3. Pneumothorax - tension pneumothorax
4. Pulmonary over pressurization syndrome (blast injury, water ascent injury, etc.)

## Procedure

Secure patient's airway using appropriate airway management techniques and according to the Airway Management Protocol.

1. Ensure the patient's airway is clear of obstructions and suction as needed.
2. Ensure that the ventilator is connected to an oxygen source, such as a portable oxygen cylinder or main ambulance oxygen source. FIO2 should be set at 100%.
3. Set appropriate ventilator setting which may include:
   I. Mode
   II. FIO2
   III. Tidal volume (TV)
   IV. Respiratory rate (RR)
   V. Positive end-expiratory pressure (PEEP)
4. Determine the proper ideal volume setting. This is done by determining the patient's ideal body weight and multiplying it by 6-8 ml/kg. Begin with the lowest tidal volume limit.
5. Set respiratory rate to achieve ventilation goals to avoid hyperventilation.
   - Age ≥ 14 yrs=10
   - Age 2-14 yrs=20
   - Age≤ 2 years= 25
6. Set initial PEEP at 5 cm H2O (if available)
7. Assess ventilations. Listen for bilateral lung sounds and observe for proper chest rise and fall which should appear normal and symmetrical.
8. Assess and manage the airway as you normally would for any patient with controlled ventilation.
9. May be used with King Airway or endotracheal tube.
10. If applicable, **consider sedation** with Midazolam for the patient following the Medicated Facilitate Intubation Protocol dosing.
11. **For Interfacility Transport Use:** Follow Sedation Interfacility Protocol.
12. If spontaneous breathing occurs, it may be desirable to reduce the respiratory rate (RR) as long as the patient's spontaneous rate is sufficient for their age and condition and they are maintain adequate tidal volume.
13. Check oxygen cylinder pressure level frequently. This device will quickly deplete a "D" cylinder.



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## Special Considerations

1. Chest rise may not appear full in patients with COPD. Do not increase TV past the upper TV limit.
2. If lung sounds ae absent or on one side only, remove the patient from the ATV and manually assist ventilations which ruling out airway obstructions, improper tube placement, or pneumothorax. Check all ATV settings and verify the device is operating properly.
3. If chest expansion is not adequate, the rescuer should slowly increase tidal volume until chest expansion is adequate or the uppermost limit (for the patient's ideal body weight) is reached.
4. If chest appears to over-expand, decrease tidal volume.
5. Frequent evaluation of the patient's mental status and/or degree of agitation should be performed throughout the transport and adequate sedation should be administered per medical direction authority.

## Medical Provider Maintenance Requirements

Agencies using this equipment must be certain to follow the manufacturer's instructions regarding use, maintenance, cleaning and regular testing of this device.

1. The unit must be inspected and tested after every patient use.
2. The unit must be disinfected after use unless a disposable unit is used.
3. The unit shall undergo preventative testing and maintenance by qualified personnel annually.
4. Agencies shall arrange for (at least) annual inspection and testing of the equipment by a manufactures representative (or designee). Documentation of this service shall be maintained in a service log. This record shall be kept by each agency using ATV's.

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# COMBITUBE
# STANDARD OPERATIONAL GUDIANCE

## SCOPE OF PRACTICE

Use of the Combitube is restricted to personnel as EMT or Paramedic, and who have completed training. Each agency shall be responsible for meeting and documenting the combitube continuing education of their personnel. It is the responsibility of each agency to ensure the competency of their personnel in the use of the combitube. This is to include annual assessment of cognitive and psychomotor skills. Agencies that elect to participate in the Combitube program shall assure that Combitubes are available on responding vehicles.

## INDICATIONS FOR USE

Patient is unconscious and unable to protect own airway; no apparent gag reflex.

## CONTRAINDICATIONS

1. Patients under 70 pounds and under 5 feet tall.
2. Responsive patients with an intact gag reflex.
3. Patients with known esophageal disease.
4. Patients who have ingested caustic substances.
5. Known or suspected foreign body obstruction of the larynx or trachea.
6. Presence of tracheotomy.
7. Combitube will not advance due to resistance.

## PROCEDURE

1. Maintain C-spine precautions if indicated.
2. Pre-oxygenate with 100% oxygen, BVM hyperventilation for minimum of one minute prior to Combitube placement.
3. Have suction equipment available and ready.
4. Choose appropriate sized tube based on height (small for 5.0-5.5 feet, regular for over 5 feet).
5. Check integrity of balloons/cuffs.

## Tube placement

1. Lubricate tube with KY jelly or water.
2. Remove dentures and broken teeth *__Caution: When facial trauma has resulted in sharp, broken teeth or dentures, remove denture and exercise extreme caution when passing the Combitube into the mouth to prevent the cuff from tearing.*__
3. Lift patient's tongue and lower jaw with non-dominant hand.
4. Hold tube in dominant hand so it curves up.

5. Gently insert and advance tube until patient's teeth or gums are between the two black lines on the tube.
6. If you meet resistance, try rocking the tube from side to side while advancing *__Caution: DO NOT FORCE THE COMBITUBE. If the tube does not advance easily, redirect it or withdraw and reinsert. Have suction available and ready whenever withdrawing tube.*__
7. If you have trouble advancing past the back of the tongue, change the tube angle. Bend the tube sharply just below the large balloon cuff and hold for 15 seconds. Unbend the tube and quickly advance before tube straightens.
8. Tube should be placed in 30 seconds. If unable to intubate after 30 seconds, stop, hyperventilate for one minute and reattempt tube placement.
9. Inflate balloons/cuffs in the following order:
    - Pharyngeal port (port 1, blue port) with 100cc of air with large (140cc) syringe.
    - Distal port (port 2, white port) with 15cc of air with 20cc syringe
    - Ventilate through port 1 (blue) and check for proper tube placement If not adequate, ventilate through port 2 (white) and check for proper tube placement
    - If you have an air leak through the mouth, add another 20cc of air to port 1 (blue) and recheck, may repeat twice to a total of 60cc of air. If air leak persists, reposition tube and repeat above. Also, consider balloon/cuff leak and try a different Combitube.
    - Check tube placement:
        - Look for chest rise.
        - Listen with stethoscope for absence of epigastric air entry with bagging.
        - Listen with stethoscope for breath sounds in both axillae with bagging.
10. If unable to obtain ventilation with Combitube, remove tube, insert oropharyngeal airway and ventilate with BVM.
11. Secure Combitube as soon as possible.
12. Ventilate at eight (8) times a minute with bag-valve and 15L/min oxygen.
13. **Reassess adequate tube placement every time patient is moved.**

## SPECIAL NOTES

1. The Combitube is designed with the idea that it will be inserted into the esophagus.
2. The small, distal balloon blocks air entry into the stomach.
3. The large proximal balloon blocks air escape through the mouth
4. Ventilating through port 1 (blue) pushes air through the side holes between balloons and into the lungs.
5. **THE AIRWAY IS CONSIDERED .UNSECURE**
    - If you do not hear lung sounds and hear stomach sounds with bagging through port 1, change to port 2 (white).

6. **THE AIRWAY IS CONSIDERED SECURE**
    - If you hear breath sounds, you likely blindly intubated the trachea and the tube functions like a standard endotracheal tube.

## DOCUMENTATIONS OF ADHERENCE TO PROTOCOL

1. Evidence of respiratory distress without gag reflex
2. Successful insertion of Combitube
3. Size used
4. Note patient respiratory status post- insertion

## REMOVAL OF COMBITUBE

May remove with medical direction or when attempting reinsertion, or if the patient awakens. Remove combitube as follows:

1. Have suction ready
2. Deflate blue tube
3. Deflate white tube
4. Remove combitube
5. Be prepared for vomiting

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# CONTINUOUS POSITIVE AIRWAY PRESSURE
# STANDARD OPERATIONAL GUIDELINE

## PURPOSE

To improve ventilation and oxygenation, and avoid intubation, in patients with congestive heart failure (CHF) with acute pulmonary edema, or near drowning

## INFORMATION

Continuous Positive Airway Pressure (CPAP) is an optional skill and can only be performed by EMS personnel who have received training and Medical Director Approval.

Continuous Positive Airway Pressure has been shown to rapidly improve vital signs, gas exchange, reduce the work of breathing, decrease the sense of dyspnea, and decrease the need for endotracheal intubation in patients who suffer from shortness of breath from asthma, COPD, pulmonary edema, CHF, and pneumonia. In patients with CHF, CPAP improves hemodynamics by reducing left ventricular preload and afterload.

## INDICATIONS

1. Patients age 18 or older in *severe respiratory distress* and:
   - CHF with pulmonary edema
   - Near-drowning
   - Other causes of severe respiratory distress

## CONTRAINDICATIONS

Bag-valve-mask ventilation or endotracheal intubation should be considered for any patient who exhibits one or more of the following contraindications.

1. Age < 8.
2. Respiratory or cardiac arrest.
3. Agonal respirations.
4. Severely depressed level of consciousness.
5. Signs and symptoms of pneumothorax.
6. Inability to maintain airway patency.
7. Major trauma, especially head injury with increased ICP or significant chest trauma.
8. Facial anomalies or trauma (e.g., burns, fractures)
9. Vomiting.

## Relative Contraindications (USE CAUTIOUSLY)

1. History of COPD
2. History of Pulmonary Fibrosis
3. Decreased LOC
4. History of CHF and systolic blood pressure <90 mmHg
5. Claustrophobia or unable to tolerate mask (after first 1-2 minutes trial)



*Created 1-15;01-16, 01/1; Revised 02/21*

## COMPLICATIONS

1. Hypotension
2. Pneumothorax
3. Corneal Drying

## GOALS OF CPAP

1. Elimination of dyspnea
2. Decreased respiratory rate
3. Decreased heart rate
4. Increased Sp02
5. Stabilized blood pressure

Bag-valve-mask ventilation or endotracheal intubation should be considered if the patient fails to show improvement based on the above goals.

## PROCEDURE

Personnel are encouraged, but not required, to make Medical Direction contact.

## Patient preparation

1. Place patient in a seated position with legs dependant
2. Monitor ECG, Vital signs, (BP, HR, RR, Sp02, RDS)
3. While one member of the team is setting up the CPAP equipment, the second team member should treat the patient according to treatment protocols.
4. The patient must be reassessed frequently (every 5 minutes) for;
   a. Blood Pressure
   b. Heart Rate
   c. Respiratory Rate
   d. Pulse Oximetry
   e. Respiratory Difficulty Scale (RDS)

## Explain what you will be doing to the patient:

1. “You are having trouble breathing because your heart is not pumping well enough right now and fluid is backing up into your lungs."
2. "I am going to put this mask on your face to help push air into your lung and push the fluid out.
3. "It will feel a little strange at first, but you will notice right away that your breathing will be a lot easier”.
4. "Just relax breath normally, and you will see this will really help."

Patients have a natural tendency to hyperventilate - increase rate and depth of ventilation - any time a mask/mouthpiece is applied. Asking them to breath “normally” will help avoid this.

**Apply the mask**

1. When you are ready to apply the mask to the patient, turn the ON/OFF valve fully on (counter--clockwise 1/2 turn), be sure the gas is flowing, and then hold the mask on the patient's face. It will help to put one hand on the back of the patient's head and one on the mask to be sure you are applying just enough pressure to keep a good air seal.
2. Within a few minutes, when the patient is comfortable, use the head strap to hold the mask in place. Ensure that it is not too tight. Some air leakage is acceptable unless it is in the eye area.
3. Make sure you are providing flow in excess of the patient's inspiratory flow rate in order to maintain continuous pressure throughout the breathing cycle. This should be checked frequently during transport as the patient's needs may change.
4. There are 3 ways to determine whether your flow is set high enough:
    - The CPAP valve should remain slightly open during the entire respiratory cycle.
    - The anti-asphyxia valve on the mask should not open during normal operation.
    - You should be able to feel some gas escaping from the exhalation port of the CPAP valve even during inspiration.
5. For patient comfort, and to preserve oxygen, turn the flow adjustment knob down to maintain the flow just above patient's flow rate.
6. Normally, the patient should improve in the first 5 minutes with CPAP, as evidenced by:
    - Decreased heart rate
    - Decreased respiratory rate
    - Decreased blood pressure
    - increased 02 sat

**Failure to Improve**

1. Should the patient fail to show improvement with CPAP (as evidenced by the following) *remove the CPAP device* and assist ventilations with BVM, as needed.
    - Sustained or increased heart rate
    - Sustained or increased respiratory rate
    - Sustained or increased blood pressure
    - Sustained or decreasing pulse oximetry readings, and/or
    - Decrease in level of consciousness

## REMOVAL PROCEDURE

CPAP therapy needs to be continuous and should not be removed unless the patient cannot tolerate the mask or experiences respiratory arrest or begins to vomit.

1. Intermittent positive pressure ventilation with a Bag-Valve-Mask, placement of a non-visualized airway and/or endotracheal intubation should be considered if the patient is removed from CPAP therapy.

## DOCUMENTATION

1. Documented the use of the CPAP on the PCR.
2. Due to changes in preload and afterload of the heart during CPAP therapy, a complete set of vital signs (BP, HR, RR, Sp02) must be obtained and documented every 5 minutes.
3. Narrative documentation should include a description of the patient's response to CPAP. Refer to "Goals of CPAP" for descriptive terms that may be useful.
4. Additional narrative documentation should include if the patient does not respond to CPAP and endotracheal intubation is required.

## SPECIAL INFORMATION

1. If you are using a portable tank, it is important to conserve your oxygen. For example:
   - *At 100% FI02 and at full flow, a full tank will last approximately:*
     → "D" cylinder = 3.5 - 4 minutes
     → "E" cylinder = 5.5 - 6 minutes
     →"M" cylinder = 28 minutes
   - *At 28% FI02 a full tank will last approximately:*
     → "D" cylinder = 30 minutes
     → "E" cylinder = 45-50 minutes
     →"M" cylinder = 236 minutes

2. Pulse oximetry must be used to continuously monitor patient's oxygen saturation.
3. Correct CPAP pressure must be delivered at all times. The flow from the generator should always be in excess of the patients demand. Check to make sure that you feel excess flow coming out from the exhaust port of the CPAP valve at all times.
4. Do not remove CPAP until hospital therapy is ready to be placed on patient. Watch patient for gastric distention, which can result in vomiting.

Tucson Medical Center
Base Hospital

# i-gel
# STANDARD OPERATIONAL GUIDANCE

## SCOPE OF PRACTICE

Use of the i-gel is restricted to personnel as EMT or Paramedic, and who have completed training. Each agency shall be responsible for meeting and documenting the i-gel continuing education of their personnel every two years. It is the responsibility of each agency to ensure the competency of their personnel in the use of the i-gel. This is to include assessment of cognitive and psychomotor skills. Agencies that elect to participate in the i-gel program shall assure that i-gel are available on responding vehicles.

## INDICATIONS FOR USE

The i-gel is intended for airway management in patients who have controlled or spontaneous ventilation and weigh between **5** kg to **90**+ kg. The i-gel is also indicated for difficult and emergent airways.

## CONTRAINDICATIONS

The following contraindications are applicable for routine use of the i-gel:

1. Responsive patients with an intact gag reflex.
2. Patients with known esophageal disease.
3. Patients who have ingested caustic substances.

## SIZE

The i-gel is 100% latex-free and should be considered safe to use on patients who are latex sensitive.

| i-gel size | Patient Size | Patient weight guidance (kg) |
|---|---|---|
| 1 | Neonate | 2-5kg |
| 1.5 | Infant | 5-12kg |
| 2 | Small paediatric | 10-25kg |
| 2.5 | Large paediatric | 25-35kg |
| 3 | Small adult | 30-60kg |
| 4 | Medium adult | 50-90kg |
| 5 | Large adult | 90+kg |

Tucson Medical Center
Base Hospital

# i-gel
# STANDARD OPERATIONAL GUIDANCE

## PROCEDURE

1. Using the information provided, choose the correct i-gel size, based on patient weight.
2. Open the i-gel package, and on a flat surface take out the cage pack containing the device.
3. In the final minute of pre-oxygenation, 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 cradle in preparation for lubrication. Do not use silicone based lubricants.
4. 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. This process may be repeated if lubrication is not adequate, but after lubrication has been completed, check that no BOLUS of lubricant
   remains in the bowl of the cuff or elsewhere on the device. Avoid touching the cuff of the device with your hands.
5. Place the i-gel back into the cradle in preparation for insertion. NB. The i-gel must always be separated from the cradle prior to insertion. The cradle is not an introducer and must never be inserted into the patient's mouth.
6. Ensure gag reflex is not intact.
7. 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.
8. 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 to insert the i-gel.
9. Introduce the leading soft tip into the mouth of the patient in a direction towards the hard palate.
10. Glide the device downwards and backwards along the hard palate with a continuous but gentle push until a definitive resistance is felt.

**11.** At this point the tip of the airway should be located into the upper esophageal opening and the cuff should be located against the laryngeal framework. The incisors should be resting on the integral bite-block.

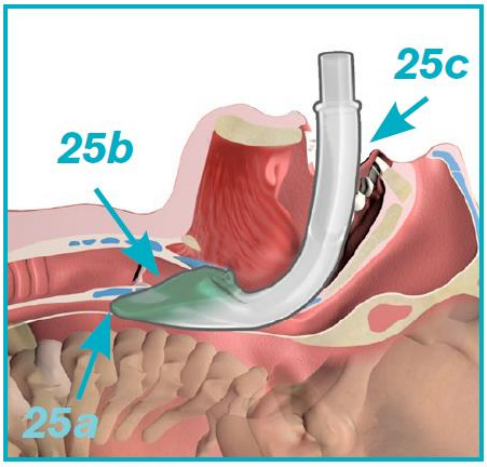
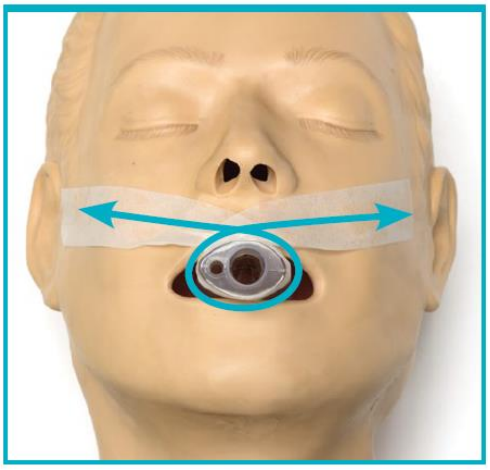



***Figure 25:*** *Correct placement of the* ***i-gel***

**12.** i-gel should be taped down from 'maxilla to maxilla' (upper jaw to upper jaw) or secured with approved securing device.



**13.** If required, an appropriate size nasogastric tube may be passed down the gastric channel.

| i-gel size | Maximum size of Nasogastric Tube (FG) |
|---|---|
| 1 | N/A |
| 1.5 | 10 |
| 2 | 12 |
| 2.5 | 12 |
| 3 | 12 |
| 4 | 12 |
| 5 | 14 |

**Do not use Gastric Channel if:**

1. There is an excessive air leak through the gastric channel.
2. There are esophageal varices or evidence of upper gastro-intestinal bleed.
3. In cases of esophageal trauma.
4. There is a history of upper gastro-intestinal surgery.
5. The patient has bleeding/clotting abnormalities.

**WARNINGS/PRECAUTIONS**

1. **THE AIRWAY IS CONSIDERED UNSECURE**
    - Intubation of the trachea cannot be ruled out as a potential The i-gel does not protect the airway from the effects of regurgitation and aspiration. High airway pressures may divert gas either to the stomach or to the atmosphere.
    - Intubation of the trachea cannot be ruled out as a potential complication of the insertion of the i-gel.
2. After placement, perform standard checks for breath sounds and utilize an appropriate carbon dioxide monitor as required by protocol.
3. i-gel must be lubricated according to the instructions for use. Avoid blockage of the ventilation apertures with lubricant or aspiration of the lubricant.
4. The i-gel is not intended for reuse.
5. Excessive air leak during manual ventilation is primarily due to sub-optimal depth of i-gel insertion.
6. As with all supraglottic airways, it is important to ensure the correct size of device is used, lubrication is optimal, the device is inserted and positioned correctly and regularly checked intraoperatively in order to reduce the potential for nerve damage, tongue numbness, cyanosis and other potential complications.

**USER TIPS**

1. Sometimes a feel of ‘give-way’ is felt before the end point resistance is met. This is due to the passage of the bowl of the i-gel through the faucial pillars (pharyngo-epiglottic folds).
2. Once resistance is met and the teeth are located on the integral bite block, do not repeatedly push i-gel down or apply excessive force during insertion.
3. No more than three attempts in one patient should be attempted.
4. A horizontal line (Adult sizes 3,4 and 5 only) at the middle of the integral bite-block represents the correct position of the teeth. If the teeth are located lower than the distal tip of the bite block, then it is likely the device has been incompletely inserted. In this instance, remove the i-gel and reinsert with a gentle jaw thrust applied by an assistant. If that does not resolve the problem, use one size smaller i-gel.

## DOCUMENTATIONS OF ADHERENCE TO PROTOCOL

1. Evidence of respiratory distress without gag reflex.
2. Successful insertion of i-gel.
3. Size used.
4. Note patient respiratory status post- insertion.

## REMOVAL OF THE i-gel

1. The removal with medical direction authority or when attempting reinsertion, or if the patient awakens.
2. Remove i-gel as follows:
   - i-gel removal should always be carried out in an area where suction equipment and the ability for rapid intubations are present.

Tucson Medical Center
Base Hospital

# KING LTS-D
# STANDARD OPERATIONAL GUIDANCE

## SCOPE OF PRACTICE

Use of the King LTS-D is restricted to personnel as EMT or Paramedic, and who have completed training. Each agency shall be responsible for meeting and documenting the King LTS-D continuing education of their personnel every two years. It is the responsibility of each agency to ensure the competency of their personnel in the use of the King LTS-D. This is to include assessment of cognitive and psychomotor skills. Agencies that elect to participate in the King LTS-D program shall assure that King LTS-D are available on responding vehicles.

## INDICATIONS

The KING LTS-D is intended for airway management in patients over 4 ft in height (122 cm) for controlled or spontaneous ventilation. It is also indicated for difficult and emergent airways.

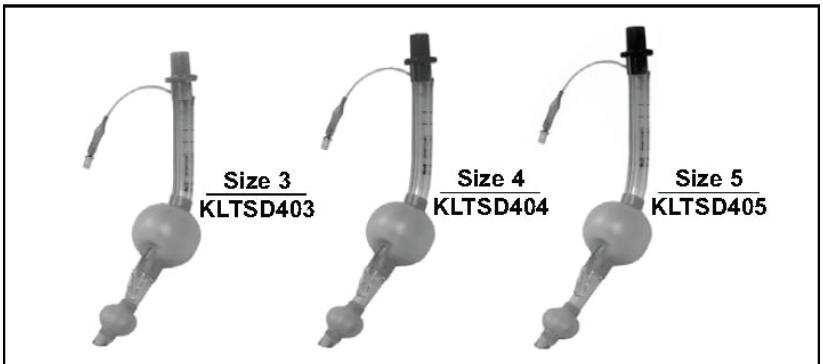
## CONTRAINDICATIONS

The following contraindications are applicable for routine use of the KING LTS-D:

1. Responsive patients with an intact gag reflex.
2. Patients with known esophageal disease.
3. Patients who have ingested caustic substances.

## SIZE

The KING LTS-D is 100% latex-free and should be considered safe to use on patients who are latex sensitive.



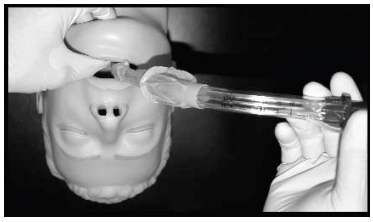

| Size | Description | Connector Color | OD | ID* | Gastric Tube Size | Inflation Volume |
|---|---|---|---|---|---|---|
| 3 | 4-5 feet (122-155 cm) in height | Yellow | 18 mm | 10 mm | ≤18 Fr | 45-60 ml |
| 4 | 5-6 feet (155-180 cm) in height | Red | 18 mm | 10 mm | ≤18 Fr | 60-80 ml |
| 5 | greater than 6 feet (180 cm) in height | Purple | 18 mm | 10 mm | ≤18 Fr | 70-90 ml |

*Equivalent ID of Ventilation Lumen

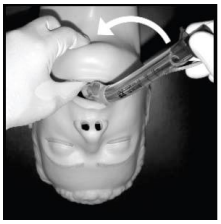
# KING LTS-D
# STANDARD OPERATIONAL GUIDANCE

**PROCEDURE**

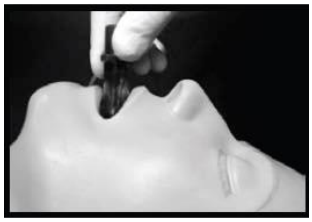
1. Using the information provided, choose the correct KING LTS-D size, based on patient height.
2. Test cuff inflation system by injecting the maximum recommended volume of air into the cuffs (size 3 – 60 ml; size 4 – 80 ml; size 5 – 90 ml). Remove all air from both cuffs prior to insertion.
3. Apply a water-based lubricant to the beveled distal tip and posterior aspect of the tube, taking care to avoid introduction of lubricant in or near the ventilatory openings.
4. Have a spare KING LTS-D ready and prepared for immediate use.
5. Pre-oxygenate.
6. Ensure gag reflex is not intact.
7. Position the head. The ideal head position for insertion of the KING LTS-D is the "sniffing position". However, the angle and shortness of the tube also allows it to insert with the head in a neutral position.
8. Hold the KING LTS-D at the connector with dominant hand. With non-dominant hand, hold mouth open and apply chin lift.
9. With the KING LTS-D rotated laterally 90º such that the blue orientation line is touching the corner of the mouth, introduce tip into mouth and advance behind base of tongue. Never force the tube into position.



10. As tube tip passes under tongue, rotate tube back to midline (blue orientation line faces chin).



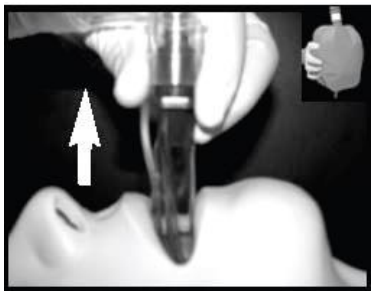

11. Without exerting excessive force, advance KING LTS-D until proximal opening of gastric access lumen is aligned with teeth or gums.



**12.** Inflate cuffs with the minimum volume necessary to seal the airway at the peak ventilatory pressure employed (just seal volume). Typical inflation volumes are as follows.

- Size **3** 45-60 ml
- Size **4** 60-80 ml
- Size **5** 70-90 ml

**13.** Attach the breathing circuit or resuscitator bag to the 15 mm connector of the KING LTS-D. While gently bagging the patient to assess ventilation, simultaneously withdraw the airway until ventilation is easy and free flowing(large tidal volume with minimal airway pressure).



**14.** Depth markings are provided at the proximal end of the KING LTS-D which refers to the distance from the distal ventilatory openings. When properly placed with the distal tip and cuff in the upper esophagus and the ventilatory openings aligned with the opening to the larynx, the depth markings give an indication of the distance, in cm, from the vocal cords to the upper teeth.

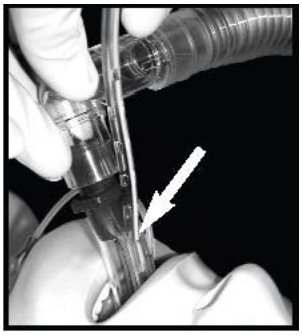
**15.** Confirm proper position by auscultation, chest movement and verification of CO2 by capnography if available.

**16.** Read just cuff inflation if needed to just seal cuff.

**17.** Secure KING LTS-D to patient using tape or other accepted means. A bite block can also be used, if desired.

**DO NOT COVER THE PROXIMAL OPENING OF THE GASTRIC ACCESS LUMEN**

**1.** Paramedic: The gastric access lumen allows the insertion of up to an 18 Fr diameter gastric tube into the esophagus and stomach. Lubricate gastric tube prior to insertion.



## WARNINGS/PRECAUTIONS

1. **THE AIRWAY IS CONSIDERED UNSECURE**
    - Intubation of the trachea cannot be ruled out as a potential The KING LTS-D does not protect the airway from the effects of regurgitation and aspiration. High airway pressures may divert gas either to the stomach or to the atmosphere.
    - Intubation of the trachea cannot be ruled out as a potential complication of the insertion of the KING LTS-D.
2. After placement, perform standard checks for breath sounds and utilize an appropriate carbon dioxide monitor as required by protocol.
3. Lubricate only the posterior surface of the KING LTS-D to avoid blockage of the ventilation apertures or aspiration of the lubricant.
4. The KING LTS-D is not intended for reuse.

## USER TIPS

1. The key to insertion is to get the distal tip of KING LTS-D around the corner in the posterior pharynx, under the base of the tongue. Experience has indicated that a lateral approach, in conjunction with a chin lift, facilitates placement of the KING LTS-D. Alternatively, a laryngoscope or tongue depressor can be used to lift the tongue anteriorly to allow easy advancement of the KING LTS-D into position.
2. Insertion can also be accomplished via a midline approach by applying a chin lift and sliding the distal tip along the palate and into position in the hypopharynx. In this instance, head extension may also be helpful.
3. As the KING LTS-D is advanced around the corner in the posterior pharynx, it is important that the tip of the device is maintained at the midline. If the tip is placed or deflected laterally, it may enter the piriform fossa and the tube will appear to bounce back upon full insertion and release. Keeping the tip at the midline assures that the distal tip is placed properly in the hypopharynx/upper esophagus.
4. Depth of insertion is key to providing a patent airway. Ventilatory openings of the KING LTS-D must align with the laryngeal inlet for adequate oxygenation/ventilation to occur. Accordingly, the insertion depth should be adjusted to maximize ventilation. Experience has indicated that initially placing the KING LTS-D deeper (proximal opening of gastric access lumen aligned with teeth or gums), inflating the cuffs and withdrawing until ventilation is optimized results in the best depth of insertion for the following reasons:

- It ensures that the distal tip has not been placed laterally in the piriform fossa (see item #3 above).
- With a deeper initial insertion, only withdrawal of the tube is required to realize a patent airway. A shallow insertion will require deflation of the cuffs to advance the tube deeper (several added steps).
- As the KING LTS-D is withdrawn, the initial ventilation opening exposed to or aligned with the laryngeal inlet is the proximal opening. Since the proximal opening is closest to and is partially surrounded by the proximal cuff, airway obstruction is less likely, especially when spontaneous ventilation is employed.
- Withdrawal of the KING LTS-D with the balloons inflated results in a retraction of tissue away from the laryngeal inlet, thereby encouraging patent airway.

**5.** Ensure that the cuffs are not over inflated. Inflate cuffs with the minimum volume necessary to seal the airway at the peak ventilatory pressure employed (just seal volume). Note that nitrous oxide is known to diffuse into cuffs and increase pressure; accordingly, if using nitrous oxide, cuff pressures should be monitored periodically to avoid over-inflation.

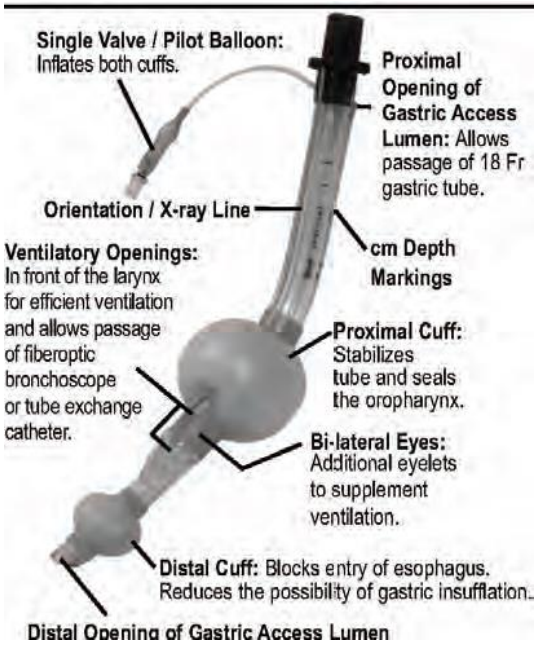
## DOCUMENTATIONS OF ADHERENCE TO PROTOCOL

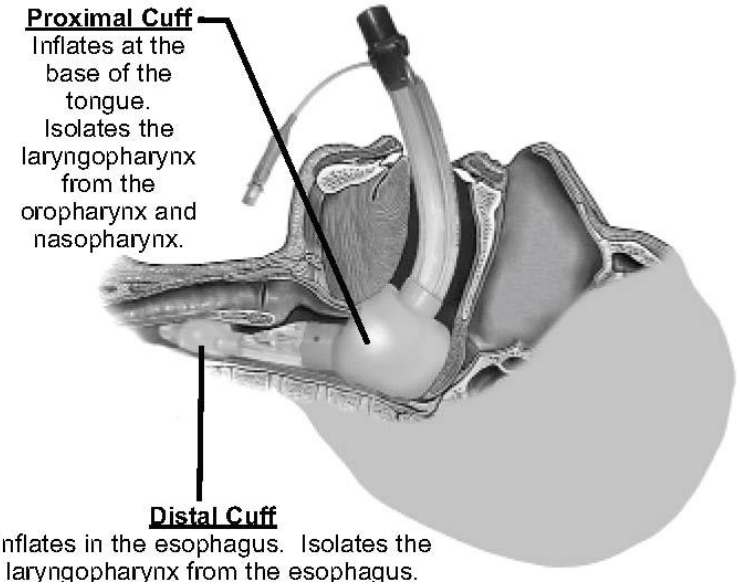
**1.** Evidence of respiratory distress without gag reflex.
**2.** Successful insertion of King Airway.
**3.** Size used.
**4.** Note patient respiratory status post- insertion.

## REMOVAL OF THE KING LTS-D

**1.** The removal with medical direction authority or when attempting reinsertion, or if the patient awakens.
**2.** Remove KING LTS-D as follows:
- KING LTS-D removal should always be carried out in an area where suction equipment and the ability for rapid intubations are present.
- For KING LTS-D removal, it is important that both cuffs are completely deflated
- Follow diagrams

# KING LTS-D
# STANDARD OPERATIONAL GUIDANCE



Tucson Medical Center

Base Hospital

# Medicated Facilitated Intubation Protocol (MFI)

## Overview

Each patient may present unique challenges to airway management. Before any intervention is attempted the paramedic should contemplate a plan of action that addresses the needs of the patient as well as anticipate complications and how to manage those complications, should the need arise.

This procedure should be used to facilitate intubations in patients who require an invasive airway; conscious or semi-conscious, and who will not accept nasal or conventional oral intubation. Use of waveform capnography is mandatory on intubated patients.

Airway management is a continuum of interventions, not an "all or none" treatment. Some patients may only need airway positioning to achieve adequate ventilation and oxygen. Others will require more invasive procedures. The paramedic should choose the **least** invasive method that can be employed to achieve adequate ventilation and oxygenation and only be performed when the benefits of performing the procedure outweigh the potential risk to the patient.

Pediatric airway management in the prehospital care setting is controversial and there is evidence that prehospital intubation of the pediatric patient does not contribute to improved patient outcomes. Pediatric intubation should be deferred whenever possible, unless the patient's airway has an immediate risk of being compromised or that ventilation/oxygenation cannot be maintained by using less invasive measures.

## Prehospital Goal

Facilitate placement of invasive airway with use of medications. Follow this protocol along with the ALS Stabilization Administrative Order.

## Indications

Inability to tolerate laryngoscopy due to gag reflex, failure or contraindication of other means:

- King airway, Combitube
- Hypoxia (Sp02 < 90 %) with failed interventions to improve oxygenation
- Respiratory arrest that cannot be intubated due to non-flaccid state
- Head injury with GSC ≤8 with need for definitive airway and mechanical ventilation
- Unconsciousness or altered mental status with airway compromise of risk pulmonary aspiration
- Potential for airway compromise due to trauma to larynx, asthma, respiratory illnesses
- Uncontrolled seizure activity requiring airway control
- Combative patient with airway compromise
- Patients unable to protect airway

## Guidelines

1. Take into considerations the indications, risks and alternatives to intubation.
2. Obtain SAMPLE history.
3. Perform a brief anatomic assessment. A thorough evaluation of the anatomy of the hypopharynx is essential in airway management.
4. Perform a brief neurological status and GCS Score. This **MUST** precede the administration of sedatives agents.
5. Have essential equipment available.
6. Hypotension related to midazolam administration may be reversed with IV fluid bolus.

7. **Under no circumstances should MFI be used to restrain a violent or combative patient.**

**Preparation**
- Prepare all equipment including suction, capnography, and rescue airway

**Oxygenation**
- Pre-oxygenate with 100% $FiO_2$ for 4-5 minutes by BVM or NRB + Nasal Cannula at 15L
- If unable to wait 4-5 minutes, give 4 vital capacity breaths with BVM. If assisting with BVM, 100% $O_2$ for at least 1-2 is preferred

**Medication Facilitated**
Midazolam (Versed) Dosing: IV/IO/IM
- Age 14 years of age or older: 1-10 mg, may repeat to max of 20 mg
- Age 9-14 years of age: 1-4 mg slow push, may repeat to max of 15 mg
- Age 8 years of age or younger: 1-2 mg slow push, may repeat to max 10 mg
- IM Dosing all ages: 0.2mg/kg IM, same max per age

**Intubation**
- Perform oral intubation
- If NOT successful in 15 seconds perform BVM ventilation and reattempt, consider administration of another dose of midazolam as indicated
- If unsuccessful after 3 attempts use alternate advanced airway

**Confirm Placement**
- Visualized tube pass through vocal cords
  - Goals $O_2$ Sat 94%-99% and $EtCO_2$ 35-45
  - Consider use of PEEP is available
- End tidal $CO_2$ detector and $CO_2$ monitor + 2 other methods
  - Observe chest rise and fall
  - Auscultate for lung sounds-no epigastric sounds

**Ventilate and Secure Tube**
- Ventilate patient at appropriate rate and depth
- Secure tube with tape or commercial device
- Consider soft restraints to patient's arms to prevent unplanned extubation

**Post Intubation Sedation**
- If needed, follow facilitated dosing amounts. **DO NOT** exceed maximum amount. If needed, call medical direction for increased dosing amounts.

**Reassessment**
- Reassess patient every five minutes, vital signs, cardiac monitor, $EtCO_2$
- Adjust ventilations as needed to maintain goals
- Check tube placement after each patient move

**Special Information and Considerations Prior to Intubation**
- Consider using follow **Pain Management AO** for pain control
- **I**f actual or suspected head injury or increased ICP; patients with cardiovascular disease at risk from increased BP & cardiac force of contraction (aneurysm, intracranial

hemorrhage, etc.) present administer Fentanyl 1.5 mcg/kg IV/IO administer, 2-3 minutes BEFORE intubating

- **If hemodynamically unstable** consider push dose epinephrine 1:10,000, standard dose 10 mcg and titrate as needed (expel 1cc from 10cc NS flush and replace with 1cc of 1:10,000 epi = 10 mcg/mL). **HAVE TO CALL MEDCIAL DIRECTION FOR THIS**

**Documentation**

Documentation will be completed on the Prehospital Patient Care Report (PCR)/ (EPCR). The PCR or the patient's incident number will be forward to your agency's EMS Coordinator and Base Hospital Medical Direction within **24 hours.**

1. In addition to complete documentation of patient assessment and care, specific areas to be addressed on the PCR/ePCR will include but not be limited to:
   - Facilitated Intubation indications
   - Description of airway condition (clear, vomitus, blood, etc.)
   - Documentation of pre-oxygenation with the oxygen saturations
   - All drugs used-doses, times
   - Document reasons for repeat doses of medications
   - Vital signs every five (5) minutes post medication administration
   - Number of intubation attempts (pre and post use of sedation)
   - Tube size, depth of endotracheal tube insertion and method used for securing the endotracheal tube
   - Three (3) methods used for tube verification. NOTE: presence of bilateral breath and no air movement over the epigastrium are bundled as only one method of confirmation of tube position.
   - Oxygen saturation levels during procedure
   - Documentation of EKG monitor strip before and after intubation
   - Documentation of reverification of tube placement during transport and methods used
   - Status of ETT at turnover at receiving facility or air medical and after each patient movement
   - Name of RN/Physician patient was transferred to