Providers of all levels should be trained to acquire 12-lead ECG’s. Cardiac(rhythm) interpretation remains an EMT-I and EMT-P skill.

Initiating care of the clinically unstable patient takes precedence over 12-lead ECG acquisition; whenever possible patient care and 12-lead ECG should take place simultaneously. Obtaining a 12-lead ECG should be performed within ten (10) minutes of EMS contact.

The 12-lead ECG is not a triage tool used to make a decision whether or not to transport the patient.

Once a 12-lead ECG has been obtained, the patient should be transported. EMRs, EMTs and AEMT level providers must transmit anytime a provider suspects a STEMI or ECGs that display “***ACUTE MI SUSPECTED***” or “***MEETS ST ELEVATION MI CRITERIA***” to the receiving hospital and contact Medical Command and speak with the attending physician at that hospital for ECG interpretation. Once the 12-lead ECG is acquired and transmitted, the EMS provider should leave the leads connected and the ECG monitor on to allow the monitor to evaluate for ST segment changes.

If the patient has unstable vital signs AND/OR has a high risk history or complicated ALS complaints, reasonable attempts must be made to rendezvous with a medic level provider for transport.

Any change in patient status or condition should result in a medic being summoned to meet during transport. EMS should not delay transport while attempting to find or meet with a medic.

**Acquisition Criteria:**

EMS should acquire a 12-lead ECG on the following patients in no more than 10 minutes of EMS patient contact:

- Patients > 30 years old experiencing any of the following:
  - Chest pain, discomfort, pressure or tightness
  - “Heartburn” or epigastric pain
  - Complaints of “heart racing” (HR > 150 or irregular and > 120)
  - Complaints of “heart too slow” (HR < 50 and symptomatic)
  - A syncopal episode or severe weakness in patients > 45 years old
  - New onset stroke symptoms (< 24 hours old)
  - Difficulty breathing (with no obvious non-cardiac causes)

- Patients (regardless of age) with any of the above symptoms and a history of:
  - Prior cardiac disease such as a heart attack
  - A family history of early heart attack
  - Diabetes mellitus
  - Severe obesity
  - Recent illicit drug use
**STEMI Patients: (All providers)**

If an acute ischemic event or myocardial infarction is identified, or the monitor reads “***ACUTE MI SUSPECTED***” or “***MEETS ST ELEVATION MI CRITERIA***”, the receiving Attending Physician should be contacted promptly, the care of the patient discussed, and additional resources may be mobilized as necessary to expedite patient care (i.e. potentially including Medic rendezvous, critical care transport or Medevac). If transmitting a 12-lead ECG, you must contact medical command and request to speak to the Attending Physician. Inability to transmit 12-lead ECG should **NOT** delay voice communication to the receiving Attending Physician. If SMJH ER Attending Physician is not immediately available, do not delay giving full report to the RN. When a STEMI is suspected, providers should use the phones to communicate with the Attending Physician so a name & date of birth can be communicated to pre-register the patient.

Obtaining the field 12-lead ECG is valuable for comparison to later 12-lead ECG’s; the field ECG may be repeated if the patient’s clinical situation changes. ALS providers should attempt to establish IV access, preferred 18-20 gauge. **If at all possible, the patient’s right hand/wrist should be avoided for IV access.**

Field 12-lead ECG tracings should be provided to the receiving hospital for documentation in the patient’s chart upon arrival.

**Procedure:**
- Expose chest and prep as necessary.
- Apply chest leads and extremity leads using following landmarks:
  - 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 mid-clavicular line
  - V5 – 5th intercostal space at anterior axillary line
  - V6 – 5th intercostal space at mid-axillary line
  - Instruct patient to hold still
  - Press appropriate button to acquire 12-lead
  - Print and transmit ECG, include patients sex and age
### Chest Leads

Standard Chest Lead Electrode Placement

<table>
<thead>
<tr>
<th>Lead</th>
<th>Positive Electrode Placement</th>
<th>View of Heart</th>
</tr>
</thead>
<tbody>
<tr>
<td>V₁</td>
<td>4th Intercostal space to right of sternum</td>
<td>Septum</td>
</tr>
<tr>
<td>V₂</td>
<td>4th Intercostal space to left of sternum</td>
<td>Septum</td>
</tr>
<tr>
<td>V₃</td>
<td>Directly between V₂ and V₄</td>
<td>Anterior</td>
</tr>
<tr>
<td>V₄</td>
<td>5th Intercostal space at left midclavicular line</td>
<td>Anterior</td>
</tr>
<tr>
<td>V₅</td>
<td>Level with V₄ at left anterior axillary line</td>
<td>Lateral</td>
</tr>
<tr>
<td>V₆</td>
<td>Level with V₅ at left midaxillary line</td>
<td>Lateral</td>
</tr>
</tbody>
</table>

### Elements of Chest Leads

**I - Lateral**
- Circumflex Artery
- aVR

**II - Inferior**
- Right Coronary Artery
- aVL - Lateral
- Circumflex Artery

**III - Inferior**
- Right Coronary Artery
- aVF - Inferior
- Right Coronary Artery

**V1 - Septal**
- Left Anterior Descending Artery

**V4 – Anterior**
- Left Anterior Descending Artery

### SITE

<table>
<thead>
<tr>
<th>SITE</th>
<th>ST ELEVATION LOCATION</th>
<th>RECIPROCAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTERIOR</td>
<td>V3, V4</td>
<td>NONE</td>
</tr>
<tr>
<td>ANTEROLATERAL</td>
<td>I, aVL, V3, V4, V5, V6</td>
<td>II, III, aVF</td>
</tr>
<tr>
<td>ANTEROSEPTAL</td>
<td>V1, V2, V3, V4</td>
<td>NONE</td>
</tr>
<tr>
<td>EXTENSIVE ANTERIOR</td>
<td>I, aVL, V1, V2, V3, V4, V5, V6</td>
<td>II, III, aVF</td>
</tr>
<tr>
<td>INFERIOR</td>
<td>II, III, aVF</td>
<td>I, aVL</td>
</tr>
<tr>
<td>LATERAL</td>
<td>I, aVL, V5, V6</td>
<td>II, III, aVF</td>
</tr>
<tr>
<td>POSTERIOR</td>
<td>V7, V8, V9</td>
<td>V1, V2, V3, V4</td>
</tr>
<tr>
<td>RIGHT VENTRICLE</td>
<td>II, III, aVF, V1, V4R</td>
<td>I, aVL</td>
</tr>
<tr>
<td>SEPTAL</td>
<td>V1, V2</td>
<td>NONE</td>
</tr>
</tbody>
</table>
Modified 12-lead Placement (Posterior)

*Be sure to strike through lead labels V4 - V6 and change to V7 - V9 on the print out*
Modified 12-lead Placement (Right Sided)

*Be sure to change the V3 – V6 lead labels to V3R - V6R on print out*
Airway management in an acutely ill or injured patient is one of the greatest challenges in pre-hospital care. The primary goals of airway management are adequate oxygenation and ventilation, and these should be achieved in the least invasive manner possible. Although endotracheal intubation is considered the “gold standard” of airway management in many emergency and acute care settings, its application in the pre-hospital setting is particularly challenging.

**Shockable rhythm (pulseless VT and VF):**

In these rhythm scenarios, the treatment priorities include chest compressions and defibrillation. Early airway management, in a resource-limited environment, should focus on strategies which do not adversely impact chest compressions and defibrillation. In this scenario, an oral airway with 100% NRB face mask is appropriate. In a non-resource-limited environment, early application of an invasive airway can be made, as long as its use does not adversely impact chest compressions and defibrillation. Later in the resuscitation (i.e., beyond 6 to 8 minutes), placement of an invasive airway can occur, as long as its use does not adversely impact chest compressions and defibrillation.

**Non-shockable rhythm (asystole and PEA):**

In these rhythm scenarios, the treatment priorities include chest compressions, invasive airway management, and IV medication administration. Earlier invasive airway placement (i.e., within the first 2-6 minutes of resuscitation) can be made, as long as its use does not adversely impact chest compressions and other therapies.

**Goal:**

- To establish a timely and effective airway while minimizing potential harm to patients.

**Advanced Airway Attempt Defined as:**

- Introduction of an airway device (ET or supraglottic) or insertion of laryngoscope blade past the teeth.
  - Laryngoscopy for the purpose of any other reason (i.e. management of airway obstructions or foreign bodies) should be recorded on the TJEMS airway form and in the narrative of the PPCR/ePPCR.
Supraglottic Insertion**

**Note: order is alphabetic only**

**Combitube®**

Description:
- Sterile; single use device
- Twin lumen device
- Cuffs are inflated using individual valve/pilot balloon
- Cuffs are designed to seal the esophagus and oropharynx

Indications:
- Unconscious patients in respiratory failure without an intact gag reflex
- Primary airway:
  - If intubation anticipated to be difficult and rapid airway control is necessary
  - In pulseless arrest, when attempts at intubation are likely to interrupt CPR
- Anticipated need for prolonged positive pressure ventilation
- Secondary method of airway management for failed intubation attempt

Contraindications:
- Responsive patients with intact gag reflex
- Patient less than five (5) feet tall
- Patients with known esophageal disease
- Patients who have ingested caustic substances
- Latex allergy

Warnings:
- Intubation of the trachea is possible
- Lubricate only the posterior surface

Insertion:
- Check baseline breath sounds
- Pre-oxygenate, if possible
- In large syringe (blue marking) draw up 100 mL of air
- In small syringe (white marking) draw up 15 mL of air; attach fluid deflector elbow
- Apply lubricant to distal tip
  - Position head in “sniffing” (ideal) or neutral position
- With non-dominant hand; perform a tongue-jaw lift to open mouth
- With dominant hand, insert tube so curve of tube matches natural curvature of the pharynx, maintaining a midline position until the teeth lie between the two (2) printed bands
☐ Inflate #1 (one) (blue) pilot balloon with 100 mL of air from syringe; remove syringe
☐ Inflate #2 (two) (white) pilot balloon with 15 mL of air from syringe; remove syringe
  • Attach bag-valve and start ventilating in “blue” tube. If chest rise seen, auscultate breath and epigastric sounds. Positive breath sounds and negative epigastric sounds, tube is placed correctly, continue to ventilate through this port
  • If chest rise is not seen with ventilation through “blue” “1” tube, attempt ventilation through “white” “2” tube, follow same steps as above bullet for tube verification
☐ Verification of CO₂ by capnography
☐ Continuous end-tidal CO₂ waveform monitoring is recommended during transport
☐ Document all attempts (this includes any unsuccessful attempts)

Removal:
☐ Have suction available and ready
☐ Deflate cuff #1 (blue) first, then cuff #2 (white)
☐ Withdraw tube
☐ Suction as needed
☐ Be prepared to turn patient on side
  • Re-assess ABC’s

King Airway®

Description:
☐ Sterile single use latex-free device
☐ Curved tube with ventilation ports between two (2) cuffs
☐ Both cuffs are inflated using a single valve/pilot balloon
☐ Cuffs are designed to seal the esophagus and oropharynx

Indications:
☐ Unconscious patients in respiratory failure without an intact gag reflex
  o in patients over 35 inches in height or 12 kg
☐ Primary airway:
  o If intubation anticipated to be difficult and rapid airway control is necessary
  o In pulseless arrest, when attempts at intubation are likely to interrupt CPR
☐ Anticipated need for prolonged positive pressure ventilation
☐ Secondary method of airway management for failed intubation attempt
Contraindications:
- Responsive patients with intact gag reflex
- Patients with known esophageal disease
- Patients who have ingested caustic substances

Warnings:
- High airway pressures may leak air into the stomach or atmosphere
- Intubation of the trachea is possible (although not reported)
- Lubricate only the posterior surface of the King airway

Insertion:
- Check baseline breath sounds
- Pre-oxygenate, if possible
- Choose correct size
  - Green connector #2 for patients 35 – 45 inches or 12 – 25kg
  - Orange connector #2.5 for patients 41 – 51 inches or 25 – 35kg
  - Yellow connector #3 for patients 4 – 5 feet in height
  - Red connector #4 for patients 5 – 6 feet in height
  - Purple connector #5 for patients over 6 feet in height
- Apply lubricant to beveled distal tip and posterior side of tube avoiding air ports
  - Position head in “sniffing” (ideal) or neutral position
- Hold tube at colored connector end with dominant hand. With non-dominant hand; open mouth and apply chin lift
- Hold tube rotated laterally such that the blue line is touching the corner of the mouth, introduce tip into mouth and advance behind base of tongue
- As tip passes behind tongue, rotate tube back to midline. Blue line will face chin
- Without exerting excessive force, advance tube until base of connector is aligned with teeth or gums
  - Inflate cuffs with volume per manufacturer's guideline
    - If a leak occurs add 50% of original volume
      - If a leak continues after attempting above step, a larger tube may be needed
- Attach bag/valve, while gently bagging, simultaneously withdraw airway until ventilation is easy and free flowing and no air leak noted
- Confirm proper position by auscultation, chest movement and verification of CO₂ by capnography
- Continuous end-tidal CO₂ waveform monitoring is recommended during transport
- Secure airway with commercial tube holder device
  - If using a tube holder be aware that not all commercial holders work,
  - Also even when using a tube holder, it may be necessary to hold the tube, and continuous monitoring for leaks
**Endotracheal Intubation**

**Indications:**
- Unconscious patients in respiratory failure without an intact gag reflex
- Anticipated need for prolonged positive pressure ventilation
  - Patient’s with intact gag reflex see RSI guideline for approved providers

**Contraindications:**
- If intubation anticipated to be difficult and rapid airway control is necessary
- In pulseless arrest, when attempts at intubation are likely to interrupt CPR
- EMT-Intermediate:
  - Pediatrics (under 12 years old)

**Insertion:**
- Check baseline breath sounds
- Suction & pre-oxygenate, as necessary
  - Providers should always have a backup airway ready (King Airway®, Combitube® or other device)
- Patients should have constant pulse oximetry and cardiac monitoring done before, during and after the procedure
  - Any patient desaturation below 90% and/or drop in heart rate should result in immediate termination of the procedure and the patient should be bagged (ventilated) back up
- Check and prepare equipment
- Position patient:
  - If trauma: have assistant hold in-line spinal immobilization in neutral position
  - If no trauma: sniffing position or slight cervical hyperextension is preferred
- Place ETT
  - Correct tube depth may be estimated as 3 times the internal diameter of tube at teeth or gums (e.g: 7.0 ETT is positioned at 21cm at teeth)
- Confirm and document tracheal location by:
  - ETCO2 waveform or colormetric device
  - Presence and symmetry of breath sounds
  - Stable or rising SpO2

**Removal:**
- Turn on suction and place patient on side
- Deflate cuffs
- Withdraw tube
- Re-assess ABC’s
All devices shall be secured appropriately
  o For non-trauma patients, if excessive movement is anticipated, consider immobilization of patient to better prevent dislodged endotracheal tubes
• Any movement or change in the patient’s status shall result in immediate re-evaluation of the airway placement

IMPORTANT NOTES:
• De-saturation below 90% and/or drop in heart rate should result in immediate termination of the procedure and the patient should be bagged (ventilated) back up
  o Respiratory disease patients may not be able to get sats above 88-90%. Use caution as those patients will desaturate quickly
• After two (2) unsuccessful intubation attempts on the patient, providers should terminate intubation attempts and promptly move forward with their planned rescue/salvage procedure to secure the airway
• Endotracheal intubation is associated with worse outcomes among pediatric patients and head injured patients when compared to BLS airway maneuvers. Therefore, it is relatively contraindicated in these populations
• Endotracheal Intubation is associated with interruptions in chest compressions during CPR, which is associated with worse patient outcomes. Additionally, intubation itself has not been shown to improve outcomes in cardiac arrest
• Providers shall fill out the TJEMS airway form located on the www.tjems.org website and submit it after any attempted airway procedure

Helpful Tips for Endotracheal Intubation:
• Use of an “endotracheal introducer” or “gum elastic bougie” to assist in endotracheal intubation is strongly encouraged for initial attempts or with an anticipated or proven difficult airway
• The availability of equipment such as video laryngoscopy should be considered for all agencies/providers undertaking endotracheal intubation
- **L.E.M.O.N.**
  - Look - at the patient’s anatomy, any facial trauma, large tongue, beard, etc.
  - Evaluate - 3, 3, 2 fingers between: teeth, hyoid and mentum, hyoid and thyroid
  - Mallampati Classification
  - Obstruction – secretions, stridor, muffled voice, mass and/or foreign body
  - Neck Mobility – limited neck mobility
Capnography must be used on all endotracheal airways and should be used with supraglottic airways. It may also be used with spontaneously breathing patients whose respiratory status may be further evaluated with the use of waveform capnography.

Procedure:

1. Attach capnography sensor to endotracheal tube, supraglottic airway, nebulizer or oxygen delivery device.
   a. If you are unable to obtain a CO2 reading, re-evaluate your airway device and may include removal of device, reverting back to an OPA/NPA.

2. Note CO2 level and waveform changes.
   a. Normal levels: ETCO2 of 35 – 45 mmHg
   b. Example of “normal” wave forms:

3. The capnometer shall remain in place and be monitored throughout transport.
   a. A rise in CO2 above normal indicates inadequate ventilation and requires increase in rate of ventilation.
   b. A CO2 below normal or falling indicates hyperventilation and requires decrease in rate of ventilation.

4. Colorimetric devices may be used for confirmation but not for monitoring.

5. Documentation of initial reading and reading at the time of transfer of care should be recorded. Both strips should be attached to regional airway form. Attaching a copy of the strips to the PPCR/ePPCR is also required.
Indications: **Unstable** patients with supraventricular tachycardia or ventricular tachycardia with pulse or rapid atrial fibrillation.

Procedure

- Ensure patient is properly attached to monitor/defibrillator and capturing.
- Set energy selection to appropriate setting per manufacturer recommendations.
- Set monitor to sync mode.
- Charge the device.
- Ensure the patient is clear of all personnel.
- Press and hold the shock button to cardiovert. Stay clear until energy has been delivered (there may be a delay from the time the shock button is pushed until the energy is delivered).
- Note response and perform immediate defibrillation if indicated.
- If patient’s condition is unchanged, repeat using escalating energy until maximum setting or the rhythm stabilizes.
- Document procedure, response, time and energy settings on PPCR.
Continuous positive airway pressure (CPAP) is a treatment modality that is used in conjunction with medical therapy in the management of pulmonary edema. Pulmonary edema most frequently occurs due to cardiac causes (congestive heart failure), although it can occur from non-cardiac causes such as near drowning and fluid overload from renal failure. CPAP maintains a positive pressure in the respiratory system throughout the respiratory cycle and can reduce the work of breathing and improve oxygenation in patients with pulmonary edema. This guideline has been developed for use with the Whisperflow CPAP system, but the general principles apply to any CPAP system. CPAP is a non-invasive therapy that can be used by both ALS and BLS providers.

**Indications for CPAP:**

- Pulmonary edema due to CHF, fluid overload or near-drowning
- Hypoxia – pulse oximetry less than 90%
- Significant respiratory distress including use of accessory muscles and retractions
- Associated signs of CHF including edema of the legs, neck vein distention and rales/wheezing on chest examination

**Contraindications for CPAP include:**

- Lack of spontaneous respiration
- Unconscious
- Inability to maintain on open airway
- Pneumothorax
- Significant trauma to the face or chest
- Hypotension (systolic BP <90)
- Uncontrolled vomiting

**Monitor patient’s vital signs**

- If the patient is unable to tolerate the CPAP mask, therapy may need to be discontinued and high flow oxygen therapy re-instituted.
- The CPAP mask must be removed if the patient begins vomiting and not re-applied until vomiting is controlled.
- If the patient’s condition deteriorates to the point they lose consciousness or they lose the ability to maintain their posture and the seal of the mask then CPAP will need to be discontinued and BVM assistance of respiration initiated.
- If the patient’s blood pressure drops below 90 systolic, discontinue CPAP therapy.
- If the patient has adapted to using the CPAP mask and the system is operating properly but oxygen saturations remain less than 90%, increase the inspired oxygen concentration by attaching standard oxygen tubing to the port just below the pressure valve adapter and add oxygen using the low pressure oxygen regulator.
  - Start at flow rates of 2 L/minute and increase by 2 L/minute until saturations improve to 90% or better.
If the patient does not seem to be responding to CPAP

- Double check connections from the oxygen source to the generator and from the generator to the patient circuit.
- Make sure that your oxygen source has adequate reserve to power the generator. CPAP requires a closed system to maintain positive pressure, so check for leaks around the mask and the connections.
- Inform the receiving hospital that CPAP therapy has been initiated so that a CPAP generator can be made available when the patient reaches the emergency department.
- The corrugated patient circuit tubing, mask, head straps and the pressure valve are single patient use only.
## Indications:
- Cardiac arrest with ventricular fibrillation or pulseless ventricular tachycardia

## Procedure:

### Adults
- Continuous chest compressions only with passive ventilations (room air or NRB mask)
  - Rate of 100 to 120 beats/minute
  - Adequate depth of compression
    - Adults, minimum 2", but no more than 2.4"
    - Adequate chest recoil
  - **If staffing allows:**
    - Continuous compressions w/1 breath every 6 seconds (basic maneuver and/or airway adjunct)
- Advanced airway (supraglottic or ET) placement if and/or when ROSC (return of spontaneous circulation)

### Infants and Children
- Ratio of 30:2 for infants and children (single rescuer)
  - 15:2 for two (2) rescuer
    - Prioritize ventilation
- Basic airway maneuver and/or adjuncts

---
- Defibrillation should occur as soon as an AED or monitor is available.
- Apply defibrillation pads.
- Set the appropriate energy setting per manufacturer recommendation. If appropriate energy setting is unknown, use 200j for biphasic devices.
- Charge the defibrillation while continuing chest compressions.
- Stop compressions and “clear” the patient visually and verbally ensuring no person is in contact with the patient and the oxygen source has been adequately removed.
- Press the shock button to deliver the shock.
- Immediately resume compressions.
- After two (2) minutes of CPR, assess rhythm and check pulse if appropriate for rhythm.
- Repeat procedure every two (2) minutes with energy setting per manufacturer recommendation. If appropriate energy setting is unknown, use 200j for biphasic devices.
- Limit interruptions of CPR and limit pulse checks to every two (2) minutes. Any interruption in CPR ideally should be less than 10 seconds.
The bougie, often called a gum elastic bougie (GEB), is a long, flexible stylet which is introduced through the glottis opening before the ETT, whether visualization of the vocal cords can be achieved or not. The distal end is curved upward and there are markings at 10 cm intervals to measure ETT insertion depth. This shape and size of the GEB are designed to be easier to place in the trachea than the ETT when faced with a difficult airway. The following guideline is meant to facilitate the use of this highly efficient and easy-to-use difficult airway tool.

**Indications:**
- Unsuccessful intubation attempts
- Predicted difficult intubation

**Contraindications:**
- Less than eight (8) years old
- ETT size less than 6.5 mm

**Procedure:**
- Select proper ETT without stylet, test the cuff and prepare suction
- Lubricate the distal end and cuff of the ETT and the distal ½ of the bougie
  - Note: failure to lubricate the bougie and the ETT may result in failure
- Visualize the vocal cords using laryngoscopy and introduce the bougie with curved tip anteriorly
  - The tip should be seen passing through the vocal cords or above the arytenoids if the cords cannot be visualized.
- Once inserted, gently advance the bougie until you meet resistance (“hold-up”) or movement of the tip on the tracheal rings (“washboard”). If resistance is not met and/or tracheal rings are not felt then a probable esophageal intubation has occurred and insertion should be attempted again.
- Once the tip has been properly place, a second provider should be used to load the ETT and hold proximal control of the bougie to keep it in the trachea while the operator is still holding laryngoscopic pressure.
- Gently advance the bougie and loaded ETT until you feel hold-up or tracheal rings again, thereby assuring proper placement.
- While maintaining a firm grasp on the proximal bougie, slide the ETT over the bougie to the appropriate depth.
- If you are unable to advance the ETT into the trachea and the bougie and ETT are adequately lubricated, withdraw the ETT slightly and rotate the ETT 90 degrees COUNTER-clockwise to turn the bevel of the ETT posteriorly. If this technique fails, direct laryngoscopy while advancing the ETT might be necessary (this will require an assistant to maintain the position of the bougie and advance the ETT).
- Once the ETT is correctly placed, hold it securely and remove the bougie.
- Confirm tracheal placement with all pertinent methods, secure tube and reassess frequently.
Provider level: Intermediate and Paramedic

Indications:

- Critically ill patient who is >12 years of age and requires IV access for fluid or medication administration when an extremity cannulation is not possible.
- Can be attempted initially in life threatening situations where no obvious peripheral site is noted.
- Consider intra-osseous insertion as a viable alternative

Procedure:

- Use personal protective equipment.
- Gather all necessary equipment, attach extension tubing when possible.
- Place the patient in a supine, head down position. This helps distend the vein and decreases the chance for air embolism.
- Turn the patient’s head toward the opposite site of insertion if no risk of cervical injury exists.
- Prep the site as per the peripheral IV.
- Align the catheter with the vein and aim toward the same side shoulder.
- “Tourniqueting” the vein lightly with one (1) finger above the clavicle, puncture the vein midway between the angle of the jaw and the clavicle to cannulate the vein in the usual method.
- Attach the IV and secure the catheter avoiding circumferential dressing or taping.
- Label with “field”, date and initials of person performing procedure.
- Set proper flow rate.
- Use caution to not inadvertently pull out the line.
- Document procedure, time, type of fluid, flow rate, total infusion at the time of transfer, provider who performed procedure and response to treatment.
King Airway
Procedure Guideline

Reviewed: 2017     Updated: September 2015

Description:
- Sterile single use latex-free device
- Curved tube with ventilation ports between two (2) cuffs
- Both cuffs are inflated using a single valve/pilot balloon
- Cuffs are designed to seal the esophagus and oropharynx

Indication:
- Airway management in patients over 35 inches in height or 12 kg

Contraindications:
- Responsive patients with intact gag reflex
- Patients with known esophageal disease
- Patients who have ingested caustic substances

Warnings:
- King airway does not protect the airway from aspiration or regurgitation
- High airway pressures may leak air into the stomach or atmosphere
- Intubation of the trachea is possible (although not reported)
- Lubricate only the posterior surface of the King airway

Insertion:
- Check baseline breath sounds
- Choose correct size
  - Green connector #2 for patients 35 – 45 inches or 12 – 25kg
  - Orange connector #2.5 for patients 41 – 51 inches or 25 – 35kg
  - Yellow connector #3 for patients 4 – 5 feet in height
  - Red connector #4 for patients 5 – 6 feet in height
  - Purple connector #5 for patients over 6 feet in height
- Apply lubricant to beveled distal tip and posterior side of tube avoiding air ports
- Pre-oxygenate, if possible
- Position head in “sniffing” (ideal) or neutral position
- Hold tube at colored connector end with dominant hand. With non-dominant hand open mouth open and apply chin lift.
- Hold tube rotated laterally such that the blue line is touching the corner of the mouth, introduce tip into mouth and advance behind base of tongue.
- As tip passes under tongue, rotate tube back to midline. Blue line will face chin.
• Without exerting excessive force, advance tube until base of connector is aligned with teeth or gums.
• Inflate cuffs with volume as above.
  o If a leak occurs add 50% of original volume,
  o If a leak continues after attempting above step, a larger tube may be needed.
• Attach bag/valve. While gently bagging, simultaneously withdraw airway until ventilation is easy and free flowing and no air leak noted.
• Confirm proper position by auscultation, chest movement and verification of CO2 by capnography if available.
• Continuous end-tidal CO2 monitoring is recommended during transport.
• Secure airway with tape or tube holder device
  o If using a tube holder be aware that not all commercial holders work,
  o Also even when using a tube holder, it may be necessary to hold the tube, and continuous monitoring for leaks.

Removal:

• Airway is well tolerated until the return of protective reflexes
• Turn on suction and place patient on side
• Deflate cuffs
• Withdraw tube
• Re-assess ABC’s
A needle cricothyrotomy airway is a standing-order, Paramedic-level procedure designed for the viable patient airway that cannot be successfully managed with the available non-invasive (BVM) or invasive airway devices/procedures, which include the supraglottic devices and endotracheal intubation. This procedure provides limited, short term oxygenation but provides little ventilation. It should be used only as a temporary airway.

**Level of care:** Paramedic

**Indications:**
- Massive facial trauma
- Foreign body aspiration
- Laryngoedema
- Laryngospasm
- Airway burns
- Laryngeal fracture
- Epiglottis

**Complications:**
- Vocal cord injury
- Failure to place catheter in trachea

**Procedure:**
- Place patient in a supine position and hyperextend the neck using stable positioning. Consider keeping the trauma patient’s head in a neutral position.
- Prepare equipment including 14g Jelco type needle, 10cc syringe, ventilation tubing (pre-made kits should consist of short piece of IV tubing with hub in tact with the other end inserted and taped into a piece of oxygen tubing in which a slit has been made).
- Secure the larynx laterally between thumb and forefinger. Identify the cricothyroid membrane puncture site which is bounded superiorly by the thyroid cartilage and inferiorly by the cricoid cartilage.
- Cleanse the area properly with alcohol
- Insert 14g catheter at a 45 degree angle toward the feet
- Attach a 10cc syringe and attempt to aspirate air
- Thread the catheter completely to hub
- Connect tip to adapter with 15L O2
- Occlude the slit that has been cut into the oxygen tubing to provide a breath for the patient. The slit should be covered for one (1) second and uncovered for three (3) seconds to allow for the necessary prolonged expiratory phase.
• Additional needles may be placed in the cricothyroid membrane as needed and there is space to do so. Placement of additional catheters will allow for better ventilation. The hubs of all catheters should be occluded for one (1) second inhalation and uncovered for three (3) second exhalation.
• Assess placement and secure
• Documentation should include person performing procedure, indication for procedure, other methods of airway interventions that were attempted, time of procedure and response to treatment. A regional airway form should be completed.
**Needle Decompression**

**Procedure Guideline**

<table>
<thead>
<tr>
<th>Reviewed: 2017</th>
<th>Updated: June 2015</th>
</tr>
</thead>
</table>

**Provider level:** Intermediate and Paramedic

**Indications:**

- Patient with hypotension/shock in the setting of trauma with unilateral decreased breath sounds (after excluding mainstem intubation)
- Severe respiratory distress in the setting of trauma
- Patient is in traumatic arrest with chest trauma for whom resuscitation is indicated
- Bilateral decompression may be required if breath sounds are absent for unconscious patients with agonal respirations in the setting of trauma

**Procedure:**

- Use gloves and eye protection
- High flow oxygen
- Identify the intercostal space between the 2nd and 3rd ribs at the mid-clavicular line on the affected side
- Cleanse the site with alcohol
- Select a 14g needle at least two (2) inches in length from the drug box
  - Note: Jelco needles are supplied in the medication drawer
- Insert the catheter into the skin over the top of the 3rd rib into the intercostal space
- Advance the catheter until a “pop” is felt and either air or blood is noted from the catheter
- Remove the needle, leaving the catheter in place
- Secure the catheter hub to the chest wall
- Consider placing a finger cut from a glove over the hub after cutting a small hole in the end of the finger to make a flutter valve
Providers: Intermediate/Paramedic

Indications:

- Gastric decompression in intubation or ventilated patients

Procedure:

- Estimate length of insertion by measuring from corner of mouth, around ear to xiphoid process
- Lubricate the distal end of the tube
- Pass through the patient’s mouth along the tongue
- Continue to advance tube until appropriate depth of insertion as measure above is reached
- Confirm placement by using a Toomey syringe filled with air. Auscultate over the stomach for a “swish” of air or bubbling. Aspiration of gastric contents may also be attempted
- Secure the OG tube to the patient’s face with tape
- Decompress the stomach by connecting tube to suction (100 mmHg) or manually aspirating with Toomey syringe
- Document procedure, time and person performing procedure
Oxygen administration has been one of the cornerstones of pre-hospital care since its inception, and in many cases the dictum was "the more the better", resulting in the administration of high-flow oxygen to most, if not all, patients who received oxygen therapy. There is increasing evidence that administration of excessive amounts of oxygen during pre-hospital care can cause measurable adverse effects on patient outcomes.

Patients with chronic obstructive lung disease (COPD) should receive oxygen at the lowest flow rate required to keep their oxygen saturations at 90-92%. Oxygen therapy – if necessary – can be started at 2L/min via nasal cannula and titrated upwards as needed in 1 L/min steps. Patients on home oxygen should be started at their normal flow rate, or at an increased flow rate as directed by the patient, and then titrated upwards as required. Nebulized medications should be delivered using air rather than oxygen when possible to avoid high oxygen concentrations.

Patients with acute coronary syndrome should be treated with oxygen only if they are hypoxic, oxygen saturations of less than 90-92%. They should be started on flow rates of 2 L/min via nasal cannula and titrated upwards in 1 L/min steps as needed.

In general attention should be given to administering oxygen in a step wise manner at the flow rate necessary though the device necessary to maintain oxygen saturations in the range of 90-92%. There are some cases in which high flow oxygen is therapeutic, such as possible carbon monoxide poisoning, in which high flow rates/concentrations are still the goal of therapy.

References:


Indications (for patient’s ≥ 16 years old):

- Help control hemorrhage in pelvic fractures with ongoing hypotension
- May be applied in trauma patients with all of the following:
  - **Ongoing hypotension after two (2) liters of NS**
  - No other suspected reason for hypotension
    - Continued external blood loss, tension pneumothorax, etc.
  - Suspected pelvic fracture

Contraindications:

- None

Application procedure (EMT’s may assist with application):

- Remove objects from the patient’s pockets or pelvic area.

**SAM Pelvic Sling® Method:** (preferred device by experts)

- Place SAM sling printed side down under patient at level of the buttocks (greater trochanters / symphysis pubis).
- Wrap non-buckle side of sling around patient.
- **Firmly wrap** buckle side of sling around patient, positioning buckle at midline. Secure in place by velcroing blue flap to sling.
- Lift black strap away from sling by pulling upward.
- Firmly pull orange and black straps in opposite directions until you hear and feel click.
- **Maintain tension!**
- Immediately press black strap onto blue flap to secure it. *Do not be concerned if you hear a second click after sling secure.*

[https://www.youtube.com/watch?v=KVOk1WB2yhM](https://www.youtube.com/watch?v=KVOk1WB2yhM)

**Sheet or blanket Method:**

- Place sheet or blanket under patient at level of buttocks (greater trochanters / symphysis pubis).
- Wrap sheet tightly around patient’s pelvis to gradually compress pelvis at this level.
- Cross sheet ends and twist from opposing sides, applying pressure.
- Secure sheet ends.
Considerations:

- Assess pulse, motor and sensation after splinting
- The splint should not be removed in the prehospital setting due to risk worsening hemodynamic instability.

[https://www.youtube.com/watch?v=Omg79Ced6s0](https://www.youtube.com/watch?v=Omg79Ced6s0)
Requirements for RSI program:

- Current NREMT-P/Paramedic certification and other training as required by agency medical director.
- Second provider on scene who is cleared to perform intubation.
- Drugs will only be administered by RSI approved provider. If allowed by agency OMD, intubation may be performed by another qualified intubator under the direct supervision of the RSI approved provider.
- Written approval for each provider by OMD of agency where RSI will be used.
- There will be 100% QI review of patient encounters.
- Maintenance of RSI approval will require continued OMD approval.

Contents of RSI pack:

- Pack to be stored in secured area like drug boxes
  - 2 – Etomidate 20 mg/19g needles
  - 2 – Vecuronium 10 mg with filter needles
  - 2 – 10cc sterile water diluent/30 cc syringe
  - 2 – Succinylcholine 200 mg/10cc syringes
  - 2 – Ketamine 200 mg vials
  - 1 – Atropine 1 mg bristojet type syringe
  - 2 – 3cc syringes with 20g needles
  - 5 – 10cc syringes
  - 2 – 30cc syringes
  - 7 – 19g needles
  - 10 – alcohol prep pads

Indications for RSI:

- RSI may be done under standing orders
- Patients over 18 years of age unless specific permission given prior to procedure by medical command.
- Need for intubation:
  - Burns with suspected significant inhalation injury
  - GCS < 8 related to traumatic injury
  - Acute or impending airway loss (inability to protect airway)
    - RR < 10 or > 30
• No known contraindications to RSI drugs

Procedure:

• Preparation
  o Monitoring (continuous ECG and SpO2, and BP pre- and post-)
  o Monitoring waveform capnography
  o Functional laryngoscope and BVM with high flow oxygen
  o Endotracheal tube(s), stylet, 10cc syringe
  o Alternate airway (i.e. rescue airways and cricothrotomy equipment) immediately available
  o All medications drawn up and labeled
  o Patent IV
  o Assess for difficult intubation: LEMON
  o Suction on and ready
  o Tube confirmation equipment available (EtCO2 + EDD)

• Pre-oxygenation
  o Either 100% oxygen x 5 minutes or 8 vital capacity (deep) breaths on 100% O2
  o Patient on continuous pulse oximeter monitoring

• Paralysis and induction
  o Etomidate 0.3 mg/kg (20 – 30 mg)
  o Ketamine 1 – 2 mg/kg/IV
  o Succinylcholine 1.5 mg/kg (120 mg)
    - **Contraindicated with
    - Burns > 24 hours old
    - Crush injury > 72 hours old
    - Denervation process (i.e. para/quadriplegia)
    - Risk of hyperkalemia (i.e. ESRD)

• Confirmation of placement
  o End-tidal CO2 color change or proper waveform
  o Breath sounds auscultated over lungs, no gastric sounds
  o Secure endotracheal tube, note position

• Post-intubation management
  o Long-term paralytic: Vecuronium 0.1 mg/kg (9mg)
  o Sedation: (May be repeated as indicated)
    - Midazolam 0.1 mg/kg
    - Fentanyl 1 – 2 mcg/kg
    - Ketamine 1 – 2 mg/kg
  o Continuous waveform capnography

• Paperwork
  o PPCR
  o Airway form
  o RSI form

• Exchange
  o Kit will be exchanged in return for PPCR + Airway form + RSI form ONLY
## Spinal Motion Restrictions

### Procedure Guideline

<table>
<thead>
<tr>
<th>Patient ≥ 16 years old</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full Motion Restrictions</strong></td>
</tr>
<tr>
<td>C-collar, spider straps, head blocks on a back board</td>
</tr>
<tr>
<td>Multi-system blunt trauma (meets CDC triage level 1 or UVA Alpha or Beta alert criteria)</td>
</tr>
<tr>
<td>Acutely abnormal mental status due to trauma</td>
</tr>
<tr>
<td>Acute neurologic symptoms due to blunt and penetrating trauma, including weakness, numbness, tingling</td>
</tr>
<tr>
<td>Tenderness on palpation</td>
</tr>
</tbody>
</table>

Other considerations:

- Patients should not be forced or “wrestled” into motion restrictions, transport in position of comfort acceptable to patient. Make the motion restrictions conform to the patient, not the patient to the motion restrictions.
- If motion restriction procedures/devices worsen or cause symptoms, including pain, neurologic symptoms including numbness, weakness, tingling, or respiratory distress then discontinue procedure/device that aggravated the symptoms.
- Penetrating trauma to head, neck, torso without neurologic deficits should not be placed in motion restrictions
  - Manage acute life threats and emphasize prompt transport
- Consider removing spider straps, blocks/rolls, and long back board after patient has been transferred to ED stretcher in non-priority trauma patients.
A surgical airway is a standing-order, Paramedic procedure designed for the viable patient whose airway cannot be successfully managed with the available non-invasive (BVM) or invasive airway devices/procedures, which include the supraglottic devices (i.e. LMA, King, Combitube) and endotracheal intubation. Providers performing this skill must be released at their designated skill levels and be approved by their medical director.

**Level of care:** Paramedic

**Indication/s:** Not recommended for children less than 8 years of age

- Massive facial trauma
- Foreign body aspiration
- Laryngoedema
- Laryngospasms
- Airway burns
- Laryngeal fracture
- Epiglottitis

**Complications:**
- Severe bleeding
- Vocal cord injury
- Failure to place catheter in trachea

**Procedure:**
- Place patient in a supine position and hyperextend the neck using stable positioning. Consider keeping the trauma patient’s head in a neutral position.
- Secure the larynx laterally between thumb and forefinger. Identify the cricothyroid membrane puncture site which is bounded superiorly by the thyroid cartilage and inferiorly by the cricoid cartilage.
- Cleanse the area properly with betadine swab.
- With scalpel, make a 1.0 to 2.0 cm shallow, vertical incision over the skin. Have fingers on either side providing mild to moderate spreading pressure to open the incision, if landmarks are obscured by marked obesity or subcutaneous air, make a 2.0 to 3.0 cm vertical incision through the skin, and dissect bluntly down to identify the cricothyroid membrane.
- Once the membrane has been located, make a 1.0 cm horizontal puncture.
- Enlarge the incision with the handle of the scalpel or other appropriate surgical instrument. NEVER enlarge the incision with the scalpel blade. A bougie can be used to determine whether the incision was made all the way through the anterior wall of the
trachea. While moving the bougie, proper positioning should be indicated by feeling a "washboard" feeling as the bougie tip rubs against the tracheal rings.

- Insert the appropriate size tracheostomy tube (in the absence of a tracheostomy tube, an endotracheal tube may be used). Insert the tube only until the cuff enters the trachea then inflate the cuff. Remove the obturator, ventilate and confirm successful airway placement:
  - Observe chest wall rise on ventilation
  - Auscultate for bilateral breath sounds
  - ETCO2 waveform/SpO2 monitoring is required to determine and maintain correct tracheal tube placement
  - Secure the tube with twill tape
Indications:

- Heart rate less than 60 beats per minute with signs and symptoms of inadequate perfusion.

Procedure:

- Attach cardiac monitor leads.
- Apply multi-function or pacing pads per manufacturer recommendation.
- Select pacing function on cardiac monitor.
- Set heart rate to 80 bpm for adults and medical control for children.
- Note pacer spikes on ECG screen.
- Slowly increase output (mA) from the lowest setting until electrical capture is attained. Electrical capture occurs when the pacer spike immediately precedes the QRS complex.
- If unable to capture while at maximum current output, turn the pacer off.
- If electrical capture is attained, check the patient for corresponding pulse (mechanical capture) and assess vital signs.
- Consider the use of sedation or analgesia if indicated when BP > 90 mmHg.
- Document response to pacing. Attachment of ECG strips to the PPCR/ePPCR is required.
Indications:

- Any medical or traumatic patient where either fluid or medication therapies are needed or the need for such may arise.

Fluid resuscitation/hydration rates:

- KVO or TKO rates are:
  - Adults
    - 30 – 60 mL/hr
  - Children 4 years and under:
    - No more than 30 mL/hour
  - Neonates:
    - See below

- Adults:
  - Fluid boluses when indicated should generally be 500 mL and can be repeated until:
    - A maximum of two (2) liters
    - SBP reaches 90 – 110 mmHg and/or MAP ≥ 65 (mean arterial pressure)
    - Increase in respiratory distress/increasing hypoxemia
  - Fluid boluses of less than 500 mL may be indicated according to patient condition.

- Pediatric:
  - Fluid boluses should be 20 mL/kg repeated as needed for poor perfusion.
    - After 2 – 20 mL/kg call medical command for further instructions.

- Neonatal (<30 days):
  - Fluid boluses should be 10 mL/kg over 30 minutes as needed for poor perfusion.
    - After 2 – 10 mL/kg call medical command for further instructions.

IV Procedure:

- Gather necessary equipment.
- Select appropriate fluid and administration set.
  - NS is generally the fluid of choice.
  - Use macro-drip (15gtt) set for trauma patients and medical patients where fluid overload is unlikely and infusion of IV medications is not anticipated.
  - Use micro-drip (60gtt) set when possibility of fluid overload is a concern (CHF or pediatric patients) or when infusion IV medications may be indicated (dopamine or amiodarone drips).
  - Use of extension tubing is required on all insertions. Use of the short or long extension tubing is at the discretion of the provider according to patient condition.
- Apply personal protective equipment.
- Select appropriate site.
  - Begin with the most distal site suitable. Avoid the use of the both hands if establishing bilateral IV’s. Cardiac arrest, acute stroke and SVT should have antecubital IV.
Avoid extremities with injury or where venous access is contraindicated (radical mastectomies, dialysis, etc.).

- Lower extremities should be avoided in patients with poor distal circulation such as diabetics.
- Perform the IV insertion using aseptic techniques.
- Set the appropriate rate, as indicated above in the fluid replacement/hydration section.
- Secure the IV in a manner to ensure it remains as clean as possible.
  - Uses of commercial products such as Tegaderms are encouraged when available.
  - Sterile dressing can be folded and placed over the hub of the catheter prior to taping.
  - Taping should be applied in a manner that uses the least amount of tape feasible and reasonably allows tubing to be disconnected.
  - All field insertions should be labeled with “Field” and the gauge of catheter.
- Consider insertion of second line when shock is present or anticipated.
- Document procedure, time, provider performing insertion, number of attempts, type of fluid, rate of administration, total infusion at the time of transfer and any response to fluid therapy.

**IO Procedure:**

**Intra-osseous Insertion**

**EZ-IO®**

**Indication:**
- The EZ-IO® is approved for patients weighing 40kg (88lbs) or more. The EZ-IO PD® is approved for patients weighing 3-39kg (6.5-85lbs). Placement is indicated when a patient is in or approaching extremis and either intravascular fluid resuscitation or medications are essential to resuscitation efforts, but traditional vascular access techniques are not possible or require multiple or prolonged attempts. Such patients should undergo two (2) RAPID IV attempts prior to utilizing the EZ-IO® system.

- Appropriate patient examples (not all inclusive):
  - Near arrest
  - Status epilepticus (no response to IM Versed)
  - Patients in profound shock with or without altered level of consciousness
  - Severe burns
  - Cardiac arrest
  - Post resuscitation
  - Profoundly hypoglycemic patients with no response to Glucagon after 5 – 10 minutes

- Patients who are NOT appropriate candidates:
  - Unconscious but without significant trauma
  - Hemodynamic instability
  - Seizure

**Contraindications:**
- Fracture of the bone you intend to place the IO in (tibia or humerus)
- Previous orthopedic procedures (i.e. knee replacement) in the area of intended insertion (as indicated by a large scar)
- The extremity is compromised by a pre-existing condition (i.e. tumor)
- Skin infection at the insertion site (i.e. redness, skin lesions)
- Inability to locate landmarks
- Excessive tissue over the insertion site (If the 5mm mark on the IO needle is not visible once the needle has been placed through the skin, but has not reached to the bone, then there is too much tissue)
- If any of these contraindications are noted, check another extremity for possible insertion
Equipment:
- EZ-IO® driver and appropriate needle set for patient size (EZ-IO PD® is pink)
- 10ml syringe
- Alcohol or Chlorhexidine swabs
- Extension set or EZ-Connect
- IV fluid, tape or gauze
- Pressure bag and/or bolus fluid administration set-up

Procedure:
- Observe BSI precautions and aseptic techniques
- Locate the proper site for EZ-IO® insertion (tibia only for pediatric patients; tibia or humerus for adults)
  - **Adult tibial insertion:**
    - With the leg extended, locate the patella (kneecap), feel the anterior surface of the leg just below the patella, approximately 2 fingers widths. This round, oval bump is the **tibial tuberosity**. From the tibial tuberosity **move 1 finger width medial** (towards the centerline of the body) to the flat part of the tibia. This is the insertion site.
  - **Adult humeral insertion:**
    - Expose the shoulder and place the patient’s arm against the patient’s body, resting the elbow on the stretcher or ground and the forearm resting on the abdomen. Note the humeral head on the anterior-superior aspect of the upper arm or the anterior-lateral shoulder. Palpate and identify the **mid-shaft humerus** and continue palpating toward the proximal end (humeral head). Near the shoulder feel for a **small protrusion**, this is the base of the **greater tubercle** and the insertion site. With the opposite hand, “pinch” the anterior and inferior aspects of the humeral head, while confirming the identification of the greater tubercle. This will help ensure that you have located the midline of the humerus.
  - **Pediatric tibial insertion:**
    - If the tibial tuberosity **CAN** be palpated, the insertion site is one finger width below the tuberosity and then medial along the flat aspect of the tibia. If the tibial tuberosity **CANNOT** be palpated, the insertion site is two (2) finger widths below the patella and then medial along the flat aspect of the tibia. EZ-IO PD® Pediatric is **ONLY** for tibial insertion, not humerus.
- Clean the insertion site thoroughly using alcohol or Chlorhexidine for at least a 3” diameter around the site.
- Prepare the EZ-IO®
- Remove the driver and one (1) EZ-IO® cartridge.
- Open the cartridge and attach the proper size needle set to the driver (you should feel a “snap” as the set connects to the driver).
- Remove the needle set from the cartridge.
- Remove the safety cap from the needle set. With the needle facing you, grasp the cap tightly and rotate clockwise to loosen and remove. (Attempting to pull the cap may remove the needle set from the driver, and rotating counter-clockwise will cause the catheter and stylet to separate.)
- Insert the EZ-IO® needle set.
- Hold the driver in one hand and stabilize the insertion site laterally with the opposite hand. Make sure your hands and fingers are out of the path of insertion, and that the patient is prevented from moving suddenly (i.e. do not position your hand behind the extremity).
- Position the driver at the insertion site with the needle at a 90 degree angle to the bone.
- Power the needle set through the skin at the insertion site until it encounters the bone surface. If in doubt, verify that there is enough needle length (not too much tissue) by observing the 5mm mark.
- Apply firm and steady pressure on the driver and apply power, ensuring the driver is maintained at a constant 90 degree angle to the bone.
• Stop when the needle flange touches the skin or a sudden decrease in resistance is felt. This indicates entry into the marrow cavity. “STOP WHEN YOU FEEL THE POP”
  □ Remove the driver from the needle set.
  □ Support the needle set in on hand, gently pull straight up on the driver and lift away.
  □ Remove the stylet from the catheter by grasping the hub firmly with one hand, rotate the stylet counter-clockwise (unscrew the stylet from the catheter). Pull the stylet out and place in a sharps container.
  □ Attach a 10cc syringe and attempt to aspirate marrow (no aspirate alone does not indicate improper placement).
• Flush the IO with 10cc’s of NS
□ Confirm placement with one (1) or more of the following criteria:
  o Firm 90 degree position
  o Blood at the tip of stylet
  o Aspiration of marrow
  o The device flushes easily and fluids flow freely without subcutaneous swelling or fluid leakage.
□ Attach the infusion, secure and stabilize the catheter to the insertion site.
□ Monitor for any change in placement and remove as necessary.
□ Assure that you can fully visualize the area of insertion so that you can fully assess.
□ On-going assessment should include frequent palpation and inspection of the placement site both anteriorly and posteriorly to assure there is no infiltration or extravasation of fluid.
□ Due to the anatomy of the IO space, flow rates may be slower compared with normal IV catheters. Use a pressure bag for rapid infusions or administer by slow bolus via syringe.
  o PEDIATRIC: administration should be by syringe bolus only.
□ Apply wristband to patient to identify that an IO has been placed (optional).
• Document use of EZ-IO® on PPCR with indication and placement confirmation method per above criteria.
• For pain with fluid administration, administer 2% Lidocaine (preservative free) 20 – 40 mg for adults and 0.5 mg/kg for children. Use extreme dosage precautions to avoid medication error.

Removal:
□ Removal should be a smooth clockwise rotation of the needle, NOT a rocking motion.
• If there is indication of improperly placed EZ-IO® attempt in another extremity.
□ NEVER attempt a second IO in the same bone as a previous attempt.
• If improper placement is suspected, gently pull out the needle, seal off the access and advise hospital staff on your arrival of improper placement, so that the site can be properly monitored for any complications during the patient’s hospital course.