# ALS Procedures

## Oral Endotracheal Intubation

### Indications
- Patient with decreased sensorium (GCS less than or equal to 8) and apneic (adults)
- Patient with decreased sensorium (GCS less than or equal to 8), ventilation unable to be maintained with BLS airway

### Contraindications
- Pediatric patients under 40 kg
- Suspected hypoglycemia or narcotic overdose
- Maxillo-facial trauma with unrecognizable facial landmarks
- Patients experiencing seizures
- Patients with an active gag reflex

Ventilation should be interrupted for no more than two periods of up to 30 seconds during laryngoscopy or intubation attempts and patients should be ventilated with 100% oxygen for 1 minute via bag-valve mask between attempts. No more than two attempts at endotracheal intubation should be done (an intubation attempt is defined as the laryngoscopy and passing of an ET tube beyond the teeth with the intent of placing the endotracheal tube). Use of rescue airway or return to BLS maneuvers may occur at any time (neither require repeated advanced airway attempts before use).

Base hospital physician consultation is recommended if there is any question concerning the need to intubate a patient. The base hospital physician may also approve extubation of a patient in the field.

Nasotracheal intubation is not an approved skill in Contra Costa County.

### Procedure

1. Assure an adequate BLS airway.
2. Oxygenate with 100% oxygen using a bag-valve-mask.
3. Select appropriate ET tube. If appropriate tube has a cuff, check cuff to ensure that it does not leak; note the amount of air needed to inflate. Deflate tube cuff. Leave syringe attached.
   a. Insert appropriate stylet, making sure that it is recessed at least one cm. from the distal opening of the ET tube. Lubricate the tip of the tube.
   b. Prepare endotracheal tube introducer (bougie) and rescue airway for possible use.
4. Assure c-spine immobilization with suspected trauma.
5. Insert laryngoscope and visualize the vocal cords. If unable to identify cords, resume BLS airway management and utilize endotracheal tube introducer in next attempt.
6. Suction if necessary and remove any loose or obstructing foreign bodies.
7. CAREFULLY pass the endotracheal tube tip past the vocal cords; remove the stylet; advance the ET tube until the cuff is just beyond the vocal cords.
8. Inflate the cuff with 5-7ml of air. For uncuffed pediatric tubes, advance tube no more than 2.5 cm beyond vocal cords (use vocal cord marker line if present on tube).
9. Immediately assess tube placement with capnography or colorimetric end-tidal CO2 indicator and/or esophageal detector bulb (see tube confirmation procedure):
10. Following successful confirmation of intubation, auscultation of lungs, epigastrium, and observation of chest rise should be done. If chest does not rise, extubate and reintubate. Endotracheal tube introducer (bougie) should be considered for second attempt.
11. Secure the tube with tape or ET holder and ventilate. Mark the TUBE at the level of the lips.
Confirmation of Tube Placement / Post-Intubation Monitoring

- Every patient intubated with an endotracheal tube or esophageal airway requires initial evaluation of tube placement and ongoing tube monitoring until patient turnover or until resuscitative efforts cease.
- Physical findings (chest rise, lung and abdominal sounds, and vital signs, if present) must be assessed and documented in all intubated patients.
- End-tidal carbon dioxide (ETCO₂) measurement must be utilized in all intubated patients. Electronic waveform capnography (with numerical ETCO₂ readout) should be utilized from the earliest moment possible after every tube placement to continuously verify placement as well as to guide ventilation rates. Colorimetric ETCO₂ indicators may be useful if electronic monitoring is not immediately available, but should be replaced with waveform monitoring as soon as possible.
- Documentation of ETCO₂ measurement in the patient care record is required in all intubations. Electronic data upload or attachment of a code summary from the monitor-defibrillator to the record should be done in all cases.
- The esophageal detector bulb is useful only in cardiac arrest situations in which no ETCO₂ is detected, and should only be used with endotracheal tubes (not with King Airway).
- When ETCO₂ is not detected in the setting of King Airway use, physical exam remains as the key method to assess functionality of the airway.

Procedure

1) Following tube placement and cuff inflation, attach waveform capnography unit (or colorimetric ETCO₂ indicator if waveform not immediately available).
   a. If exhaled ETCO₂ is detected, the tube should be secured. Waveform capnography should be used continuously until patient turnover or cessation of resuscitative efforts. Physical exam reassessment should also be utilized after any patient movement.
   b. If exhaled ETCO₂ is not detected:
      1. In a patient with pulses, the tube should be removed and reintubation attempted.
      2. In a patient without pulses:
         b. King Airway: use physical examination findings (chest rise, lung sounds present, abdominal sounds absent) should be used to verify placement.
   c. Reassessment should occur after any patient movement, and in pulseless patients may include re-use of the esophageal detector bulb.
   d. In all patients, ETCO₂ monitoring should be continued as it may be the initial indicator when there is return of spontaneous circulation.
### SIGNIFICANCE OF END-TIDAL CO₂ WAVEFORM / CHANGES AFTER INTUBATION

<table>
<thead>
<tr>
<th>Event Description</th>
<th>Possible Causes</th>
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| Loss of previous waveform with ETCO₂ near zero | • Endotracheal tube disconnected, dislodged, kinked or obstructed  
• Loss of circulatory function |
| Decreasing ETCO₂ with loss of plateau | • Endotracheal tube cuff leak or deflation  
• Endotracheal tube located in hypopharynx  
• Partial obstruction |
| Sudden increase in ETCO₂ | • Return of spontaneous circulation |
| Gradual increase in ETCO₂ | • If elevated above normal levels, need for increased ventilation  
• From low levels, improvement in perfusion |
| Gradual decrease in ETCO₂ | • Effects of hyperventilation  
• Worsening of perfusion |
| “Sharkfin” waveform | • Asthma or COPD |

**Normal capnography:**

*Image of normal capnography graph*

- **ET Tube disconnected, displaced, or patient develops cardiac arrest:**
  - *Image of ET tube waveform with sudden increase in ETCO₂*
  - **Sudden Increase in ETCO₂ (return of spontaneous circulation):**
  - *Image of ET tube waveform showing return of spontaneous circulation*

- **ET Tube in hypopharynx (above cords), partly obstructed, or cuff leak:**
  - *Image of ET tube waveform showing gradual increase in ETCO₂*
  - **“Shark-Fin” waveform (asthma or COPD):**
  - *Image of ET tube waveform showing “Shark-Fin” waveform*

*Source: Medtronic Physio-Control Capnography Educational Series 2002*

### ESOPHAGEAL DETECTOR BULB FINDINGS AND ACTIONS

<table>
<thead>
<tr>
<th>Finding</th>
<th>Action</th>
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<tbody>
<tr>
<td>Rapid inflation of bulb</td>
<td>• Tracheal placement – Secure tube</td>
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</table>
| Slow inflation or no inflation | • Likely esophageal placement – remove tube and re-attempt intubation.  
• If second attempt, remove tube and use King Airway or BLS airway management |
| If paramedic confident of tube placement (false findings more common with excessive secretions, CHF, or obesity) | • Visualize airway directly via laryngoscopy  
• Alternative – rotate tube 90 degrees, suction, and recheck with bulb  
• Remove tube if any question |
Endotracheal Tube Introducer (Bougie)

The flexible endotracheal tube introducer is a useful adjunct which can be used on any intubation. It is particularly helpful when vocal cord visualization is anticipated to be difficult (e.g. short neck, limited neck mobility, spinal immobilization). A two-person or a one-person technique can be used. Do not force introducer as it can potentially cause tracheal or pharyngeal perforation. The introducer cannot be used in endotracheal tubes smaller than 6.0.

1. Two-Person Technique (recommended when visualization is less than ideal)
   a. Using laryngoscope, visualize as well as possible
   b. Place stylet just behind the epiglottis with the bent tip anterior and midline
   c. Gently advance the tip through the cords, maintaining anterior contact
   d. Use stylet to feel for tracheal rings
   e. Advance stylet black mark past teeth to feel for the carina. If no stop felt, remove as stylet is in esophagus, and retry.
   f. Withdraw the stylet to align the black mark with the teeth.
   g. Have assistant load and advance ETT tip to the black mark
   h. Have assistant grasp and hold steady the straight end of stylet
   i. Advance endotracheal tube while maintaining laryngoscope position
   j. At glottic opening turn endotracheal tube 90 degrees counterclockwise to assist passage over arytenoids
   k. Advance endotracheal tube to appropriate position
   l. Maintaining endotracheal tube position, withdraw stylet

2. One-Person Technique or Pre-loaded technique (recommended when visualization better but cords too anterior to pass tube). Can be used, by paramedic choice, for any intubation.
   a. Load stylet into endotracheal tube with bent end approximately 10 cm past distal end of tube
   b. Pinch the endotracheal tube against the stylet
   c. With bent tip anterior, visualize cords and advance stylet through cords
   d. Maintain laryngoscope position
   e. When black mark on stylet is at the teeth, ease grip to allow tube to slide over the stylet. If available, have an assistant stabilize the stylet.
   f. At glottic opening, turn endotracheal tube 90 degrees counter-clockwise to assist passage over the arytenoids.
   g. Advance endotracheal tube to appropriate position
   h. Maintaining endotracheal tube position, withdraw stylet
Esophageal Airway (King LTS-D)

The Esophageal Airway, or King LTS-D, is a single-use device intended for airway management. It can be used as a rescue airway device when other airway management techniques have failed, or as a primary device when advanced airway management is required in order to provide adequate ventilation. The esophageal airway does not require direct visualization of the airway or significant manipulation of the neck.

Its main use is in cardiac arrest situations (pulseless and apneic patients). In some patients it may be preferable to use initially (e.g. patients who are obese or with short necks, patients with limited neck mobility, difficult visualization due to access to the patient, or blood or emesis in the airway). It is not necessary to attempt endotracheal intubation before opting for the esophageal airway.

Because it is not tolerated well in patients with airway reflexes, it should not be used in patients with perfusing pulses unless all other methods of ventilation have failed.

Two intubation attempts with the esophageal airway are permissible. Ventilations should be interrupted no more than 30 seconds per attempt. Between attempts, patients should be ventilated with 100% oxygen for one minute via bag-valve mask device.

The King LTS-D is available in three sizes and cuff inflation varies by model:

- Size 3 – Patient between 4 and 5 feet tall (55 ml air)
- Size 4 – Patient between 5 and 6 feet tall (70 ml air)
- Size 5 – Patient over 6 feet tall (80 ml air)

Indications

- Cardiac arrest (of any cause)
- Inability to ventilate non-arrest patient (with BLS airway maneuvers) in a setting in which endotracheal intubation is not successful or unable to be done

Contraindications

- Presence of gag reflex
- Caustic ingestion
- Known esophageal disease (e.g. cancer, varices, stricture, others)
- Laryngectomy with stoma (can place ET tube in stoma)
- Height less than 4 feet

Note: Airway deformity due to prior surgery or trauma may limit the ability to adequately ventilate with this device (may not get adequate seal from pharyngeal cuff)

Equipment

- Suction
- King LTS-D Kit (Size 3, 4, or 5)
- Bag-Valve-Mask
- Stethoscope
- End-tidal CO2 detection device
Procedure

1) Assure an adequate BLS airway (if possible).
2) Select appropriately sized esophageal airway.
3) Test cuff inflation by injecting recommended amount of air for tube size into the cuffs. Remove all air from cuffs prior to insertion.
4) Apply water-based lubricant to the beveled distal tip and posterior aspect of tube, taking care to avoid introduction of lubricant in or near ventilatory openings.
5) Have a spare esophageal airway available for immediate use.
6) Oxygenate with 100% oxygen.
7) Position the head. The ideal head position for insertion is the “sniffing position.” A neutral position can also be used (e.g. spinal injury concerns).
8) Hold mouth open and apply chin lift unless contraindicated by cervical spine injury or patient position.
9) With tube rotated laterally 45-90 degrees such that the blue orientation stripe 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 the tube tip passes under tongue, rotate tube back to midline (blue orientation stripe faces chin).
11) Without exerting excessive force, advance tube until base of connector aligns with teeth or gums.
12) Inflated cuff to required volume.
13) Attach bag-valve to airway. While gently bagging the patient to assess ventilation, simultaneously withdraw the airway until ventilation is easy and free flowing.
14) Confirm proper position by auscultation, chest movement, and verification of CO2 by capnography. Do not use esophageal detector device with esophageal airway.
15) Secure the tube. Note depth marking on tube.
16) Continue to monitor the patient for proper tube placement throughout prehospital treatment and transport. **Capnography should be done in all cases.**
17) Document airway placement and results of monitoring throughout treatment and transport.

Troubleshooting:

- If placement is unsuccessful, remove tube, ventilate with BVM and repeat sequence of steps.
- If unsuccessful on second attempt, BLS airway management should be resumed.

Additional Information:

- The key to insertion is to get the distal tip of the airway around the corner in the posterior pharynx, under the base of the tongue. 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 cause the tube to appear to “bounce back” upon full insertion and release.
**Tracheostomy Tube Replacement**

Establishing a patent airway in a patient with a tracheostomy may be accomplished by suctioning or by replacement of an old tracheostomy tube when suctioning is not successful. Tracheostomy tube replacement may only be performed when patient has a new replacement tracheostomy tube available. If tracheostomy tube is not available, or placement of a new tube is unsuccessful, use of an endotracheal tube (stomal intubation) or BVM ventilation is appropriate.

**Indications:**
- Dislodged tracheostomy tube (decannulation)
- Tracheostomy tube obstruction not resolved by suction

**Contraindications:**
- Recent tracheostomy surgery (less than 1 month)
- Inadequately sized tract or stoma for insertion of new tube (use endotracheal tube instead)

**Procedure:**

1) Remove old tracheostomy tube if obstructed
   a. Hyperextend head to extent possible to expose tracheostomy site
   b. Apply oxygen over mouth and nose and occlude stoma or tracheostomy tube
   c. If existing tube has a cuff, deflate with 5-10 ml syringe (do not cut balloon)
   d. Cut or untie cloth ties holding tube in place
   e. Withdraw tube using a slow and steady outward and downward motion
   f. Assess airway for patency and adequate ventilation
   g. Provide oxygen through stoma as needed

2) Replace tracheostomy tube
   a. If tube has obturator, place in tube. If tube has outer and inner cannula, use the outer cannula and obturator for placement.
   b. Moisten or lubricate tip of tube and obturator with water, saline, or a water-soluble lubricant
   c. Hold device by flange (wings) or actual tube like a pencil
   d. Gently insert tube with arching motion (follow curvature of tube) posteriorly and then downward. Slight traction on skin above and below stoma may help.
   e. Once tube is in place, remove obturator, attach BVM and attempt to ventilate. If tube uses inner cannula, insert to allow ventilation with BVM.
   f. Check for proper placement by observing bilateral chest rise, listening for equal breath sounds, and general patient assessment. Signs of improper placement include lack of chest rise, unusual resistance to assisted ventilation, air in surrounding tissues, or lack of patient improvement.
   g. If tube cannot be inserted, withdraw, administer oxygen, and ventilate as needed.
   h. If insertion not successful, consider use of smaller tracheostomy tube (if available) or endotracheal tube placement.
   i. An additional aid in placement may be use of a suction catheter as a guide (without applying suction) for tube placement. Remove obturator and slide tube along suction catheter into stoma. Remove suction catheter after placement and assess.
j. If still unsuccessful and patient requires ventilation, consider endotracheal intubation or BVM ventilation through newborn mask or via nose and mouth with stoma occluded.

3) After proper placement, place tracheostomy ties through openings on flanges and tie around neck, allowing room for a little finger to pass between ties and neck.

» Possible Complications

- Creation of false lumen
- Subcutaneous air
- Pneumothorax or pneumomediastinum
- Bleeding at insertion site or through tube

► Stomal Intubation

For patients with existing tracheostomy without tube (mature stoma):

1. Assure an adequate BLS airway.
2. Oxygenate with 100% oxygen using a bag-valve-mask.
3. Select the largest endotracheal tube that will fit through the stoma without force (it should not be necessary to lubricate the tube).
4. Check cuff, if applicable.
5. Do not use a stylet.
6. Pass endotracheal tube until the cuff is just past the stoma. Right mainstem bronchus intubation may occur if the tube is placed further since the distance from tracheostomy to carina is less than 10 cm. The tube will protrude from the neck by several inches.
7. Inflate the cuff
8. Immediately assess tube placement with colorimetric end-tidal CO₂ indicator (see confirmation of tube/post-intubation procedure).
9. Auscultate the chest for air entry on the right and left sides equally. Look for symmetric chest wall rise. Check neck for subcutaneous emphysema, which indicates false passage of tube. If the chest DOES NOT RISE, extubate and repeat steps 2-7.
10. Secure the tube with tape and ventilate.

Note: Do not attempt to reinsert a dislodged pre-existing tracheostomy tube.
ResQPOD impedance threshold device is a novel circulatory enhancement device that is intended to be an adjunct for intubated adult patients with cardiac arrest. It should not be used on patients with perfusing pulses or spontaneous breathing or on patients with history of traumatic cardiac arrest due to blunt chest trauma. The ResQPOD is not required equipment.

» Indications

- Patients ≥ 9 years of age in cardiac arrest

» Contraindications

- Patients under the age of nine (9)
- Patients with a perfusing pulse or spontaneous breathing
- Patients with history of traumatic cardiac arrest due to blunt chest trauma
- Patients with flail chest

» Procedure

1. Secure advanced airway (because less CPR interruption occurs, King Airway is the ideal advanced airway to use early in cardiac arrest to facilitate ResQPOD use).
2. Attach bottom of ResQPOD directly to the airway adjunct. Assure tight fit, being sure to avoid movement of airway.
3. Attach ventilation bag to the ResQPOD.
4. Remove clear tab and slide red timing assist light switch on.
5. Place end-tidal CO2 measurement device between bag and ResQPOD (not between tube and ResQPOD).
6. Administer 10 breaths per minute. (Timing light flash rate is 10/minute)

Do Not Hyperventilate.

If spontaneous respiration resumes, ResQPOD should be immediately discontinued.

The ResQPOD is to be used for a single patient. If secretions are encountered, clear the device by shaking it.
Continuous Positive Airway Pressure (CPAP)

The purpose of CPAP is to improve ventilation and oxygenation and avoid intubation in patients with congestive heart failure (CHF) with acute pulmonary edema or other causes of severe respiratory distress.

» Indications

Patients 14 years and older in severe respiratory distress who are:
- Awake and able to follow commands
- Able to maintain a patent airway
- Exhibit two or more of the following:
  - Respiratory rate > 25
  - Pulse oximetry < 94%
  - Use of accessory muscles during respiration

Conditions in which CPAP may be helpful include suspected:
- CHF with pulmonary edema
- Acute exacerbation of COPD or asthma
- Pneumonia
- Near drowning

» Absolute Contraindications: (Do NOT Use)

- Respiratory or cardiac arrest or agonal respirations
- Tracheostomy
- Signs and symptoms of pneumothorax
- Major facial, head or chest trauma
- Vomiting

» Procedure

1) Place patient in a seated position
2) Monitor ECG, Vital signs (BP, HR, RR, SPO2)
3) Set up the CPAP system (per manufacturers recommendation) with pressure set at 7.5 cm H₂O
4) Explain to the patient what you will be doing
5) Apply mask while reassuring patient – encourage patient to breathe normally (may have a tendency to hyperventilate)
6) Reevaluate the patient every 5 minutes – normally the patient will improve in the first 5 minutes with CPAP as evidenced by:
   - Decreased heart rate
   - Decreased respiratory rate
   - Decreased blood pressure
   - Increased SPO2

BVM ventilation or endotracheal intubation may be considered, when indicated, if the patient fails to show improvement.
**Needle Thoracostomy**

Needle thoracostomy may be performed to relieve a tension pneumothorax.

» **Indications**

- Signs and symptoms of tension pneumothorax, including:
  - altered level of consciousness
  - decreased B/P; increased pulse and respirations
  - absent breath sounds on the affected side
  - hyperresonance to percussion on the affected side
  - jugular vein distension
  - increased dyspnea or difficulty ventilating
  - tracheal shift away from the affected side (often difficult to assess)

» **Contraindications**

- Any condition other than tension pneumothorax

» **Equipment**

- 12 – 14 gauge 2 – 3” angiocath
- One-way valve
- Betadine and alcohol swabs
- Occlusive dressing/vaseline gauze
- 10-30 ml syringe
- Rubber connecting tubing
- Sterile gauze pads
- Tape

» **Procedure**

1) Locate the 2nd ICS in the midclavicular line on the same side as the pneumothorax (An alternate site is the fourth or fifth intercostal space, in the mid-axillary line).

2) Prep site

3) Attach syringe to 10 - 14 gauge angiocath.

4) Make insertion on top of lower rib at a 90° angle.

5) Advance slightly superior to clear rib, then back to 90° angle, to make "Z" track puncture.

6) A "give" will be felt upon entering the pleural space. Air and/or blood should push the syringe plunger back.

7) Advance catheter superiorly, remove needle and allow pressure to be relieved.

8) Attach one-way valve.

9) Apply vaseline gauze/occlusive dressing to site and cover with dressing.

10) Secure catheter and one-way valve.
    - criss-cross taping for catheter.
    - tape down to prevent leakage.
    - tape one-way valve in dependent position.

**Reassess - expect rapid improvement in clinical condition and breath sounds.**
### Vascular Access

#### General Indications
- Emergent administration of intravenous medication or fluid bolus
- Anticipated emergent need to administer intravenous medications or fluid bolus

#### General Contraindications
- Situations in which an IV is “precautionary” – without need or anticipated emergent need for use for medications or fluids.
- External jugular and intraosseous access are contraindicated in stable patients.

#### Other Considerations
- In difficult access situations (e.g. history IV drug use, dialysis patient), IM alternatives (e.g. glucagon, naloxone, morphine, midazolam) are generally appropriate if intravenous fluid is not required.
- For critical trauma patients, IV access should occur en route to the hospital or helispot.
- Timely transport is important in a number of conditions (e.g. stroke, STEMI, and pulmonary edema) and vascular access attempts should not unduly delay scene departure.
- In patients with potential need only, no more than two attempts should be made.

<table>
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<tr>
<th>Access Site / Type</th>
<th>Indication / Comments</th>
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<tbody>
<tr>
<td>Saline Lock</td>
<td>Indicated for vascular access in upper extremity when medication alone is being administered or a potential need for medication is anticipated.</td>
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<tr>
<td>Upper Extremity IV (available vein)</td>
<td>Indicated when fluids and / or medications are needed, and patient not in shock or arrest.</td>
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<tr>
<td>Antecubital IV</td>
<td>Indicated in arrest, shock or when adenosine (rapid IV bolus) is required&lt;br&gt;• In arrest, use intraosseous access if rapid peripheral access cannot be obtained within 30-60 seconds&lt;br&gt;Appropriate if other peripheral sites not available and medication or fluids indicated</td>
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<tr>
<td>Intraosseous Access (IO)</td>
<td>Indicated in cardiac arrest, profound shock, or unstable dysrhythmia when peripheral IV access cannot be accomplished or a suitable vein cannot be rapidly found&lt;br&gt;• Should be done only when medication or fluid bolus is being administered, <strong>not for prophylactic vascular access</strong>&lt;br&gt;• <strong>Not indicated</strong> when other routes for medications available (IM, IN)&lt;br&gt;• <strong>Not indicated</strong> in alert or stable patients&lt;br&gt;• <strong>IO infusion is PAINFUL!</strong> In non-arrest patients, use lidocaine for pain control PRIOR to giving fluid or medication</td>
</tr>
<tr>
<td>External Jugular IV</td>
<td>Indicated <strong>only</strong> when unstable patient requires vascular access for emergent IV medication or fluids, no peripheral site is available and patient not appropriate for IO access (e.g., when patient is alert)&lt;br&gt;• Use intraosseous access in arrest situations (does not disrupt CPR)&lt;br&gt;• Use alternative routes for medications when possible rather than EJ&lt;br&gt;  o Patients requiring treatment of hypoglycemia should receive IM glucagon – monitoring for 10-15 minutes is appropriate before EJ considered&lt;br&gt;  o Use intranasal or IM route for naloxone in respiratory depression</td>
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**Intraosseous Infusion (Pediatric and Adult)**

Intraosseous infusion may be performed by EMT-P’s who have successfully completed a Contra Costa County EMS approved training course.

**Indications**
- After evaluation of potential IV sites, it is determined that an IV attempt would not be successful;
- One of the following conditions exists:
  - cardiac or respiratory arrest, impending arrest, or unstable dysrhythmia
  - shock or evolving shock, regardless of cause

**Absolute Contraindications**
- Fracture or suspected vascular compromise of the selected tibia
- Inability to locate anatomical landmarks for insertion

**Relative Contraindications**
- Skin infection or burn overlying the area of insertion

**Equipment**
- Povidone-based prep solution
- IV of NS attached to 500ml bag in pediatric patients
- IV NS 1 liter in adult patients
- 10/12 ml syringe filled with normal saline
- Sterile gloves
- Pressure bag for IV fluid administration
- Intraosseous needle (suitable to age 8)
- Automated IO insertion device (EZ-IO PD) up to 40 kg
- Automated IO insertion device (EZ-IO AD) if over 40 kg
- Lidocaine 2% for injection

**Procedure**
1) Locate and prep the insertion site. For children, place supine with a rolled towel under the knee, restrain if necessary. Select extremity (if applicable) without evidence of trauma or infection.
2) Put on gloves and thoroughly prep the area with the antiseptic solution.
3) Locate insertion site:
   a. In small children (3-12 kg), the tibial tuberosity cannot be palpated as a landmark, so the insertion site is two finger-breadths below the patella in the flat aspect of the medial tibia.
   b. In larger children (13-39 kg), the insertion site is located on the flat aspect of the medial tibia one finger-breadth below the level of the tibial tuberosity. If tibial tuberosity not palpable, insert two finger-breadths below the patella in the flat aspect of the medial tibia.
   c. For adults, proximal or distal tibial sites may be utilized.
      i. The proximal tibial site is one finger-breadth medial to the tibial tuberosity.
      ii. The distal tibial site is 2 finger-breadths above the medial malleolus (inside aspect of ankle) in the midline of the shaft of the tibia.
4) Introduce the intraosseous needle at a 90° angle, to the flat surface of the tibia.
5) For manual insertion, pierce the bony cortex using a firm rotary or drilling motion (do not move needle side to side or up and down). A distinct change in resistance will be felt upon entry into the medullary space.
6) Remove the stylet and confirm intramedullary placement by injecting, without marked resistance, 10 ml normal saline.
7) Attach IV tubing to the intraosseous hub.
8) Anchor needle to overlying skin with tape.
9) If unable to establish on first attempt, make one attempt on opposite leg, no more than two (2) attempts total.
10) Monitor pulses distal to area of placement
11) Monitor leg for signs of swelling or cool temperature which may indicate infiltration of fluids into surrounding tissue.
12) For adult patients who awaken and have pain related to infusion, slowly administer **LIDOCAINE** 20 mg IO. May repeat dose once.
13) For pediatric patients with pain related to infusion, slowly administer **LIDOCAINE** 0.5 mg/kg IO (max dose 20 mg).

» **Possible Complications**
- Local infiltration of fluids/drugs into the subcutaneous tissue due to improper needle placement
- Cessation of the infusion due to clotting in the needle, or the bevel of the needle being lodged against the posterior cortex
- Osteomyelitis or sepsis
- Fluid overload
- Fat or bone emboli
- Fracture
External Jugular Vein Cannulation

» Indications

For intravenous access when meeting both of the following criteria:

- Emergent need for fluid bolus or intravenous medication and no peripheral access is available;
- No alternative route is available for administration or treatment (i.e. glucagon IM for hypoglycemia or naloxone IM or intranasally).

» Contraindications (Relative)

- Arrest or profound shock. Intraosseous access is more reliably obtained.
- Suspected coagulopathy (e.g. advanced liver disease or taking coumadin)

» Contraindications (Absolute)

- Inability to tolerate supine position
- Stable patient

» Procedure

1) Place patient in trendelenburg (preferred) or supine position.
2) Elevate shoulders on rolled towel or sheet
3) Turn head 45 to 60 degrees to side opposite of intended venipuncture site.
4) Palpate to assure no pulsatile quality to vessel.
5) Cleanse venipuncture site with appropriate solution.
6) “Tourniquet” vein by placing finger just above clavicle near midclavicular line.
7) Stabilize skin over vein with thumb.
8) Point needle toward shoulder in direction of vein, and puncture vein midway between jaw and clavicle over belly of sternocleidomastoid muscle.
9) Maintain compression of vein at clavicle area until needle withdrawn and IV tubing has been connected in order to prevent air from entering vein.
10) Secure IV site.

» Possible Complications

- Air embolism
- Hematoma requiring compression of neck
- Extravasation of fluid or medication, infection, thrombosis
► Saline Lock

A saline lock is used to provide IV access in patients who do not require continuous infusion of solutions and administration of multiple medications is not anticipated. If a saline lock is in place, it may be used to administer one to two medications in an emergent situation, prior to connecting a primed IV line.

**Indications**

- Any patient where placement of a prophylactic IV line is appropriate

**Contraindications**

- Patient presentations which may require IV fluid replacement or multiple IV medication administrations
- Patients requiring administration of D50

**Equipment**

- IV start pak or equivalent
- Intravenous catheter of appropriate gauge (not to be used with 24 gauge catheters).
- Saline lock catheter plug with short extension
- 3ml syringe
- Sterile normal saline (3-5ml)

**Procedure**

1) Explain the procedure to the patient.
2) Remove catheter plug and attached extension set from package and prime with normal saline.
3) Prepare the site for venipuncture.
4) After venipuncture, secure extension set to hub of catheter and affix to patient's skin.
5) Prep rubber stopper on saline lock, insert needle, and slowly flush with at least 3ml of normal saline while observing for signs of infiltration.
6) While injecting the last .2ml of normal saline, continue exerting pressure on the syringe plunger while withdrawing the needle from the saline lock.
7) If a medication is administered via the saline lock, flush with at least 3ml of normal saline following administration of the medication.

**NOTE:** If the patient requires fluid bolus or administration of multiple medications, remove saline lock and secure primed IV tubing to catheter.
Intranasal Administration of Naloxone

» Indications

Patients with altered mental status who have respiratory rate of less than 12 and in whom an opiate overdose is suspected.

» Contraindications

- Patients do not meet criteria for naloxone administration
- Patients in whom vascular access has already been established for other reasons
- Patients with increased upper respiratory secretions (e.g., due to bleeding or URI)
- Patients with shock and signs of poor perfusion

» Equipment

- Mucosal Atomizer Device (MAD)
- Naloxone 2 mg/ml

» Procedure

1) Assess ABC’s and support ventilation as needed.
2) Load syringe with naloxone 2 mg and attach MAD to syringe.
3) Place atomizer in nostril.
4) Administer 1 mg (one-half of dose) in each nostril
5) Continue to support respirations as needed.
6) Consider use of IM or IV naloxone if no response and opiate overdose is suspected.

» Note

Intranasal administration may also be less effective in patients with pre-existing nasal mucosa damage.
Pulse oximetry is a method of detecting hypoxia in patients. A pulse oximeter measures arterial blood oxygen saturation and provides a reading as a percent of hemoglobin saturated with oxygen. (% SpO2) A normal pulse oximetry reading for a person breathing room air is in the high 90s. A SpO2 reading of less than 95% may indicate hypoxia and should be investigated.

While the pulse oximeter is a sensitive device that may detect hypoxia long before overt signs and symptoms of hypoxia are present, it is very important to remember that the pulse oximeter is just one tool used in assessment of the patient. The reading must be used in conjunction with other assessment findings to make a determination of whether the patient is hypoxic or not.

In addition to indicating hypoxia, the pulse oximeter is a good tool for monitoring the effectiveness of airway management and oxygen therapy and to detect if the patient is deteriorating or improving.

» **Indications:**
- When the patient’s oxygen status is a concern
- When hypoxia is suspected

» **Limitations:**
The pulse oximeter needs pulsatile arterial blood flow to determine an accurate reading. Any condition that interferes with the blood flow in the area where the probe is attached may produce an erroneous reading. The following conditions may produce no reading or inaccurate readings:
- Shock or hypoperfusion states associated with blood loss or poor perfusion
- Hypothermia or cold injury to the extremities
- Excessive movement of the patient
- During some types of seizures
- Nail polish if the finger probe is used
- Carbon monoxide poisoning
- Anemia

» **Equipment:**
- Pulse Oximeter
- Probes (pedi/adult)

» **Procedure:**
1) If possible, apply the pulse oximeter prior to administration of oxygen. Do not delay administration of oxygen in a suspected hypoxic patient.
2) Choose a site that is well perfused and least restricts a conscious patient’s movement.
3) Clean and dry site prior to sensor placement.
4) Apply appropriate sensor for patient.
5) Monitor and document the SpO2 as a sixth vital sign.
6) Continue to assess the respiratory status, include rate and tidal volume.
**Blood Glucose Testing**

Glucose testing is to be done on all patients presenting with an altered level of consciousness from either medical or traumatic causes. Patients with known diabetes and suspected hypoglycemia (e.g., diaphoresis, weakness) should also be tested. Testing may be done from a digit blood sample or a venous sample.

» **Indications**

- Any patient with an altered level of consciousness
- Any patient with signs or symptoms suggestive of hypoglycemia

» **Equipment**

- Alcohol Swabs
- Finger lancets (for digit samples)
- Cotton Balls/sterile gauze pads
- Glucose Testing device and strips

» **Procedure**

1) If obtaining blood sample via finger stick:
   a. Cleanse finger with alcohol swab.
   b. Puncture finger tip with lancet.
   c. Place drop of blood on glucose test strip per manufacturer's instructions.
   d. Place gauze/cotton ball on puncture site with pressure to stop bleeding.
   e. Use glucose testing device per manufacturer's instructions.
   f. If blood sugar is less than or equal to 60mg/dl, give Dextrose as specified in field treatment guidelines.

2) If obtaining blood sample via venipuncture (e.g., at IV start), follow steps c-f above.
External Cardiac Pacing

External cardiac pacing may be performed for the treatment of symptomatic bradycardia. This procedure is required for transport providers and optionally available for first-responder paramedic providers.

**Indications**
- Symptomatic bradycardia (heart rate less than 60 and one or more signs or symptoms below)
  - Signs and symptoms:
    - Blood pressure less than 90 systolic;
    - Shock—Signs of poor perfusion, evidenced by:
      - decreased level of consciousness or decreased sensorium;
      - prolonged capillary refill;
      - cool extremities or cyanosis;
    - Chest pain, diaphoresis;
    - CHF or acute shortness of breath.

**Contraindications**
- Patients with asymptomatic bradycardia (pacing equipment should be immediately available)
- Asystole
- Brady-asystolic cardiac arrest
- Hypothermia (relative contraindication) – patient warming measures have precedence
- Children less than 14 years old (hypoxia/respiratory problems are most likely causes of bradycardia in children and should be addressed.)

**Equipment**
- Cardiac monitor/defibrillator with pacing capability
- Pacing electrodes

**Procedure**
1) Patient assessment and treatment per Symptomatic Bradycardia treatment guideline.
2) Explain procedure to the patient.
3) Place pacing electrodes and attach pacing cable to pacing device per manufacturer’s recommendations.
4) Set pacing mode to demand mode, pacing rate to 80 BPM, and current at 10 mA.
5) As possible/if required, provide patient sedation/pain relief with midazolam or morphine sulfate IV or IM. Patients with profound shock and markedly altered level of consciousness may not require sedation/pain relief initially.
6) Activate pacing device and increase the current in 10 mA increments until capture is achieved (pacemaker produces pulse with each paced QRS complex).
7) Assess patient for mechanical capture and clinical improvement (BP, pulses, skin signs, LOC).
8) Continue monitoring. Contact base for further orders if patient symptoms are not resolving (consideration for dopamine, further alteration of pacer settings) or if further sedation/pain control orders required.
12-Lead Electrocardiography

» Indications

- Chest pain/Acute Coronary Syndrome
  - Includes patients with atypical symptoms or anginal equivalents such as shortness of breath, syncope, dizziness, weakness, diaphoresis, nausea/vomiting, or altered level of consciousness. Elderly patients, females and diabetics are more likely to present atypically.
- Arrhythmias (both pre- and post-conversion) if patient stable or not in extremis
- Suspected cardiogenic shock
- Consider in pulmonary edema if patient not in extremis (may be presentation in ischemia)
- Consider in cardiac arrest patients with return of spontaneous circulation

» Contraindications (relative)

- Uncooperative patient
- Any other condition in which delay to obtain ECG would compromise care of the patient (e.g., arrhythmia requiring immediate shock or pacing)

» Equipment

- Monitor-defibrillator with 12-lead ECG capability
- Electrodes for limb leads and chest leads
- Clippers, scissors, or razor for chest hair removal
- Gauze or commercially available skin prep for electrode placement
- Sheet or blanket to cover patient as necessary while obtaining ECG

» Procedure

1. Expose Chest. Remove excess hair. **Prep skin.**
2. Place electrodes on chest and limbs.
   (See [12-lead placement](#))
3. Acquire ECG tracing as per manufacturer’s direction. ECG should be done prior to administration of nitroglycerin (NTG).
4. If baseline artifact or other artifact is noted, repeat ECG as machine readout may be incorrect
5. Patient destination should be promptly determined per STEMI Triage and Destination Policy if machine notes
   - ***Acute MI*** (Zoll) or;
   - ***Acute MI Suspected*** (Lifepak-12); or
   - ***Meets ST-Elevation MI Criteria (Lifepak-15)***
   and no significant artifact is noted.
6. Perform V4R in patients who have inferior MI infarct pattern noted (ST-segment elevation in leads II, III and aVF). Label ECG to note V4R (machine will not mark lead).
7. Perform repeat ECG’s if any question about quality of ECG or if intial ECG does not show ST-elevation and suspected cardiac symptoms continue.

8. Leave electrodes in place unless defibrillation, cardioversion, or pacing is required.

9. Deliver copy of ECG to hospital personnel caring for the patient upon arrival in the Emergency Department.

10. A copy of 12-lead ECG shall be forwarded with the PCR to the appropriate personnel at the provider agency.

» 12-Lead Placement

1. Limb leads should be placed on distal extremities if possible. May be moved to proximal if needed.

2. Chest leads should be placed:
   - V1 – 4th intercostal space at the right sternal border
   - V2 – 4th intercostal space at the left sternal border
   - V3 – Directly between V2 and V4
   - V4 – 5th intercostal space at left midclavicular line
   - V5 – Level of V4 at left anterior axillary line
   - V6 – Level of V4 at left mid-axillary line
   - V4R – Place in 5th intercostal space at right midclavicular line

» Documentation

Required documentation includes:

1. The performance of the 12-lead ECG procedure(s);
2. Findings of the 12-lead ECG;
3. Confirmation of a STEMI Alert (if applicable);
4. Electronic attachment of ECG data to the PCR.

» STEMI Alert

The STEMI Receiving Center should receive a STEMI Alert as soon as possible after an ECG indicates STEMI (based on the listed messages noted above) and the machine interpretation is felt to be correct (e.g., no significant artifact). The alert should follow SBAR format in accordance with the STEMI Triage and Destination Policy.
LUCAS Chest Compression System

The LUCAS Chest Compression System is designed to perform external chest compressions on adult patients. It is a safe and efficient tool that standardizes chest compressions in accordance with the latest scientific guidelines.

» Indications

- Adult patients with medical cardiac arrest
- Cases where manual chest compression would be used

» Contraindications

Do NOT use LUCAS Chest Compression System in the following cases:

- Adult patient too small: The pad within the suction cup does not touch patient’s chest when it is lowered as far as possible.
- Adult patient too large: The support legs of the LUCAS cannot be locked to the back plate without compressing the patient.
- Patient < 18 years old
- Traumatic arrest
- Pregnant patients

» Equipment

- LUCAS Chest Compression System
- Air Tanks (2) with LUCAS regulator preattached

» Procedure

1) Arrival at the patient:
   a. Confirm cardiac arrest by determining level of consciousness, breathing and pulse.
   b. If the patient has suffered a cardiac arrest, establish a team leader and commence manual CPR.
      If CPR already being done when you arrive, assess patient and take over CPR from bystander(s).

2) CPR or Defibrillation
   a. For unwitnessed arrests or witnessed arrests with 5 minutes or more time elapsed without CPR before arrival of first responders, provide 2 minutes or 5 cycles of CPR.
   b. For all other witnessed arrest, provide CPR until defibrillator available.
   c. Prepare LUCAS device.
      Minimize interruptions in CPR.

3) Connecting the Air:
   a. Confirm that the ON/OFF knob is in the Adjust (1) position.
   b. If not already connected, attach the air hose to the connector.
   c. Attach the connector to a portable air cylinder.
d. If using a pressure regulator, open the air valve.

4) When initial CPR or Defibrillation is complete - Assemble the LUCAS:
   a. Take the back plate out of the bag
   b. At the direction of the team leader - Interrupt CPR
   c. Place the back plate under body below patient’s armpits – use two people to lift patient – supporting head.
   d. Resume manual CPR
   e. Attach compressor – extend legs with claw locks open

Connecting to back plate – listen for click
   f. Pull up once to ensure attachment
   g. Position suction cup – the lower edge of the cup should be positioned immediately above the end of the sternum – the suction cup should be centered over the sternum
   h. Lower suction cup until the pressure pad inside the suction cup touches the patient’s chest without compressing the chest.
      Adjust as needed - It is critical that the pad is correctly positioned to prevent unwarranted injuries.
      **Mark the chest at the edge of the suction cup using the permanent marker**

5) Start Compressions using the LUCAS
   a. When the position of the suction cup is correct
   b. Turn the **ON/OFF** knob to **Engage (3)** (Active)
   c. Check that the device is working as it should
   d. Apply the stabilization strap
   e. Secure the patient’s arms with the straps on the support legs.

Turn **ON/OFF** knob to **Lock (2)** to pause compressions for:
   a. Ventilations when doing bag-mask ventilation
   b. Analysis using an AED and
   c. Rhythm check using a manual monitor defibrillator.

LUCAS may be used continuously with intubated patients.

**NOTE:** LUCAS is only intended for temporary use.
LUCAS is only intended for use in the prehospital setting.
LUCAS will be attended by a trained first responder at all times and the first responder will remain with the device until transfer of care to the emergency room personnel can be done.