PROCEDURES

Procedures - Section 30.000

Airway Management

Fundamental Concepts

Purpose:

Proper airway management is the first priority of the EMS Provider/Paramedic.

Indications:

- Airway control and protection.
- Inadequate ventilation and/or oxygenation.

Oxygenation, Maintenance of Airway and Ventilation:

A. Supplemental oxygen:

1. A Nasal cannula is useful for small amounts of supplemental oxygen.

2. Partial Rebreather masks (PRB) are recommended when higher flow and concentrations of oxygen need to be delivered.

3. "Blow-by" oxygen should be used for infants and toddlers.

4. Attempt to maintain oxygen saturation >94%.

B. Nasopharyngeal Airway (NPA) or Oropharyngeal Airway (OPA) should be used for patients who are unable to maintain their own airway.

C. A Bag-Valve-Mask (BVM) should be used when inadequate ventilation is present.

D. CPAP should be considered for MEDICAL patients complaining of moderate to severe respiratory distress meeting **ALL** the criteria described in ***Continuous Positive Airway Pressure (CPAP)*** procedure.

E. PEEP valve should be considered when ventilating a patient with COPD or emphysema to maintain alveolar inflation during exhalation.

Automatic Implantable Cardio-Defibrillator (AICD) Deactivation

Definition:

An AICD is an implanted defibrillator device that consists of a lead system that senses cardiac activity, logic circuitry to analyze the sensed signals, a power supply for device function and generating high voltage, and a capacitor that stores and delivers shocks when needed when brady and/or tachyarrhythmias are detected within programmed parameters. These devices may malfunction occasionally.

Indications:

For verified frequent and recurrent inappropriate AICD discharges, a magnet may be utilized to deactivate "runaway" devices. Inhibition of AICD devices should be considered only when continuous ECG monitoring with ACLS is readily available and there is evidence of device malfunction.

Procedure:

A. Contact OLMC.

B. Monitor ECG and verify sinus rhythm AND inappropriate defibrillator discharge.

C. Locate the position of the AICD device.

D. Place doughnut magnet directly over the device.

E. After defibrillator deactivation, tape magnet firmly in place and transport.

Precautions:

A. It is very important to make the correct diagnosis before utilizing this protocol (ECG showing NSR without ectopy and indications of recurrent AICD discharges).

B. Some AICD devices will emit varying beeping or continuous tones when magnets are applied, others will not. Disregard these tones.

C. If the magnet placement is successful in overriding the pulse generation of the AICD, DO NOT REMOVE THE MAGNET. Some units will return to operational activity after removal of the magnetic field.

Magnets should be stored so as not to come in contact with magnetic sensitive materials, i.e., tapes, credit cards, magnetic door entry cards, and other electronic equipment.

A small percentage of AICDs are impervious to magnetic fields (AICD recipients who normally work around magnetic fields have these special units) and will not be deactivated with the doughnut magnet. In such cases advise OLMC and transport.

Consider use of the AICD magnet in deactivating cardiac pacemaker malfunctions.

Identification information of the AICD type, date implanted and location of implantation (usually on a wallet card) should accompany the patient to the ED.

Continuous Positive Airway Pressure (CPAP)

Continuous Positive Airway Pressure has been shown to rapidly improve vital signs, gas exchange, and to decrease the work of breathing, the sense of dyspnea and the need for endotracheal intubation in patients who suffer from shortness of breath secondary to CHF/pulmonary edema, COPD, or severe asthma.

Indications:

MEDICAL patients complaining of moderate to severe respiratory distress meeting **ALL** the following criteria:

A. Is awake and oriented and has the ability to maintain an open airway.

B. Has signs and symptoms consistent with either CHF/pulmonary edema, COPD, or severe asthma.

C. Has a systolic blood pressure above 90 mmHg (MAP of 65 mmHg).

D. Is over 12 years old and is able to fit the CPAP mask.

Contraindications:

A. Respiratory arrest

B. Non-cooperative patient

C. Suspected pneumothorax

D. Hemodynamically unstable

E. Presence of tracheostomy

F. Inability to maintain mask seal

G. Active vomiting

Procedure:

A. EXPLAIN and COACH THE PATIENT ON THE PROCEDURE.

B. Ensure adequate oxygen supply to ventilate device.

C. Place the patient on continuous pulse oximetry and end-tidal CO_2.

D. For the CPAP device: start with oxygen flow at the manufacturer's recommended rate and adjust as needed and adjust as needed. Look at manometer for correct pressure.

E. Place the CPAP over the mouth and nose.

F. Secure the mask with the provided straps.

G. Check for air leaks.

H. Monitor and document the patient's respiratory response to the treatment.

I. Continue to coach patient to keep mask in place and readjust as needed.

J. IF RESPIRATORY STATUS DETERIORATES, REMOVE DEVICE AND CONSIDER BAG VALVE MASK VENTILATION AND/OR ENDOTRACHEAL INTUBATION.

Removal Procedure:

CPAP therapy needs to be continuous and should not be removed unless the patient cannot tolerate the mask or experiences continued or worsening respiratory failure.

Special Notes:

A. If unable to maintain oxygen saturation > 90%, administer positive airway pressure via BVM and PEEP valve.

B. Reassessment of the patient's status is critical and documentation should be performed every 5-10 minutes until patient is stable.

C. Remove CPAP mask temporarily to administer nitroglycerin.

D. Suctioning of secretions may be required on some patients.

E. Watch for gastric distention and/or nausea.

F. Estimated CPAP pressure delivered by CPAP:

Oxygen Flow Rate (liters / min)		Estimated CPAP Pressure (cm H_2O)
Flow-Safe II	Rescuer II	
8 - 9	5	5
10 - 12	7	7.5
13 - 14	8	10

Endotracheal Intubation

Indications:

- Hypoventilation.
- Severe hypoxemia (hypoxemia despite supplemental oxygen).
- Clinical condition requiring airway protection.
- Airway obstruction.
- Head injury with GCS ≤ 8 secondary to trauma.

Procedure:

A. Open airway, pre-oxygenate patient.
   1. If patient is breathing, administer oxygen via NRB mask.
   2. If patient is not breathing, use a BVM with OPA/NPA.
   3. Place nasal cannula in the patient's nares. If patient tolerates, administer oxygen at 15 L/minute (apneic oxygenation).
   4. If unable to maintain oxygen saturation > 90%, consider addition of PEEP valve to BVM and continue apneic oxygenation.

B. Assemble airway equipment including two O_2 tanks w/ regulators, nasal cannula, mask or BVM, intubation equipment, suction, and alternative airway devices (Bougie, rescue airway) and attach required equipment (cardiac monitor, $EtCO_2$ monitor and pulse oximeter). Optimize patient position for mask ventilation, laryngoscopy, and intubation by aligning the ear with the sternal notch for nontrauma patients.

C. If feasible, consider positioning of the patient in semi-sitting position or head up approximately 20-30 degrees.

D. Open airway/Oxygenate.

E. Intubate patient with bougie (strongly recommended).

F. Verify placement of ET tube using the $EtCO_2$.

G. Insert an oral airway or compatible bite block device.

H. Secure the ET tube and record depth.

I. Verify placement of ET tube using the $EtCO_2$. Place patient on continuous $EtCO_2$ monitoring. **In situations where $EtCO_2$ does not have a consistent waveform, the ET tube should be removed and ventilation be performed by alternative methods (BVM, supraglottic airway, or repeat intubation) <u>OR</u> perform direct visualization of ET tube inserted through vocal cords.**

J. **Always** recheck and document the ET tube placement with $EtCO_2$ after every major movement of patient or change in vital signs.

Intubation with Paralytic Agents

[Advanced Airway Training Required]

Procedure:

A. Start IV per protocol.

B. Administer etomidate 0.3 mg/**kg** IV/IO push. If etomidate unavailable, administer ketamine 1 mg/**kg** (Ideal Body Weight) IV/IO.
- **1.** All patients who received ketamine should receive one dose of midazolam.
- **2.** Ketamine may be the preferred pre-induction agent for young patients (< 35 years) with severe asthma due to its bronchodilator effects.
- **3.** If emergency cricothyroidomy is required, consider administration of either etomidate or ketamine without paralytics.

C. Follow with succinylcholine:
- **1.** Adults and children 6 years or older (≥ 20 kg): 1.5 mg/**kg** IV/IO.
- **2.** Children less than 6 years old (< 20 kg): 2 mg/**kg** IV/IO push.
- **3.** If inadequate relaxation present after 60-90 seconds, check IV line patency and repeat the same dose.
- **4.** If succinylcholine is contraindicated, substitute vecuronium 0.1 mg/**kg** IV/IO push or rocuronium at 1 mg/**kg**.

D. Continue or initiate apneic oxygenation via nasal cannula at 15 L/minute during the intubation process.

E. When patient is paralyzed, perform intubation with bougie (strongly recommended), approximately 1 minute after succinylcholine; 2-3 minutes for vecuronium.
- **1.** If patient desaturates (pulse oximetry reading of less than 90%) during the attempted intubation, ventilate with BVM and 100% oxygen before next attempt.
- **2.** If intubation attempts fail, ventilate via BVM and proceed to rescue airway (i.e. i-gel airway).
- **3.** If unable to ventilate with BVM or rescue airway, proceed to cricothyrotomy.

F. Treat bradycardia occurring during intubation with ventilation;
- **1.** If bradycardia persists, administer atropine:
  - **a.** Adults 1.0 mg IV/IO.
  - **b.** Pediatrics: Atropine, 0.02 mg/**kg** IV/IO **for children less than 2 years old**. Minimum dose is 0.1 mg. Do not exceed adult dose.

G. Verify placement of ET tube using the $EtCO_2$. Place patient on continuous end-tidal CO_2 monitoring. **In situations where $EtCO_2$ does not have a consistent waveform, the ET tube should be removed and ventilation be performed by alternative methods (BVM, supraglottic airway, or repeat intubation) OR perform direct visualization of ET tube inserted through vocal cords**. Consider insertion of OG tube to decompress the stomach and facilitate ventilation.

H. Insert an oral airway or compatible bite-block device.

I. Secure the endotracheal tube and record depth.

J. **Always** recheck and document the ET tube placement with $EtCO_2$ after every major patient movement or change in vital signs.

K. Administer midazolam, 2.5 - 5 mg IV/IO if systolic BP > 100 mmHg. This may be repeated every 15 minutes to maintain sedation as needed. (Pediatric dosage 0.1 mg/**kg**, up to 2.5 mg). If agitation or combativeness continues after initial dose of midazolam, consider fentanyl 50 to 100 micrograms (adult). If unable to maintain sedation, consider ketamine 1 mg/**kg** (Ideal Body Weight).

L. If additional paralysis is needed during transport, vecuronium 0.1 mg/**kg** IV/IO or rocuronium may be administered. A repeat dose of vecuronium 0.1 mg/**kg** IV/IO (or rocuronium 1 mg/**kg** IV/IO) can be administered if transport time is prolonged.

M. Contact OLMC for further sedation or paralysis orders.

Precautions:

Airway maintenance, including control of the cervical spine, is the primary concern in the treatment of all patients. If unable to establish and/or maintain an adequate airway, the patient shall be transported to the nearest hospital to obtain definitive airway control. This includes patients entered in the trauma system.

A. Check IV placement if the first dose of succinylcholine does not appear to be effective in paralyzing the patient.

B. Continuously monitor the patient's overall condition, including vital signs, cardiac rhythm, perfusion, and ease of bagging post-intubation.

C. Succinylcholine and vecuronium/rocuronium do not affect the level of consciousness and should always be used with etomidate (or ketamine *and* midazolam) in a conscious patient.

D. Succinylcholine is contraindicated in patients with a history of hypersensitivity to the drug.

E. Succinylcholine should be avoided in:

1. Major burns and crush injuries between 48 hours and 6 months old.
2. Stroke or spinal cord injury with profound residual deficits between 48 hours and 6 months old.
3. Neuromuscular disease (muscular dystrophy, multiple sclerosis, etc).
4. Suspected hyperkalemia such as end-stage renal disease patients who have missed dialysis.

F. Vecuronium and rocuronium should be avoided in patients suspected of having status epilepticus who require intubation.

G. If ketamine is administered, monitor closely for laryngospasm.

H. If ketamine is administered to an adult, always administer midazolam to avoid negative emergence reaction.

I. Administer ketamine by slow IV/IO push (over 60 seconds).

J. Ketamine should be dosed by ideal body weight and not actual body weight.

Emergency Surgical Cricothyrotomy

Indications:

A. When a patient's airway cannot be secured using nonsurgical methods (e.g. oral intubation and when rescue devices do not work).

B. When an airway is required immediately in a patient who is not a candidate for orotracheal intubation (i.e. in the case of severe facial trauma).

Contraindictions:

A. Relatively contraindicated in children less than 10 years of age (needle cricothyrotomy preferred).

Equipment needed:

A. Scalpel
B. Bougie
C. Size 5.5 or 6.0 ETT
D. Trach hook (highly recommended)
E. Combat gauze

Procedure:

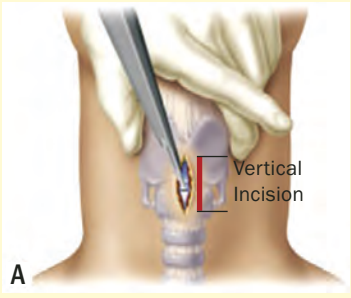
A. Assemble equipment.

B. Administer etomidate 0.3 mg/kg IV/IO push. If etomidate unavailable, administer ketamine 1 mg/kg (Ideal Body Weight) IV/IO.
  1. All patients who received ketamine should receive one dose of midazolam.
  2. Ketamine may be the preferred pre-induction agent for young patients (<35 years) with severe asthma due to its bronchodilator effects.
  3. If emergency cricothyroidomy is required, consider administration of either etomidate or ketamine without paralytics.

C. Place the patient in supine position, if patient tolerates.

D. Hyperextend the patient's neck and straighten the airway by placing a blanket or similar object under the patient's neck or between the shoulder blades. Note that airway has priority over suspected c-spine injury.

E. Locate and prep the cricothyroid membrane.
  1. Place a finger of the nondominant hand on the thyroid cartilage (Adam's apple) and slide the finger down to find the cricoid cartilage.
  2. Palpate for the "V" notch of the thyroid cartilage.
  3. Identify the cricothyroid membrane by sliding the index finger down into the depression between the thyroid and cricoid cartilage.



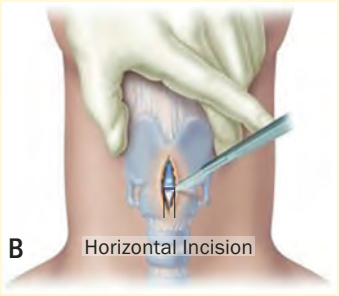
F. Prep the skin over the membrane with povidone-iodine.

G. With a scalpel in the dominant hand, make a 3-4 cm vertical (head to toe) incision through the skin exposing the cricothyroid membrane. (see figure A)

H. Once skin is incised, palpate cricothyroid membrane position and blunt dissect with fingers through subcutaneous tissue until the membrane is readily identifiable. Ignore bleeding until airway is secure (ETT placement usually has a tamponade effect). Consider the use of combat gauze to control bleeding.

I. Relocate the cricothyroid space by touch and sight.

J. Stabilize the larynx with one hand and make a 1.5 cm horizontal incision (arm to opposite arm) through the cricothyroid membrane with the scalpel blade. Drag scalpel blade from one side to the other then turn knife 180 degrees and extend to the other side (some prefer to extend the membrane with forceps). (see figure B)
NOTE: A rush of air may be felt through the opening. Look for bilateral rise and fall of the chest.



K. Dilate with gloved finger and palpate tracheal lumen, ideally identifying the cartilage of the posterior wall of the trachea/cricoid ring.

L. If available, use the tracheal hook on the inferior portion of the tracheal cartilage and increase the opening by raising the hook.

M. Insert the bougie into the tracheal opening. Confirm bougie position with finger, ensuring it passes through membrane. Bougie usually holds up at carina <10cm from the skin (may feel tracheal rings as the bougie advances), do not force if held up as may perforate carina.

N. Insert the 5.5 or 6.0 ETT over the bougie through the opening into the trachea at a 90° angle to the trachea. Ensure the ETT balloon is fully deflated and twist ETT as it passes the skin (hold up here is common). Once in the trachea, direct the tube toward the feet at a 45° angle. Only advance the ETT until the balloon is within the airway and no longer visible. Avoid inserting the airway more than 3-4 inches to avoid mainstem bronchus intubation.

O. Inflate the ETT cuff if applicable. Do NOT let go of the ETT until it is secured (see below).

P. Connect BVM bag to the tube and inflate the lungs. Check breath sounds.

Q. Connect $EtCO_2$ monitor to confirm placement.

R. If air flows freely, and the patient is breathing on his own, proceed to next step. If the patient is NOT breathing on his own, continue providing respirations via BVM.

S. Secure the ETT using tape or ET tube holder.

T. Suction the patient's airway, as necessary.

U. Apply a dressing to further protect the tube or catheter and incision using one of the techniques below.

1. Cut two 4 X 4 s or 4 X 8 s halfway through. Place them on opposite sides of the tube so that the tube comes up through the cut and the gauze overlaps. Tape securely.
2. Apply a sterile dressing under the patient's tube by making a V-shaped fold in a 4 X 8 gauze pad and placing it under the edge of the catheter to prevent irritation to the patient. Tape securely.

V. Monitor patient's respirations on a regular basis. Reassess air exchange and placement every time the patient is moved.

Precautions:

A. Troubleshooting ET placement.

1. Unilateral breath sounds and unilateral rise or fall of the chest indicate that the tube is past the carina or patient has a pneumothorax.
2. Air coming out of the patient's mouth indicates that the tube is pointed away from the lungs. Deflate the cuff on the ET tube, remove the tube, reinsert, inflate the cuff and recheck for air exchange and placement.

B. Control excessive bleeding with direct pressure. Apply combat gauze if necessary with direct pressure.

Pediatric Considerations: Needle Cricothyrotomy

Indications:

For pediatric patients aged 12 years and under. This technique is to be used only when other attempts to establish an airway have been unsuccessful (i.e., you are unable to intubate or ventilate using BVM) and respiratory obstruction exists. Such conditions are most likely to be found with foreign-body obstruction; facial and laryngeal trauma; inhalation, thermal, or caustic injury to the upper airway; angioneurotic edema; upper airway bleeding; epiglottitis; and severe croup.

Procedure:

1. Assemble equipment: 12 ga Angiocath, 3 or 5 cc syringe, 3.0 ETT adapter, oxygen, BVM.
2. Place the patient in a supine position with support under the shoulders and mild hyperextension of the neck unless C-Spine injury is suspected.
3. Palpate the neck in the midline and locate the slight depression just below the notch of the thyroid cartilage. This is the position of the cricothyroid membrane.
4. Prepare the area with Betadine® wipes.

5. Stabilize the airway between thumb and forefingers.
6. Insert the needle with catheter into the cricothyroid membrane at a 30-degree angle toward the patient's feet.
7. When the needle is through the membrane, stop and aspirate for air to ensure tracheal entry.
8. Advance the catheter over the needle and then remove the needle.
9. Attach the 3.0 ETT adapter to the hub of the catheter and begin ventilations with the BVM. Attach $EtCO_2$ monitor.
10. Secure the cannula with tape after confirming correct placement by auscultating for breath sounds (5 point check). Observe for kinking of cannula.

Notes & Precautions:

1. Hazards in performing this procedure are primarily those of damage to nearby structures - major vessels to either side of the midline, to the vocal cords if the puncture is made too high, or a through and through injury of the trachea if the puncture is made too deeply.
2. Palpation of the cricothyroid membrane is very difficult in the infant and young child. The key to success is immobilization of the trachea throughout the procedure.
3. Needle cricothyrotomy is only a temporizing measure and provides oxygenation, not adequate ventilation.
4. Dilating membrane for passage of the device may require significant pressure.

Double Sequential External Defibrillation

Indications (all below):

- Greater than 40 kg
- Refractory to 3 or more shocks
- Administered 300 mg Amiodarone
- V-fib/pulseless V-tach NEVER converted

Procedure:

A. Prepare the sites for attachment of an additional set of external defibrillation pads by drying the sites and minimizing interference of hair or other obstacles to good pad adhesion.

B. Apply first set of external defibrillation pads in anterior-posterior (A-P) location. Apply the second set of external defibrillation pads in the anterior-lateral (A-L) location while assuring they do not contact the initial set of pads.

1. Anterior-Posterior Placement:

a. Place either the ♥ or ✚ therapy electrode just below xiphoid process, left of midsternal line in the LUQ.

b. Place the other pad between the spine and medial aspect of scapula (just inferior to the spinous process of the scapula, if possible). (See Figure 1)

2. Anterior-Lateral Placement:

a. Place the ♥ or ✚ therapy electrode lateral and inferior to the patient's left nipple between the mid-axillary line and the posterior-axillary line, if possible.

b. Place the other therapy electrode on the patient's upper right torso, lateral to the sternum and below the clavicle. (See Figure 2)

Figure 1

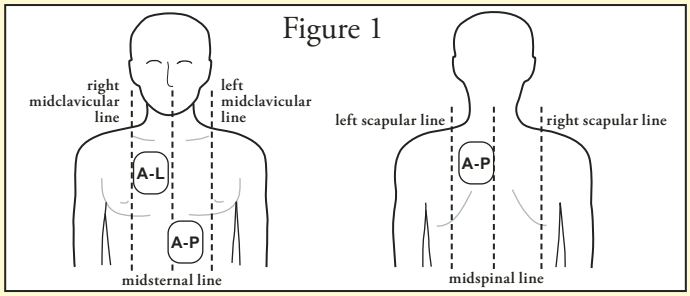
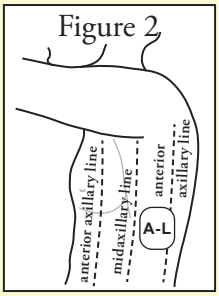


Figure 2



C. Assure that controls for the second cardiac monitor are accessible.

D. Select the maximum energy 360 joules setting on both devices. Charge both devices 15 seconds in advance of the anticipated break in CPR. Assure chest compressions continue while the device is charging.

E. At the prescribed time in the compression cycle, discontinue compressions and assess the rhythm.

F. If a shock is indicated, assertively state "CLEAR" and visualize from the patient's head to toe to assure no one is touching the patient and having a single provider deliver the double sequential external defibrillation by depressing the anterior-lateral monitor (1st) then the anterior-posterior monitor (2nd) approximately one (1) second apart.

G. Immediately resume chest compressions.

End-Tidal CO_2 Monitoring

Purpose:

To define the various uses of end-tidal CO_2 ($EtCO_2$) and capnography monitoring.

Background:

A. Capnography (an $EtCO_2$ value with a waveform) allows for the assessment of ventilation and/or perfusion.
  1. $EtCO_2$ is primarily an indicator of ventilation in patients with normal perfusion (e.g., normal blood pressure).
  2. $EtCO_2$ is primarily an indicator of perfusion in patients with low blood flow (e.g., shock, cardiac arrest).

B. Consider use of capnography in suspected critical patients and when required by protocol.

Procedure:

A. Airway Management
  1. Airway Confirmation
    a. Manage airway according to ***Airway Management*** procedure.
    b. Apply waveform capnography device.
    c. Ensure appropriate normal capnographic waveform to confirm patent airway. (see Figure 1)

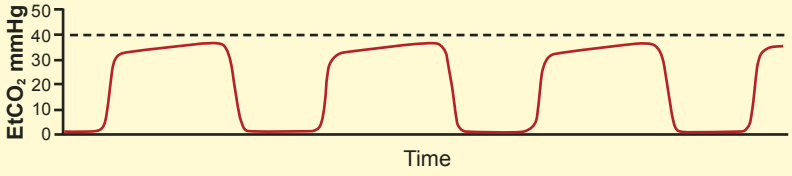


Figure 1

    d. Failure to obtain an $EtCO_2$ numerical reading and/or waveform requires the following immediate action:
      i. Re-visualization of the ETT or i-gel using direct/video laryngoscopy.
      ii. If proper location of the ETT or i-gel is not confirmed, immediate removal of the airway and use of an alternative airway.
  2. Continued Airway Assessment
    a. A sudden drop in $EtCO_2$ output and an obvious change in the waveform is indicative of advanced airway displacement (most likely into the hypopharynx) or a cuff leak (e.g., under inflated balloon, balloon rupture, or poorly sized ETT or i-gel). Re-assess airway placement immediately and take corrective action. (see Figure 2)

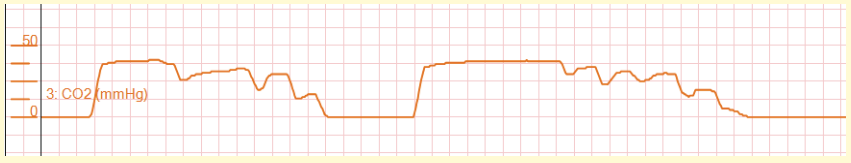


Figure 2

b. A sudden and sustained drop in $EtCO_2$ output may indicate a blocked airway (e.g., kinked tube, mucus plug). (see Figure 3)

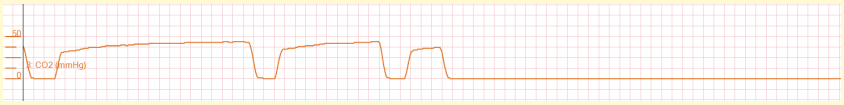


Figure 3

c. Document pulse oximetry and $EtCO_2$ readings in your prehospital care report at regular intervals, especially following movement of the patient or change in vital signs.

B. Cardiac Arrest

1. Manage patient according to ***Cardiac Arrest*** treatment.

2. Apply waveform capnography device as soon as feasible.

3. The trend of $EtCO_2$ values is the most important guide to overall resuscitation.

a. Values that decline over time may indicate poor CPR quality (e.g., switch compressors, LUCAS device has shifted).

4. Do NOT ventilate to $EtCO_2$ values during cardiac arrest as hyperventilation or hypoventilation are harmful to the patient. During cardiac arrest, the $EtCO_2$ values are indicative of pulmonary blood flow (i.e., chest compression quality).

5. A sudden and sustained rise in $EtCO_2$ values may indicate ROSC.

6. A gradual decline in $EtCO_2$ values may be the first sign of recurrent arrest in a patient who has achieved ROSC.

7. Do NOT rely solely on an $EtCO_2$ value when determining termination decisions.

C. Respiratory Distress/Respiratory Failure

1. A "shark fin" waveform can be seen in asthma and COPD. (see Figure 4)

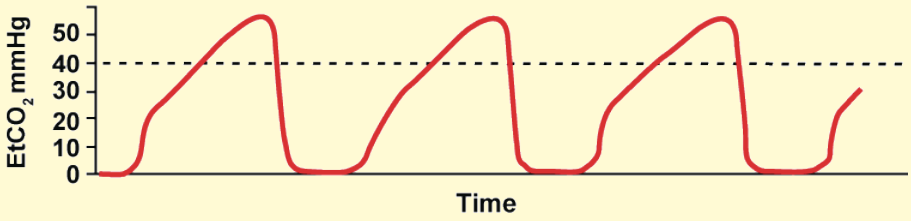


Figure 4

2. Consider use of capnography when initiating CPAP as it can assist with diagnosis (e.g., evaluating for "shark fin" waveform), assess response to treatment, and can evaluate for patient decompensation.

3. Use of waveform capnography is required in patients who are experiencing respiratory depression or have received sedating medications (e.g., opiates, benzodiazepines, anti-psychotics, etc) to help detect hypoventilation (i.e. rise in $EtCO_2$ with progressively rising waveform). (see Figure 5)

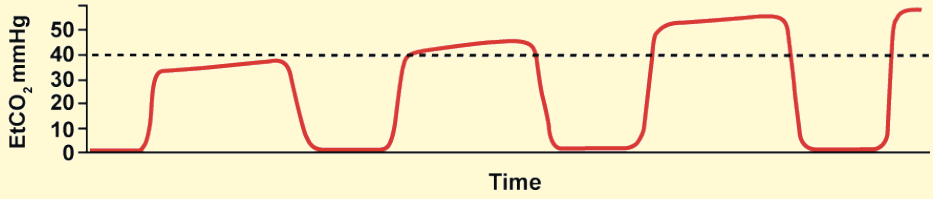


Figure 5

D. Acidosis
1. Sepsis: in patients with concern for infection and ≥2 of the following: respiratory rate >20, heart rate >90 BPM and fever (i.e. SIRS criteria), an $EtCO_2$ <25 mmHg may predict sepsis and increased mortality. Treat per ***Sepsis*** protocol.
2. DKA: in patient with elevated blood sugar, $EtCO_2$ <25 mmHg may indicate DKA. Treat per ***Diabetic Emergencies*** protocol.

E. Hypoperfusion
1. A low $EtCO_2$ may help determine cases of hypoperfusion (low blood flow) given the lack of blood flow to the lungs.
2. In trauma patients, $EtCO_2$ < 25 mmHg may indicate presence of shock and is associated with the need for blood transfusion and increased mortality.

F. Traumatic Brain Injury
1. Maintain $EtCO_2$ output between 35-40 mmHg. The following approximates the degree of ventilation:
   > 40 = Hypoventilation
   40 = Normal ventilation
   35 = Hyperventilation
   < 30 = Aggressive hyperventilation
2. Patients with signs of increased intracranial pressure (unilateral dilated pupil, posturing, focal neurologic findings) maintain $EtCO_2$ between 30-35 mmHg.

G. Transcutaneous Pacing
1. A sudden and sustained rise in $EtCO_2$ indicates increased pulmonary blood flow and may confirm mechanical capture.

Precautions:

1. Remember: pulse oximetry does not equate to ventilation. You can have a poorly ventilated patient displaying an oxygen saturation of 100%. Excessively high $PaCO_2$ levels can be detrimental to your patient's outcome.
2. A sudden drop in CO_2 output from normal (35-40 mmHg) to 15-20 mmHg and an obvious change in the waveform is indicative of tube displacement, most likely into the hypopharynx. Re-assess tube placement immediately and take corrective action.
3. Do not rely on pulse oximetry or $EtCO_2$ monitoring solely to determine the efficacy of intubation.
4. Waveform capnography is required for all intubated patients throughout transport.
5. Failure to obtain an $EtCO_2$ numerical reading or waveform requires the following immediate action:
   A. Immediate removal of the endotracheal tube and placement of a rescue airway or BVM ventilation.
   OR
   B. Re-visualization of the ETT using direct laryngoscopy.

i-gel Supraglottic Airway Device

Indications:

A. The i-gel is indicated for use in securing and maintaining a patent airway.
B. May be used as primary airway in cardiac arrest and rescue airway for other conditions.

Contraindications

A. Trismus, limited mouth opening.
B. Suspected upper airway obstruction secondary to laryngeal edema, smoke inhalation, foreign body, tumor, mass, abscess.

Sizes

i-gel Size	Patient Size	Patient Weight (kgs)	Patient Weight (lbs)
1	Neonate	2.5	4-11
1.5	Infant	5-12	11-26
2	Small pediatric	10-25	22-55
2.5	Large pediatric	25-35	55-77
3	Small adult	30-60	66-132
4	Medium adult	50-90	110-198
5	Large adult	90+	198+

Size should be determined on lean body mass

Procedure

A. Identify correct size i-gel.
B. Lubricate i-gel prior to insertion.
C. Insure that the supplementary oxygen port is capped.
D. Position the patient. The patient should always be in the "sniffing position" prior to insertion unless head/neck movements are considered inadvisable or are contraindicated.
E. If needed, use tongue depressor or curved laryngoscope blade to facilitate passage of i-gel through the oral pharynx.
F. Grasp the lubricated i-gel firmly along the integral bite block.
G. Position the device so that i-gel cuff outlet is facing towards the chin of the patient.
H. Introduce the leading soft tip into the mouth of the patient in a direction toward the hard palate. The leading edge of i-gel's tip must follow the curvature of the patient's hard palate upon insertion. Glide the device downward and backward along the hard palate with a continuous but **gentle** push until a definitive resistance is felt.

I. Determine appropriate depth of insertion. The incisors should be resting on the integral bite block. A horizontal line (Adult sizes 3,4,5 only) at the middle of the integral bite block represents the correct position of the teeth. If the teeth are located lower than the distal tip of the bite block, then it is likely the device has been **incompletely inserted**.

J. Secure i-gel to maxilla with holder or tape.

K. If gastric distention is present or fluid is present in the gastric channel of i-gel, an appropriate size nasogastric tube may be passed down the gastric channel.

i-gel Size		Maximum Size of Nasogastric Tube (French Gauge) or French Suction Catheter
	1	N/A
	1.5	10
	2	12
	2.5	12
	3	12
	4	12
	5	14

L. Attach capnography per protocol.

Notes and Precautions

A. Do not use excessive force to insert the device or nasogastric tube.

B. Sometimes a feel of "give-way" is felt before the end point resistance is met. This is due to the passage of the i-gel bowl through the faucial pillars (pharyngo-epiglottic folds).

C. Once resistance is met and the teeth are located on the integral bite block, do not repeatedly push the i-gel down or apply excessive force during insertion.

D. Do not allow peak airway pressure of ventilation to exceed 40 cm H_2O (e.g., Impact Uni-Vent Model 73X or equivalent).

E. Patients with any condition which may increase the risk of a full stomach e.g., hiatal hernia, sepsis, morbid obesity, pregnancy, or a history of upper gastro-intestinal surgery, etc., may increase the risk of aspiration.

Induced Hypothermia

Purpose:

To define the procedures for induced hypothermia for patients experiencing sudden cardiac arrest, with the aim to reduce body temperature to 32°–34° C (90°-93° F).

Indications:

A. Cardiac Arrest.

Contraindications:

A. Age <13 years old.
B. Traumatic cardiac arrest or suspected significant hemorrhage.
C. Hypothermia already present.
D. Pulmonary edema.
E. Known pregnancy.

Cooling Methods:

A. Exposure combined with ice packs and/or
B. Chilled normal saline (NS); stored at a temperature of approximately 4° C (39° F).

Procedure:

A. Remove patient's clothing (undergarments may remain).

B. Begin the cooling process with ice packs applied to the groin and axilla (wet towels may be used along with the ice packs).

C. If feasible, establish a large-bore IV. Using a high-pressure bag or other method, rapidly infuse 1 L chilled saline.

D. If ROSC is achieved, obtain a 12-lead ECG if feasible. If STEMI identified, follow STEMI protocol.

E. If ROSC is obtained and patient becomes conscious or makes purposeful movements or responds to verbal stimuli, then discontinue the ***Induced Hypothermia*** protocol.

F. If patient begins to shiver or demonstrates non-purposeful movements, administer 5 mg midazolam IV/IO. May repeat to a MAX of 10 mg as long as systolic BP is ≥ 100 mmHg.

Intraosseous Infusion

Definition:

An alternative technique for establishing vascular access in critical adult and pediatric patients when peripheral IV access is difficult or time-sensitive.

Indications:

A. Intraosseous infusion is indicated in emergency situations when life-saving fluids or drugs should be administered and IV cannulation is difficult, impossible or too time-consuming to perform.

B. Adult and pediatric patients, within the proper weight range, who present with one or more of the following clinical conditions:

1. Cardiac arrest (proximal humerus preferred).
2. Hemodynamic instability (BP < 90 mmHg and clinical signs of shock).
3. Imminent respiratory failure.
4. Status epilepticus with prolonged seizure activity greater than 10 minutes, and refractory to IM anticonvulsants.
5. Toxic conditions requiring immediate IV access for antidote.

C. IO placement may be considered prior to peripheral IV attempts in cases of cardiopulmonary or traumatic arrest, in which it may be obvious that attempts at placing an IV would likely be unsuccessful and/or too time consuming, resulting in a delay of life-saving fluids or drugs.

Adult EZ-IO™ Procedure:

A. Determine patient's weight.

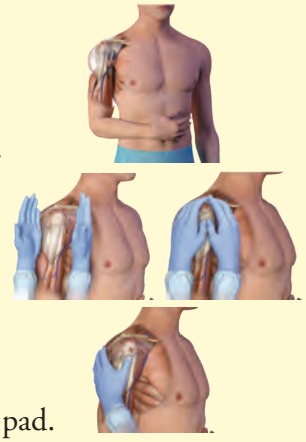
B. Assemble all necessary equipment.

1. The standard EZ-IO 25mm needle (blue) should be utilized on patients who weigh ≥ 40 kg (approximately 88 lbs. or greater).
2. The longer EZ-IO 45mm needle (yellow) should be used preferably on all adult humeral IO insertions and tibial insertions where the 25mm needle (blue) is not adequate.

C. Site Selection.

1. Determine site of needle insertion
a. Standard site is proximal tibia.
b. Proximal Humerus is preferred in adult patients to achieve the following:
- Increased flow rates
- Decreased pain
- Closer access to central circulation (heart)

D. Site Landmarks
- **1.** Tibial
  - **a.** Palpate the landmarks at the proximal tibia (patella and tibial tuberosity).
  - **b.** Insertion site should be approximately one finger width to the medial side of the tibial tuberosity.
  - **c.** An alternative site may be used at the distal tibia (especially for morbidly obese patients). Insertion site should be two finger widths proximal to the medial malleolus along the midline of the tibia.
- **2.** Proximal Humerus (Use 45mm needle).
  - **a.** Ensure that the patient's hand is resting on the abdomen and that the elbow is adducted (close to the body).
  - **b.** "Karate chop" the proximal humerus. Bring thumbs together and slide up the anterior shaft of the humerus until you feel the surgical neck ("golf ball on a tee").
  - **c.** Approximately 1 cm (depending on patient anatomy) above the surgical neck is the insertion site. Insertion site is located directly on the most prominent aspect of the greater tubercle.



E. Needle Insertion
- **1.** Prep the surface with Betadine and wipe dry with a sterile gauze pad.
- **2.** Stabilize patient's leg or arm and begin insertion from a 90-degree angle to the insertion site. Gently advance the needle set into position–do not force. Stop when you feel the "pop."
- **3.** When needle is in proper position, remove stylet (if insertion fails, leave the needle in place and clamp the EZ-Connect; do not attempt second insertion on same leg).
- **4.** Connect extension tubing or EZ-Connect, primed with saline, to IO hub.
- **5.** Confirm the catheter position (catheter is stable at a 90-degree angle to the bone, able to aspirate blood, and fluids flow without evidence of extravasation).
- **6.** Rapid bolus or "power" flush with approximately 10 mL normal saline.
- **7.** Connect IV tubing and bag to extension tubing or EZ-Connect.
- **8.** Consider additional 10 mL bolus of saline if flow rates slower than expected.
- **9.** Utilize a blood pressure cuff or pressure bag to help infuse fluids.
- **10.** Dress site and secure tubing.
- **11.** Consider securing with EZ-IO stabilizer device.

F. Pain Management
- **1.** If the procedure is performed on a conscious or semi-conscious patient, immediately following placement of the IO needle, administer 0.5 mg/**kg** 2% lidocaine (not to exceed 50 mg) *slowly* (over 120 seconds) through the IO site. Wait approximately 30–60 seconds before "power" flushing with normal saline.
- **2.** In the event a patient regains consciousness and complains of severe pain secondary to the IO insertion, temporarily stop infusing the fluids, and administer lidocaine as in F.1 above. Wait approximately 30–60 seconds before continuing fluid administration.

Pediatric EZ-IO™ Procedure (patients weighing 3-39 kg):

1. Assemble all equipment
   - **A.** The EZ-IO 25mm needle should be used on patients who weigh between 3–39 kg (approximately 6–87 lbs.).
   - **B.** Stabilizer should be used to secure needle.
2. Site Selection

   Proximal Tibia
   - **A.** Palpate the landmarks at the proximal tibia (patella and tibial tuberosity).
   - **B.** Insertion site is one finger width below the tuberosity and then medial (towards inner leg) along the flat aspect of the tibia (See Fig 1).
   - **C.** If the tibial tuberosity cannot be identified on the child, the insertion site may be two finger widths below the lower portion of patella, then medial along the flat aspect of the tibia.

   Distal Femur
   - **A.** Secure the leg out-stretched to ensure the knee does not bend.
   - **B.** Locate upper edge of the patella. Insertion site is one finger width above and then one finger width medial (towards the inner leg) from the upper patella edge. This location will avoid the growth plate of the distal femur (See Fig 2).
3. Needle Insertion
   - **A.** Prep the surface with Betadine® and wipe dry with a sterile gauze pad.
   - **B.** If you have concern that the needle may not reach the bone, gently apply pressure so the needle goes through skin until tip touches bone.
     - **i.** The black 5mm line must be visible outside the skin prior to insertion (See Fig 3).

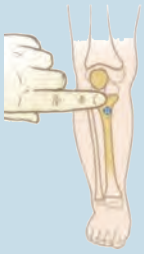


Figure 1

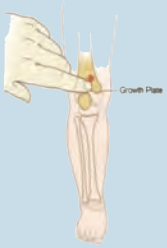


Figure 2

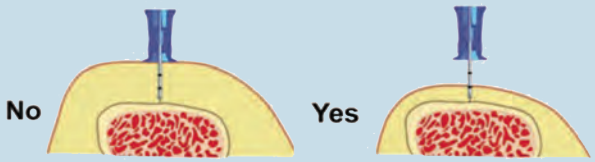


Figure 3

   - **C.** Stabilize patient's leg and begin insertion from a 90-degree angle to the insertion site. Gently advance the needle set into position–do not force. Stop when you feel the "pop" or "give".
   - **D.** When needle is in proper position, remove stylet.
     - **i.** If insertion fails, leave the needle in place and clamp the EZ-Connect.
     - **ii.** Do not attempt second insertion on same leg).
   - **E.** Apply EZ-Stabilizer.

F. Connect extension tubing or EZ-Connect, primed with saline, to IO hub.
G. Confirm the catheter position:
  i. Catheter is stable at a 90-degree angle to the bone.
  ii. Able to aspirate blood.
  iii. Fluids flow without evidence of extravasation.
H. Rapid bolus or "power" flush with approximately 5 mL normal saline.
I. Connect IV tubing and bag to extension tubing or EZ-Connect.
J. Consider additional bolus of saline if flow rates slower than expected.
K. Utilize a blood pressure cuff or pressure bag to help infuse fluids.

4. Pain Management
A. If the procedure is performed on a conscious or semi-conscious patient, *immediately* following placement of the IO needle, administer 0.5 mg/kg 2% lidocaine (not to exceed 50 mg) *slowly* (over 120 seconds) through the IO site. Wait approximately 30–60 seconds before "power" flushing with normal saline.
B. In the event a patient regains consciousness and complains of severe pain secondary to the IO insertion, temporarily stop infusing the fluids, and administer lidocaine as in D.1 above. Wait approximately 30–60 seconds before continuing fluid administration.

Contraindications (all ages):

A. Fracture of the bone selected for IO insertion (consider alternate site).
B. Previous *significant* orthopedic procedures (IO within 48 hours; prosthesis).
C. Infection at the site selected for insertion (consider alternate site).
D. Excessive tissue at insertion site, with absence of anatomical landmarks (consider alternate site).

Precautions & Possible Complications (all ages):

A. Osteomyelitis, growth plate injury (in pediatric patients), and extravasation of fluid with compression of popliteal vessels or the tibial nerve may occur.
B. Airway and breathing should be established first in accordance with other protocols.
C. Do not perform more than one attempt in each tibia.
D. All ALS medication may be administered IO.
E. Do not use hypertonic saline through an IO.
F. In the event of driver failure, EZ-IO needle may be inserted manually.

Intravenous Lines and IV Solutions Management
Normal Saline (NS) and Lactated Ringer's (LR)

Pharmacology:

These are solutions that consist of electrolytes in water. They provide water and electrolytes for replacement of acute extracellular fluid losses and do not disturb the normal electrolyte balance since the electrolyte composition and tonicity approaches that of normal plasma.

Indications:

A. Normal Saline is indicated for replacement of fluid volume losses such as in trauma, burns, dehydration or shock.

B. Lactated Ringer's is the preferred replacement fluid volume losses in trauma system and burn center patients.

C. An IV lock may be substituted for an IV line in all situations, except where IV fluid is the therapy of choice for volume replacement.

Precautions:

A. NS and LR should be used with caution in patients with renal impairment (hyperkalemia), cardiac and respiratory disorders (fluid overload), or extremes of age. LR should not be used in patients suffering from severe hypothermia, severe liver disease, or patients in renal failure.

B. When administering whole blood (LTOWB+), do not use LR. Prime Y-set blood tubing with NS only.

Procedure:

A. IV access:

1. Establish IV access and prepare NS or LR.
2. Connect an extension set between the IV hub and the solution bag and tubing on all patients.
3. All IVs will be started using regular drip sets. Use blood pump infusion sets (when available) if the patient is trauma system entry or shock is present.

B. IV access with an IV lock:

1. Establish IV access.
2. Connect an extension set[1] between the IV hub and male adapter plug.
3. After placement, the line should be flushed with normal saline.
4. If the IV lock system is used for the administration of medication, the line must be flushed after each administration

NOTE:

1. An extension set should be of standard bore and be at least 5 inches long. It should contain one, or more, injection ports and a slide clamp.

Intravenous Solutions Control and Monitoring

Definition:

The administration of fluid or medication by continuous infusion through an intravenous line.

Purpose:

To decrease the likelihood of inadvertently administering an excess volume of medication.

Indications:

A. Any time a medication is administered as a continuous infusion.
B. Any time a fluid is administered by continuous infusion in pediatric patients under the age of five.

Procedure:

A. Using a Volutrol® or Soluset® type device:

1. Establish IV access and prepare solution.
2. Connect the Volutrol® between the solution bag and the IV tubing.
3. Place one hour's solution into the Volutrol® and close the connection between the Volutrol® and the solution bag.
4. Begin infusing solution at the appropriate rate.
5. If desired, additional solution may be placed in the Volutrol®.
6. The Volutrol® should never contain more than one hour of solution.

B. Using an infusion pump:

1. Establish IV access and prepare solution.
2. Connect IV tubing to infusion pump according to manufacturer's directions.
3. Begin infusing solution at the appropriate rate.

NOTES:

A. At the time of transfer of care from one agency to another, the Prehospital Care Report should include the amount of solution currently infused, or volume "left to count."
B. All infusions and patient response should be closely monitored and documented.

Left Ventricular Assist Device

Background

Left ventricular assist devices (LVADs) are designed to assist the pumping function of the patient's left ventricle. The HeartWare HVAD®, HeartMate II® and HeartMate III® devices attach to the apex of the left ventricle (pump inflow) and propel blood to the ascending aorta (pump outflow). All devices utilize an external wearable system that includes a small controller connected to the internal pump by an external driveline and is powered by two batteries. All devices may also be "plugged in" to 110 or 12 V power, depending on the device. When managing an LVAD patient, follow these general assessment guidelines.

Procedures:

A. Assessing patient with LVAD:

1. Establish airway and provide supplemental oxygen if any respiratory signs or symptoms are present.
2. **If a patient with an LVAD is having a medical emergency, it does not necessarily mean that it is a device issue. Consider the whole clinical picture and perform a thorough patient assessment, including device function. Infection, volume depletion, stroke, bleeding, and dysrhythmias may be the cause of patient's symptoms. Most LVAD patients are anticoagulated and are at risk for bleeding complications.**
3. Auscultate heart sounds to determine if the device is functioning. Both the HeartWare HVAD® and HeartMate II® are continuous flow devices and you should hear a "whirring" sound. Because these devices diminish pulsatile flow in the circulation, peripheral pulses may not be palpable. The HeartMate III®, although continuous flow, may provide artificial pulsatility (as well as a pulsatile hum) due to the addition of intermittent speed reduction which was designed into the device. Since this artificial pulse is not synchronized with the patient's heart rate, it may augment or diminish the native pulse. If a pulse is palpable, a BP can be obtained. Assess other signs of circulation—capillary refill, absence or presence of dizziness, temp/moisture of skin, End-tidal CO_2, and mental status to determine perfusion status.
4. Standard blood pressure devices may not work. If unable to obtain a blood pressure consider using the following, if available, to estimate perfusion pressure:
   a. End-Tidal CO_2 - Expected values should be between 35 – 45 mmHg.
   b. Other clinical signs – Capillary refill, mental status.
5. Locate the device to identify which type is in place and follow the device specific troubleshooting guidelines. Intervene appropriately based on the type of alarm and device.
6. Start Large Bore IV and treat with fluids as needed.
7. Pulse oximetry may not be accurate due to the continuous flow nature of the device. You may not get an accurate reading in the field.

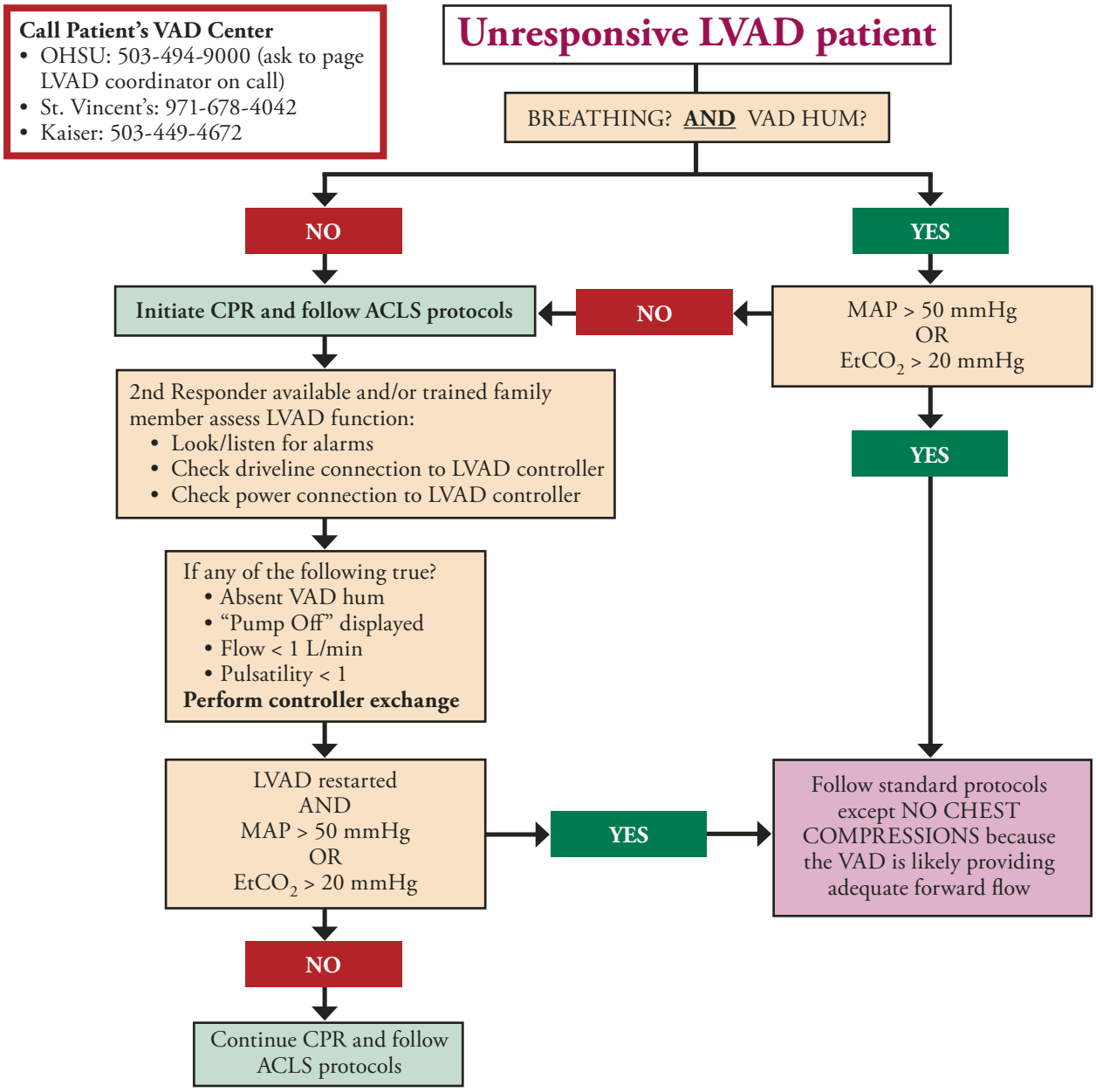
8. Your cardiac monitor will work, and a reliable EKG may be obtained. Because the LVAD creates continuous flow independent of left heart function, not all arrhythmias will be symptomatic, including ventricular arrhythmias. If a patient requires defibrillation, leave the pump running and all components in place. The LVAD does not interfere with electrical conduction. In general, LVAD patients also have an AICD/Pacemaker. Do not place defibrillation pads directly over the pump or AICD/Pacemaker (consider anterior/posterior placement).
9. All ACLS medications may be administered if necessary.

B. Transporting an LVAD patient:

1. Transport to the patients designated VAD center. **Call the number on the device to get advice from the LVAD Coordinator on call.**
2. Follow the advice of the LVAD Coordinator for troubleshooting the device. For all other concerns contact OLMC.
3. The patient must be supported by battery power. **Remember to also transport the backup controller and the spare batteries.**
4. The controller should be kept close to the patient, and care taken to not kink the leads.
5. If removing or cutting patients clothing is necessary use caution as not to sever the driveline.
6. Do not put external pressure on any area of the LVAD system.
7. Place gurney straps underneath the leads, and keep the batteries easily accessible.
8. Allow the trained caregiver to ride in the transport vehicle if possible to act as an expert on the device in the absence of consciousness in the patient.
9. Bring all of the patient's equipment.

Potential LVAD hazards with EMS response:

LVAD patients who are anticoagulated have a higher risk of bleeding and hemorrhage. They should remain on anticoagulant therapy. There are no valves on an LVAD, so there is the risk of retrograde flow and stagnation of blood if the device stops, or flow is impeded. These patients are very pre-load and afterload dependent, so hypovolemia can have a profound effect. If a patient is **hypertensive**, flow through the device may be reduced.



- Refer to the LVAD protocol for detail instructions on the battery and controller.
- The two most common causes of pump failure are disconnection of power and failure of the controller.
- Transport to the patients designated VAD center.
- Patients on LVAD support frequently do not have a palpable pulse or recognizable blood pressure, yet have adequate perfusion.
- In the noninvasive assessment of the blood pressure, use a manual BP cuff, with $EtCO_2$ as the second option.
- Assess and treat non-LVAD pathology:
  - *5 H's: Hypovolemia, hypoxia, hydrogen ion (acidosis), hypo/hyperkalemia, hypothermia*
  - *5 T's: Toxins, tamponade, tension pneumothorax, thrombosis-heart, thrombosis-lung*
- **Keep all back-up equipment with the patient during transport!**
- **Mechanical CPR is acceptable with VAD patients.**

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HeartWare™ HVAD™ System

ALARM ADAPTER

- Used to silence the [No Power] alarm.
- Should only be used on a controller that is NOT connected to a patient's pump.
- Insert into data port covered with a dust cap of the original controller after a controller exchange BUT before the power sources are disconnected or the [No Power] alarm will sound for up to two hours.

Red Alarm Adapter

DRIVELINE CONNECTION

To Connect to Controller:

- Align the two red marks and push the driveline connector straight into the silver driveline port. (Figure A)
- The Driveline Cover must completely cover the Controller's silver driveline connector to protect against static discharge. (Figure B)

Figure A

Figure B

NOTE: an audible click should be heard when connecting the Driveline to the controller. Failure to use the Driveline Cover may cause an Electrical Fault Alarm.

TO DISCONNECT A DEPLETED BATTERY

- Make sure there is a fully charged battery available to replace the depleted one.
- Disconnect the depleted battery by turning the connector sleeve counterclockwise until it stops.
- Pull the connector straight out from the controller.

CONNECTING POWER TO CONTROLLER

To Connect a Charged Battery:

- Grasp the cable of the charged battery at the back end of the connector (leaving front end of connector free to rotate)
- Line up the solid white arrow on the connector with the white dot on the Controller.
- Gently push (but DO NOT twist) the battery cable into the Controller until it naturally locks into place; you should hear an audible click.
- Confirm that the battery cable is properly locked on the controller by gently pulling the cable near the controller power connector.
- **DO NOT force the battery cable into** the controller connector without correct alignment as it may result in damaged connectors .

Power Source Connection

HeartWare™ HVAD™ System Instructions for Use IFU00375 Rev06 06/18

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HeartWare™ HVAD™ System Emergency Operation

STEPS TO EXCHANGE THE CONTROLLER

Exchange the controller when the controller display indicates [Change Controller]. Priority is to restart the pump quickly.

It may be helpful to remember the 4 P's:

1. **POWER...** Connect a power source to the new controller.
2. **PUMP...** Restart the pump by connecting the driveline to the new controller.
3. **PREVENT...** Prevent the [No Power] alarm on the original controller with the red alarm adapter or by pressing the Scroll and Mute buttons at the same time until a "beep" is heard, or for at least 5 seconds.
4. **POWER...** Connect a second power source to the new controller.

Step 1: Have patient sit or lie down and place the back-up controller within easy reach. The backup controller will become the new controller.

Step 2: Connect one **POWER** source to the new controller.

NOTE: The new controller may alarm after 10 seconds with a [VAD Stopped, Connect Driveline] high alarm. This is expected behavior.

Step 3: Disconnect the driveline from the original controller and connect the driveline to the new controller. This should restart the **PUMP.**

- Verify that the pump is working. The RPM, L/min and Watts numbers should show on the Controller Display. If the pump does not restart, re-check driveline and power source connections, if it still doesn't start, call the patient's VAD team for assistance.

DISCONNECT:

CONNECT:

- If you have only connected 1 power source to the new controller, you will also have a [Power Disconnect, Reconnect Power] alarm.

HeartWare™ HVAD™ System Instructions for Use IFU00375 Rev06 06/18

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HeartWare™ HVAD™ System Emergency Operation

Step 4: PREVENT the [No Power] alarm from sounding on the original controller. This needs to be done before removing all power. There are 2 options, see below:

- If a red alarm adapter is available:
  - Insert it into the connector data port on the original controller
  - You can now remove all power from the original controller and no alarm should sound.

- If no red alarm adapter is available:
  - Press and hold the "Alarm Mute" and "Scroll" buttons on the original controller until a "beep" is heard, or for at least 5 seconds.
  - Release the "Alarm Mute" and "Scroll" buttons.
  - You can now remove all power from the original controller and no alarm should sound.

- If you removed power before silencing the [No Power] alarm, reconnect a power source and follow the steps above to silence it.

Step 5: Connect a second **POWER** source to the new controller.

Step 6: Be sure the driveline cover is over the silver driveline connector and the data port is covered by the dust cap. If the red alarm adapter is connected to the controller that is now running the pump, remove it and close the cap on the data port.

Call the patients VAD team to obtain a new back-up controller.

HeartWare™ HVAD™ System Instructions for Use IFU00375 Rev06 06/18

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DARK BLUE DARK BLUE DARK BLUE DARK BLUE

HeartWare™ HVAD™ System Troubleshooting

Alarm Type	Alarm Display (Line 1)	Action (Line 2)
ALARM [No Power]	[no message]	[no message]
	When both power sources (2 batteries or 1 battery and an AC adapter or DC adapter) are removed. NO message will display on the controller. The [No Power] alarm will sound but the Alarm Indicator on the controller WILL NOT light. This indicates the pump has stopped. You should immediately connect two power sources.	
HIGH-CRITICAL [Flashing Red]	[VAD Stopped]	[Connect Driveline]
	[VAD Stopped]	[Change Controller]
	[Critical Battery]	[Replace Battery 1]
	[Critical Battery]	[Replace Battery 2]
	[Controller Failed]	[Change Controller]
MEDIUM [Flashing Yellow]	[Controller Fault]	[Call]
	[Controller Fault]	[Call: ALARMS OFF]
	[High Watts]	[Call]
	[Electrical Fault]	[Call]
	[Low Flow]	[Call]
	[Suction]	[Call]
LOW [Solid Yellow]	[Low Battery 1]	[Replace Battery 1]
	[Low Battery 2]	[Replace Battery 2]
	[Power Disconnect]	[Reconnect Battery 1]
	[Power Disconnect]	[Reconnect Power 2]

[CALL] VAD team listed on the patient's contact sheet.

HeartWare™ HVAD™ System Instructions for Use IFU00375 Rev06 06/18

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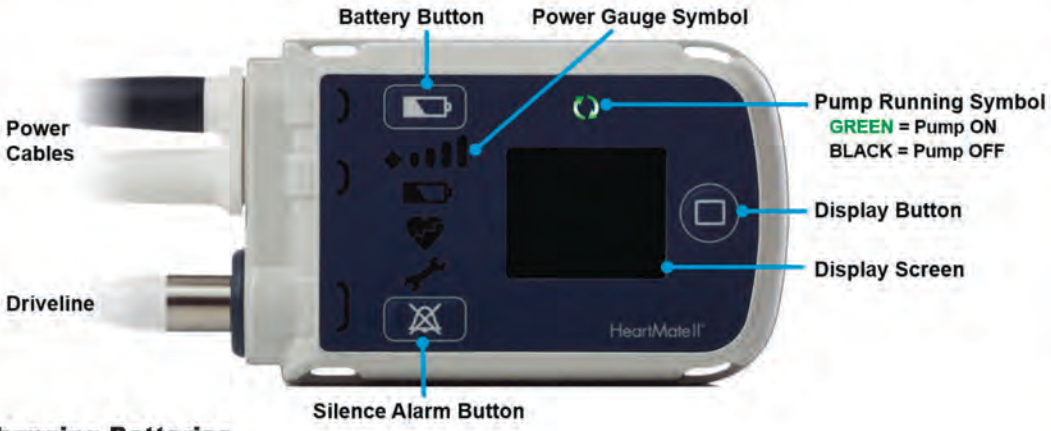
HeartMate II™ Left Ventricular Assist System

System Controller



Changing Batteries

WARNING: At least one controller power cable must be connected to a power source AT ALL TIMES. Do not remove both batteries at the same time or the pump will stop.

- Obtain two charged batteries from patient's accessory bag or battery charger. The charge level of each battery can be assessed by pressing the button on the battery. Fully charged batteries will display 5 lights. (Figures 1 and 2)
- Check the power level on the batteries, replace the battery with the fewest lights first. Remove only ONE battery from the clip by pressing the release button on the clip to unlock the battery. (Figure 3)
- Controller will start beeping and flashing yellow symbols and will read **CONNECT POWER** on the front screen.
- Insert a new, fully charged battery into the empty battery clip by aligning the RED arrows on the battery and clip (Figure 4). The battery will click into the clip. Gently tug on battery to ensure connection. If the battery is properly secured, the beeping and yellow flashing will stop.
- Repeat previous steps with the second battery and battery clip.


Figure 1


Figure 2

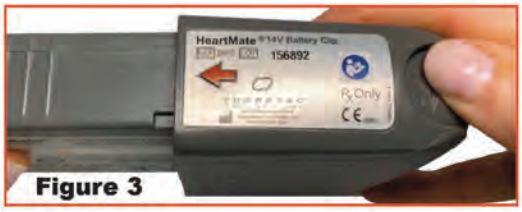


Figure 3


Figure 4

This guide does not supersede manufacturer instructions.

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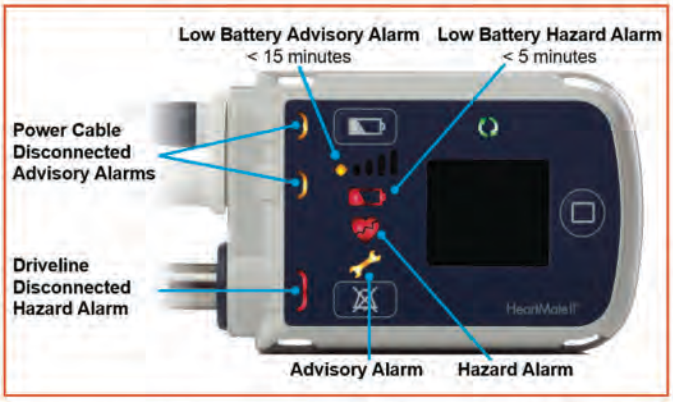
Troubleshooting HeartMate II™ LVAS

Alarms: Emergency Procedures

When an alarm occurs:

- Contact the Implant Center for direction when possible.
- Check alarm messages on controller display screen.
- Check if pump is running:
- Allow care providers trained on LVAD emergencies to remain with the patient.



When the Pump Has Stopped

- Check the driveline and power cable connections to the controller. Fix any loose connections to restart the pump.
- If the pump does not restart and the patient is connected to batteries replace the current batteries with a new, fully-charged pair. (*see Changing Batteries section on previous page*)
- If pump does not restart, change controllers if directed by implant center. (*see Changing Controllers on next page*)
- Be sure to bring ALL of the patient's equipment with them.

HAZARD ALARMS		Continuous Audible Tone
Low Flow :03 + Call Hospital Contact :07	Pump is off.	See above, when pump has stopped
	Pump flow is < 2.5 lpm.	Ensure that a power source is connected to the controller. Evaluate the patient for low flow - treat the cause. Assess volume status, hypertension, arrhythmia, right heart failure, etc.
Connect Driveline :02	Driveline disconnected.	Immediately reconnect Driveline to the controller. Check modular cable connection.
Connect Power Immediately :05 + Backup Battery :01	Both power cables are disconnected.	Immediately connect to batteries or the Mobile Power Unit.
Low Battery :06 + Replace Power :02	Low Battery Power < 5 min. remaining.	Immediately replace batteries or switch to the Mobile Power Unit.
ADVISORY ALARMS		**Intermittent Audible Tone**
Low Battery :06 + Replace Power Immediately :02	Low Battery Power <15 min. remaining.	Immediately replace batteries or switch to the Mobile Power Unit.
Connect Power :04	A power cable is disconnected.	Reconnect the power cable to power.
Check display for alarm type.		Call VAD Coordinator at implant center for direction.

This guide does not supersede manufacturer instructions.

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Troubleshooting HeartMate II™ LVAS

Changing the System Controller

Step 1: Have the patient sit or lie down since the pump will momentarily stop during this procedure.

Step 2: Place the replacement Controller within easy reach, along with the batteries/battery clips. The spare Controller is usually found in the patient's travel case.

Step 3: Attach the battery clips to the replacement controller by lining up half circles, firmly pushing together, and tightening connector nut. Insert the batteries into the clips by aligning the RED arrows.

Step 4: On the back of the replacement controller, slide the safety lock so the red release button is fully visible. Repeat this step on the original controller.

Step 5: Disconnect the drive-line from the original controller by pressing the red release button and pulling it out. The pump will stop and an alarm will sound. **Note:** The alarm will continue until the original controller is turned off. You can silence the alarm by pressing the silence alarm button.

Getting the replacement controller connected and the pump restarted is the first priority!

Step 6: Connect the replacement Controller by aligning the YELLOW ARROWS on the driveline and replacement Controller and firmly pushing the driveline into the replacement controller. The pump should restart, if not complete the following steps:

- Firmly press the Silence Alarm or Battery Button to restart the pump.
- Check the power source to ensure that power is going to the controller.
- Ensure the driveline is fully inserted into the socket by gently tugging on the metal end. **DO NOT** pull the driveline.

Step 7: After the pump restarts, slide the safety lock on the new controller so the red release button is fully covered. If unable to close the safety lock into fully locked position, gently push the driveline into the controller to ensure proper connection. Retry to close safety lock.

Step 8: Disconnect power from the original Controller.

Step 9: Hold down battery symbol for 5 full seconds to turn off the original controller.

Step 3

Step 4

Step 7

Step 5

Step 6

Step 9

This guide does not supersede manufacturer instructions.

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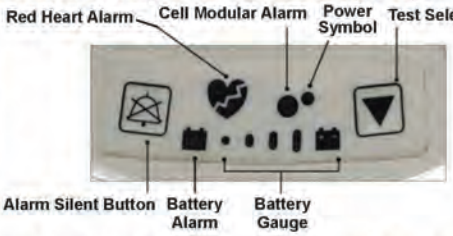
HeartMate II™ Left Ventricular Assist System

The following information applies to the original controller version called External Peripheral Controller (EPC). Some patients have this controller.

Driveline Connection: The Perc Lock must be "unlocked" in order for the driveline to be removed in a controller exchange. The Perc lock remains in locked position once the driveline has been fully inserted.

A battery clip can be attached to the EPC controller by lining up the half moons and gently pushing. Batteries can be attached to the battery clip by aligning the RED arrows on the battery and clip.

External Peripheral Controller (EPC)



External Peripheral Controller (EPC): A percutaneous lock is located on the side of the controller.

Unlock

Locked

2 MODES: ON, OFF

On: Driveline+Power source connected.

Off: No driveline or power source connected.

CELL MODULE BATTERY
No backup battery. The cell module battery powers an audible tone if EPC is removed from power while the driveline is connected. The cell module battery is supplied STERILE.

EVENT LOGGER
EPC does not include date/time records in event history. EPC can store 120 events.

GREEN POWER SYMBOL
Green light only mead that the controller is receiving power. Listen over the pump pocket for confirmation that the pump is running.

CONTROLLER BUTTONS

Alarm Silence Button: Displays the battery fuel gauge. Also silences hazard alarms for 2 minutes and advisory alarms for 4 hours.

Test Select Button: Activates a self test when held for 3 seconds.

Note: EPC does not include a display button or user interface screen. The Display Module is used to view pump parameter and alarm events.

SELF TEST
Press and hold the Test Select Button for 3 seconds.

LOW POWER

Yellow Battery Symbol: Displayed when only 15 minutes of external power is remaining.

Red Battery Symbol: Displayed when only 5 minutes of external power is remaining.

POWER SAVER MODE:
Entered when the battery voltage falls to a critically low level. Pump Speed is reduced to 8000 RPM.

STARTING THE PUMP

>8000 RPM: Pump starts automatically.

<8000 RPM: Start pump by pressing Alarm Silence Button or Test Select Button on EPC.

SYSTEM MONITOR EVENT HISTORY SCREEN

PI Event:

System Information:

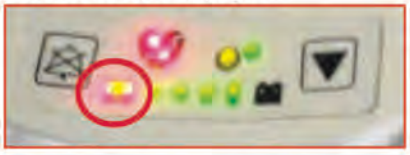
COMPATIBILITY
System Monitors I and II, Power Module, Power Base Unit (PBU), Power Module Patient Cable (12 Volt and 14 Volt), 14 Volt Lithium-ion Batteries and Battery Clips, 12 Volt SLA and NiMH Batteries and Clips.

ALARMS
For a review of alarms and their meanings, reference the HeartMate II Alarms for Clinicians, Item 103851. Note that EPC does not include Driveline fault detection.

Alarms: Emergency Procedures

Red Heart Flashing Alarm: This may indicate a Low Flow Hazard. Check patient--the flow may be too low. If patient is hypovolemic, give volume. If patient is in right heart failure-- treat per protocol. If the pump has stopped check connections, batteries and controllers as instructed on page 5.

Yellow or Red Battery Alarm: Need to Change Batteries. See changing batteries section on page 5.



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GREEN GREEN GREEN GREEN

HeartMate 3™ Left Ventricular Assist System

1. **Can I do CPR?**
   Yes, in the right clinical scenario. Chest compressions may pose a risk of dislodgement - use clinical judgment. If compressions are administered, confirm function and positioning of the pump.
2. **Can the patient be defibrillated while connected to the device?**
   Yes you can defibrillate, and you do not have to disconnect anything.
3. **Can this patient be externally paced?**
   Yes.
4. **What type of alarm occurs in a low flow state?**
   A red heart alarm indication and steady audio alarm will sound if less than 2.5 lpm. Can give a bolus of normal saline and transport to a VAD center.
5. **Can I change the speed of the device?**
   No, it is a fixed speed.
6. **Does the patient have a pulse with this device?**
   Likely they will not because it is a continuous flow device, however some patients may have a pulse.
7. **What are acceptable vital sign parameters?**
   MAP 70 - 90 mm Hg with a narrow pulse pressure.

FAQs

- Pump has "artificial pulse" created by rapid speed changes in the pump. This can be heard when auscultating the heart and differs from other continuous flow devices.
- May not be able to obtain cuff pressure (continuous flow pump).
- Pump connected to driveline exiting patient's abdominal area and is attached to controller which runs the pump.
- Pump does not affect ECG.
- All ACLS drugs may be given.
- A pair of fully charged batteries lasts up to 17 hours.
- Any emergency mode of transportation is ok. These patients are permitted to fly.
- Avoid pulling, twisting, or kinking the driveline when strapping the patient to a stretcher.
- Be sure to bring **ALL** of the patient's equipment with them.

The HeartMate 3™ LVAD has a modular cable connection near the exit site of the driveline (Figure 1). This allows a damaged driveline to be quickly replaced (if damage is external).

- When disconnecting a driveline, NEVER use the modular cable connection.
- If the modular cable requires replacement, it must be done at and by the implanting center. Patients are not given a backup modular cable.
- If the connection is loose, a yellow line at the connection will be showing. If the line is visible, turn the connector in the locked direction. It will ratchet and stop turning once tight.

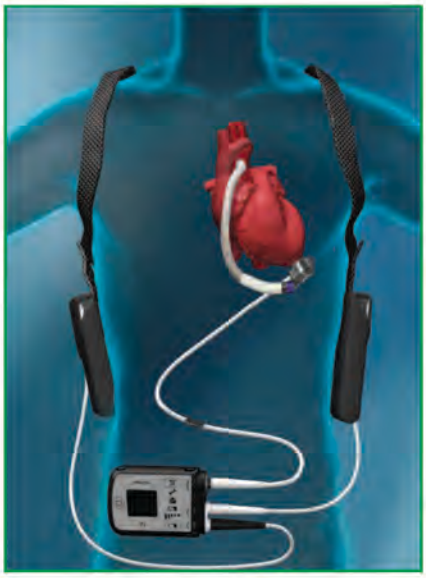

Figure 1

This guide does not supersede manufacturer instructions.

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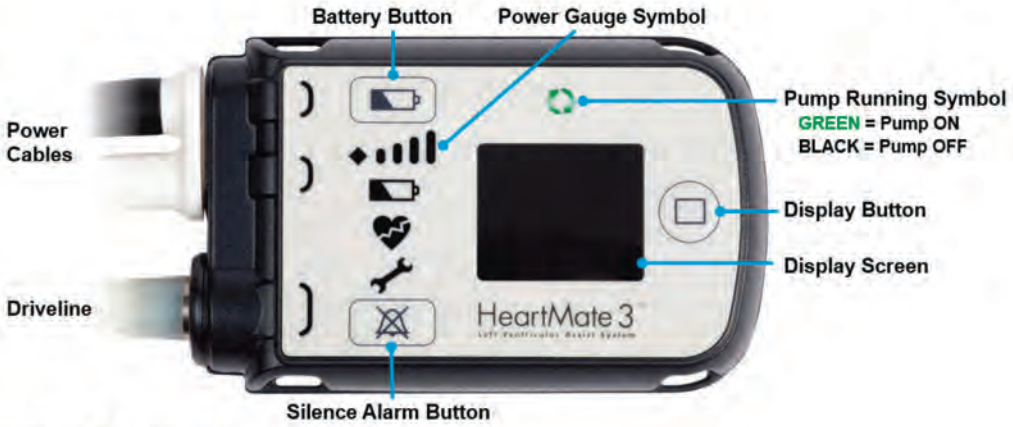
HeartMate 3™ Left Ventricular Assist System

System Controller



Changing Batteries

WARNING: At least one controller power cable must be connected to a power source AT ALL TIMES. Do not remove both batteries at the same time or the pump will stop.

- Obtain two charged batteries from patient's accessory bag or battery charger. The charge level of each battery can be assessed by pressing the button on the battery. Fully charged batteries will display 5 lights. (Figures 1 and 2)


Figure 1


Figure 2

- Check the power level on the batteries, replace the battery with the fewest lights first. Remove only ONE battery from the clip by pressing the release button on the clip to unlock the battery. (Figure 3)

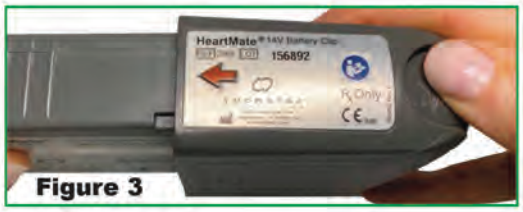


Figure 3

- Controller will start beeping and flashing yellow symbols and will read **CONNECT POWER** on the front screen.

- Insert a new, fully charged battery into the empty battery clip by aligning the RED arrows on the battery and clip (Figure 4). The battery will click into the clip. Gently tug on battery to ensure connection. If the battery is properly secured, the beeping and yellow flashing will stop.


Figure 4

- Repeat previous steps with the second battery and battery clip.

This guide does not supersede manufacturer instructions.

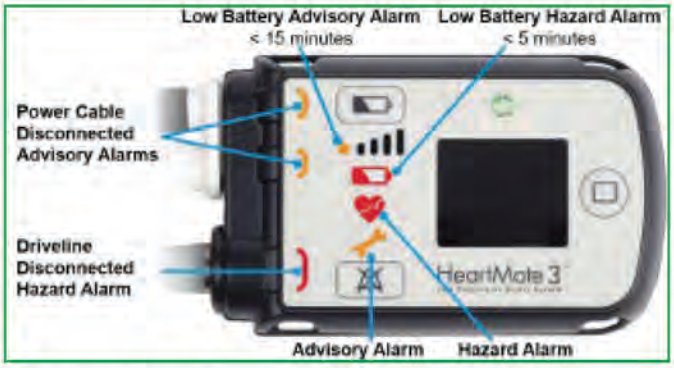
GREEN GREEN GREEN GREEN

Troubleshooting HeartMate 3™ LVAS

Alarms: Emergency Procedures

When an alarm occurs:

- Contact the Implant Center for direction when possible.
- Check alarm messages on controller display screen.
- Check if pump is running:
- Allow care providers trained on LVAD emergencies to remain with the patient.



When the Pump Has Stopped

- Check modular cable connection, driveline and power cable connections to the controller. Fix any loose connections to restart the pump.
- If the pump does not restart and the patient is connected to batteries replace the current batteries with a new, fully-charged pair. (see Changing Batteries section on previous page)
- If pump does not restart, change controllers if directed by implant center. (see Changing Controllers on next page)
- Be sure to bring ALL of the patient's equipment with them.

HAZARD ALARMS		Continuous Audible Tone
Low Flow :03 + Call Hospital Contact :07	Pump is off.	See above, when pump has stopped
	Pump flow is < 2.5 lpm.	Ensure that a power source is connected to the controller. Evaluate the patient for low flow - treat the cause. Assess volume status, hypertension, arrhythmia, right heart failure, etc.
Connect Driveline :02	Driveline disconnected.	Immediately reconnect Driveline to the controller. Check modular cable connection.
Connect Power Immediately :05 + Backup Battery :01	Both power cables are disconnected.	Immediately connect to batteries or the Mobile Power Unit.
Low Battery :06 + Replace Power :02	Low Battery Power < 5 min. remaining.	Immediately replace batteries or switch to the Mobile Power Unit.
ADVISORY ALARMS		**Intermittent Audible Tone**
Low Battery :06 + Replace Power Immediately :02	Low Battery Power <15 min. remaining.	Immediately replace batteries or switch to the Mobile Power Unit.
Connect Power :04	A power cable is disconnected.	Reconnect the power cable to power.
Check display for alarm type.		Call VAD Coordinator at implant center for direction.

This guide does not supersede manufacturer instructions.

Troubleshooting HeartMate 3™ LVAS

Changing the System Controller

Step 1: Have the patient sit or lie down since the pump will momentarily stop during this procedure.

Step 2: Place the replacement Controller within easy reach,along with the batteries/battery clips. The spare Controller is usually found in the patient's travel case.

Step 3: Attach the battery clips to the replacement controller by lining up half circles, firmly pushing together, and tightening connector nut. Insert the batteries into the clips by aligning the **RED** arrows.

Step 4: On the back of the replacement controller, slide the safety lock so the red release button is fully visible. Repeat this step on the original controller.

Step 5: Disconnect the drive-line from the original controller by pressing the red release button and pulling it out. The pump will stop and an alarm will sound. Note: The alarm will continue until the original controller is turned off. You can silence the alarm by pressing the silence alarm button.

Getting the replacement controller connected and the pump restarted is the first priority!

Step 6: Connect the replacement Controller by aligning the WHITE ARROWS on the driveline and replacement Controller and firmly pushing the driveline into the replacement Controller. The pump should restart, if not complete the following steps:

- Firmly press the Silence Alarm or Battery Button to restart the pump.
- Check the power source to ensure that power is going to the controller.
- Ensure the driveline is fully inserted into the socket by gently tugging on the metal end. **DO NOT** pull the driveline.

Step 7: After the pump restarts, slide the safety lock on the new controller so the red release button is fully covered. If unable to close the safety lock into fully locked position, gently push the driveline into the controller to ensure proper connection. Retry to close safety lock.

Step 8: Disconnect power from the original Controller.

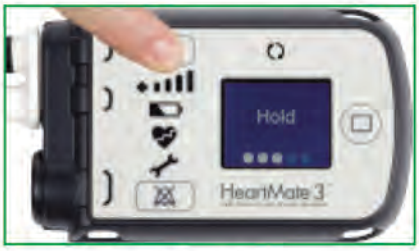
Step 9: Hold down battery symbol for 5 full seconds for complete shutdown of old controller.

Step 3

Step 4 Step 7

Step 5

Step 6



Step 9

This guide does not supersede manufacturer instructions.

LUCAS Chest Compression Device

Indications:

A. The LUCAS device may be used in patients who have suffered non-traumatic cardiac arrest, where manual CPR would otherwise be used.

Contraindications:

A. Patients who do not fit within the device.

1. Too small patient: If LUCAS alerts with 3 fast signals when lowering the SUCTION CUP, and you cannot enter the PAUSE mode or ACTIVE mode.

2. Too large patient: If you cannot lock the upper part of LUCAS to the backplate without compressing the patient's chest.

Protocol for Placement

A. All therapies related to the management of cardiopulmonary arrest should be continued as currently defined.

B. Initiate resuscitative measures:

1. Manual chest compressions should be initiated immediately while the LUCAS device is being placed on the patient.

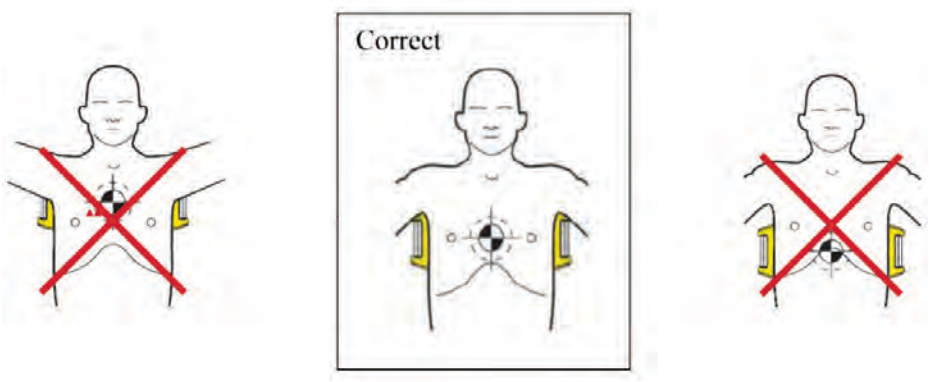
2. Limit interruptions in chest compressions to 5 seconds or less.

3. Do not delay manual CPR for the LUCAS. Continue manual CPR until the device can be placed.

C. While resuscitative measures are initiated, the LUCAS device should be removed from its carrying case and placed on the patient in the following manner:

1. Backplate Placement

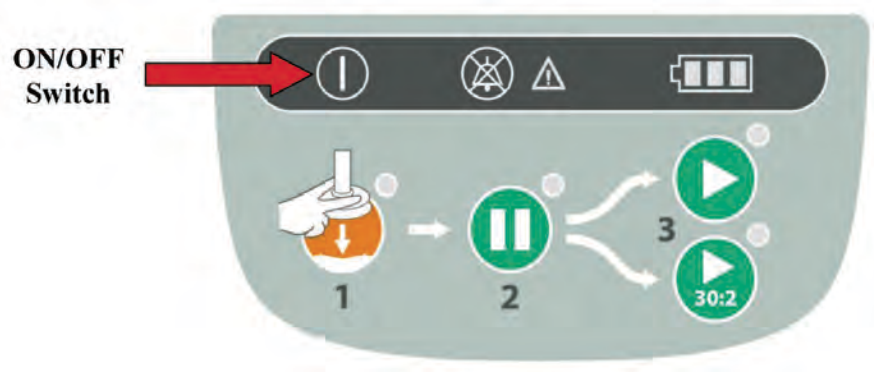
a. The backplate should be centered on the nipple line and the top of the backplate should be located below the patient's armpits.



b. If the patient is already on the stretcher, place the backplate underneath the thorax. This can be accomplished by log-rolling or sliding the backplate under the patient or raising the torso. Placement should occur during a scheduled discontinuation of compressions (e.g., after five cycles of 30:2 or two minutes of uninterrupted compressions).

2. Position the Compressor

a. Turn the LUCAS device on (the device will perform a three second self test).



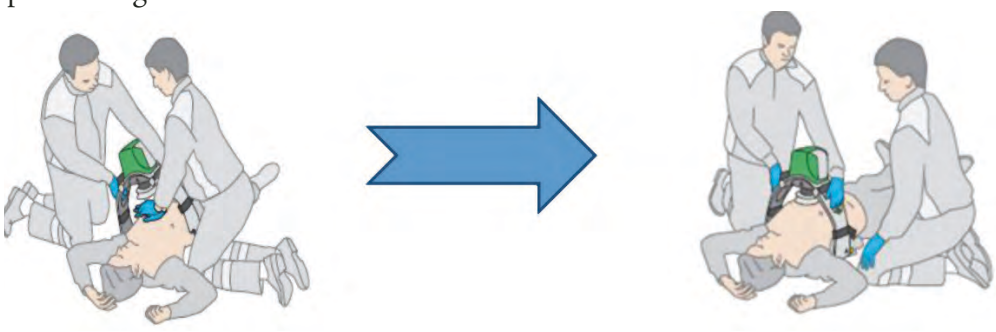
b. Remove the LUCAS device from its carrying case using the handles provided on each side.

c. With the index finger of each hand, pull the trigger to ensure the device is set to engage the backplate. Once this is complete, you may remove your index finger from the trigger loop.

d. Approach the patient from the side opposite the person performing manual chest compressions.

e. Attach the claw hook to the backplate on the side of the patient opposite from where compressions are being provided.

f. Place the LUCAS device across the patient, between the arms of the person who is performing manual CPR.

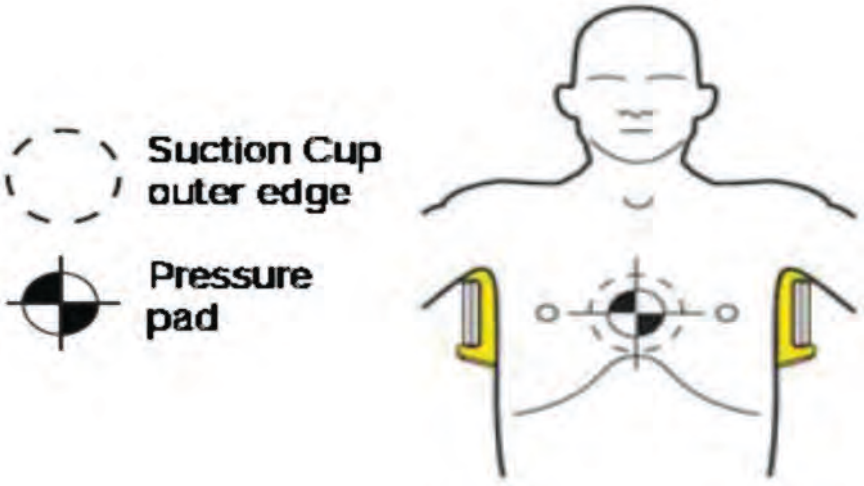


g. At this point the person performing manual CPR stops and assists attaching the claw hook to the backplate on their side.

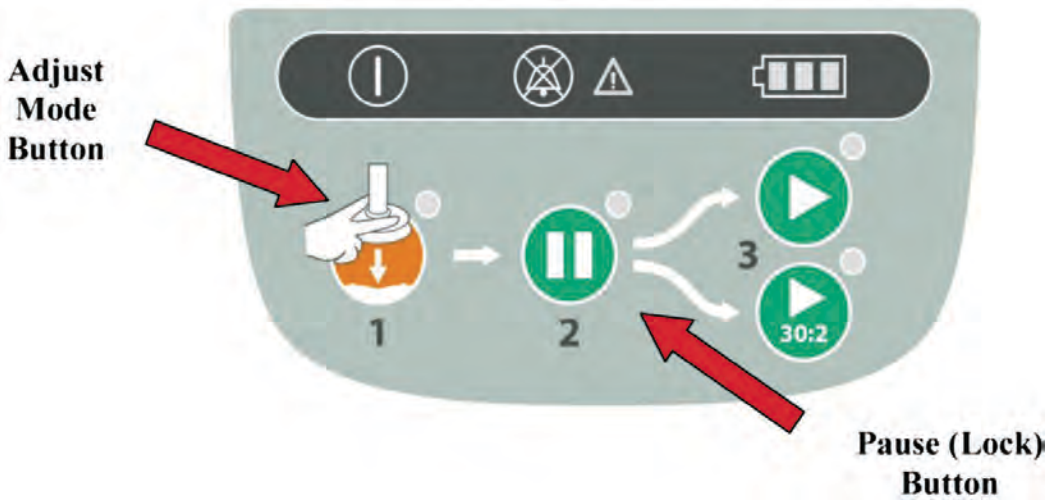
h. Pull up once to make sure that the parts are securely attached.

3. Adjust the Height of the Compression Arm

a. Use two fingers (V pattern) to make sure that the lower edge of the SUCTION CUP is immediately above the end of the sternum. If necessary, move the device by pulling the support legs to adjust the position.



b. Press the ADJUST MODE BUTTON on the control pad labeled #1 (this will allow you to easily adjust the height of the compression arm).



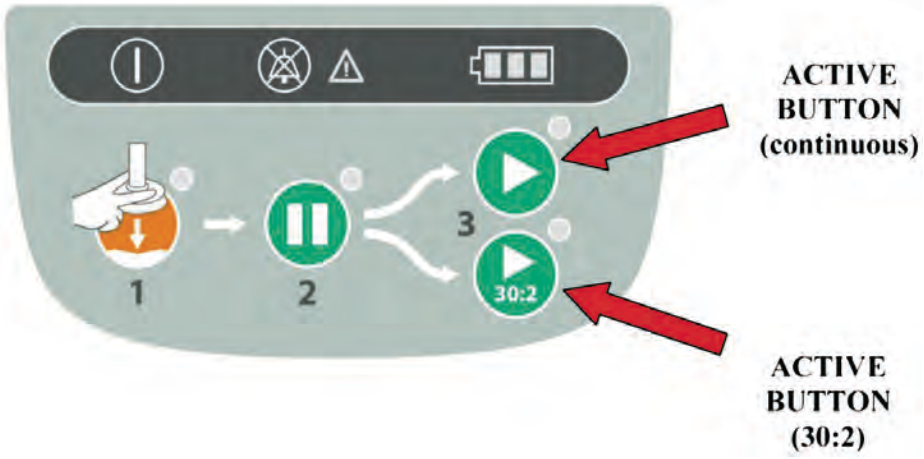
c. To adjust the start position of the compression arm, manually push down the SUCTION CUP with two fingers onto the chest (without compressing the patient's chest).

d. Once the position of the compression arm is satisfactory, push the green PAUSE BUTTON labeled #2 (this will lock the arm in this position), then remove your fingers from the SUCTION CUP.

e. If the position is incorrect, press the ADJUST MODE BUTTON and repeat the steps.

4. Start Compressions

a. To provide compression-to-ventilation ratio of 30:2, push ACTIVE (30:2) BUTTON to start.



5. Patient Adjuncts

a. Place the LUCAS stabilization strap behind the patient's head and attach the straps to the LUCAS device.

i. This will prevent the LUCAS from migrating toward the patient's feet.

ii. Place the patients arms in the straps provided.

Using the LUCAS during Resuscitation

A. Defibrillation

1. Defibrillation can and should be performed with the LUCAS device in place and in operation. There is no need to stop LUCAS to deliver a shock.

2. One may apply the defibrillation electrodes either before or after the LUCAS device has been put in position.

a. The defibrillation pads and wires should not be underneath the SUCTION CUP.

b. If the electrodes are already in an incorrect position when the LUCAS is placed, you must apply new electrodes.

c. If double sequential defibrillation is anticipated, consider application of posterior therapy pad/electrode before LUCAS backplate placement.

3. For rhythm analysis, stop the compressions by pushing the PAUSE BUTTON. The duration of interruption of compressions should be kept as short as possible and should not be > 10 seconds. <u>There is no need to interrupt chest compressions other than to analyze the rhythm.</u>

4. Once the rhythm is determined to require defibrillation, the appropriate ACTIVE BUTTON should be pushed to resume compressions while the defibrillator is charging and then the defibrillator should be discharged.

B. Pulse Checks/Return of Spontaneous Circulation (ROSC)

1. Pulse checks should occur intermittently while compressions are occurring.
2. If the patient moves or is obviously responsive, pause the LUCAS device and evaluate the patient.
3. If there is a change in rhythm, but no obvious indication of responsiveness or ROSC, a pulse check while compressions are occurring should be undertaken. If the palpated pulse is asynchronous, consider pausing the LUCAS device. If the pulse remains, reassess the patient. If the pulse disappears, immediately restart the LUCAS device.
4. A sudden change in $EtCO_2$ may indicate ROSC.

C. Disruption or Malfunction of LUCAS Device

1. If disruption or malfunction of the LUCAS device occurs, immediately revert to manual CPR.

Device Management (Power Supply, Battery Operation)

A. Changing the Battery

1. Push PAUSE to temporarily stop the compressions.
2. Pull the battery out and then upward to remove it.

3 Install a fully-charged LUCAS battery. Put it in from above.
4. Wait until the green PAUSE mode LED illuminates.
5. Push ACTIVE (continuous) or ACTIVE (30:2) to start chest compressions again. The LUCAS Smart Restart feature remembers the settings and start position for 60 seconds.

B. Other Battery Operations

1. When fully charged, the Lithium Polymer battery should allow 45 minutes of uninterrupted operation.
2. There is an extra battery in the LUCAS device carrying case.
3. The battery is automatically charged when the device is plugged into a wall outlet and not in operation. The device should be stored with the LUCAS device plugged into a wall outlet **(when detaching from the wall outlet, make sure that the cord is always with the LUCAS device)**.
4. When the orange Battery LED shows an intermittent light, replace the battery or connect to a wall outlet.
5. Ambulance: LUCAS is connected while stored in the ambulance (always keep a battery installed for the LUCAS device to remain operational).

C. Care of the LUCAS Device After Use

1. Remove the SUCTION CUP and the stabilization strap (if used, remove the patient straps).
2. Clean all surfaces and straps with a cloth and warm water with an appropriate cleaning agent.
3. Let the device and parts dry.
4. Replace the used battery with a fully-charged battery.
5. Remount (or replace) the SUCTION CUP and straps.
6. Repack the device into the carrying case.
7. Make sure that the charging cord is plugged into the LUCAS device.
8. The LUCAS device in the carrying case should be charging on and secure while stored in the ambulance.

Patient Disposition

Purpose:

A. To provide guidance to EMS providers on how to determine whether there is an identified patient.
B. To describe the process of interaction and documentation for people who are not transported by ambulance.
C. To define which people may be left at the scene because they are not considered in need of medical care and/or ambulance transport.
D. To describe the discharge from scene process and documentation requirements.

Philosophy:

A. Every person will be questioned to determine whether or not he/she/they meets the criteria for an identified patient.

B. We acknowledge that 911 can be called for people that are ill or injured, or are perceived to be in need of medical treatment:
  1. Some people may not need a medical evaluation or ambulance transport.
  2. Identified patients with decision capacity have the right to decide whether they want to be treated and/or transported by ambulance.

Definitions:

A. **Patient Identification**:
  1. Person who has obvious visible evidence of illness or injury.
  2. Person who verbalizes a chief complaint suggestive of potential illness or injury.
  3. Person who has experienced an acute event or is in a circumstance that could reasonably lead to illness or injury.
  4. Person who requests a medical evaluation or assessment.

B. **No patient identified determination**
  1. Individual 18 years or older; and
  2. Person denies illness or injury; and
  3. Person without obvious visible signs or symptoms of illness or injury; and
  4. Person with minimal or absent mechanism of injury; and
  5. Person who demonstrates mental capacity to decline medical treatment and transport services (refer to Fundamental components of Decision Making Capacity).

C. **Lift assists**
  1. Person requesting assistance after a fall or slip to the ground in which they are unable to get up under their own power due to a new injury or chronic illness/condition. These individuals may or may not have injuries that would identify them as a patient.

Procedure:

A. **Fundamental components of Decision Making Capacity**
  1. Person is greater than or equal to 18 years or is an emancipated minor.
  2. Patient must have sufficient information from the EMS provider regarding the potential medical condition and the associated risks to his/her/their health.
  3. Patient must understand that a decision must be made.
  4. Patient must understand the risks versus benefits of all options, including not following medical advice.

5. Patient must be able to use the information to make a decision in the setting of his/her/their values and belief systems.
6. Patient must be able to communicate his/her/their choice to the provider.
7. Patient must be acting without coercion or undue influence, including from family, friend and providers.
8. Person is not in immediate danger to themselves or others.
9. It is the responsibility of the EMS provider to identify loss of capacity for medical decision making.

B. Identified patient <u>WITH</u> decision making capacity <u>who refuses needed medical treatment and/or ambulance transport</u>:

1. Explain the risks and possible consequences of refusing medical treatment and/or ambulance transport.
2. If a high risk medical condition exists, contact OLMC for consult.
3. Enlist family, friends, or law enforcement to help better understand the risks versus benefits to the patient.
4. If patient continues to refuse, determine what exactly what is being refused:
   - **a.** Medical treatment and ambulance transport.
     - **i.** Explain the **<u>Refusal of Medical Care and Ambulance Transport Against Medical Advice</u>** section of EMS Discharge From Scene.
     - **ii.** Have patient initial this section, and obtain their signature and printed name at the bottom of the form. Give the top copy to the patient after all the information on the form has been completed.
     - **iii.** Complete a full patient care report *(see documentation requirements)*.
   - **b.** Ambulance transport only.
     - **i.** With knowledge and acceptance that evaluation is necessary by a healthcare professional, some patients may choose to seek medical evaluation by an alternate means of transport such as POV or ride from a relative or friend.
     - **ii.** Explain the **Assessment or Treatment without Ambulance Transport** section of the EMS Discharge From Scene.
     - **iii.** Have patient initial this section, and obtain their signature and printed name at the bottom of the form. Give the top copy to the patient after all the information on the form has been completed.
     - **iv.** Complete a full patient care report *(see documentation requirements)*.

C. Identified patient <u>WITH IMPAIRED</u> decision making capacity who refuses <u>needed</u> treatment and/or transport:

1. Attempt to treat and transport any person who is incapacitated and has a medical need.
2. With any medical need, make all reasonable efforts to assure that the patient receives medical care.
3. Enlist the assistance of family, friends or law enforcement to convince patient to go voluntarily.
4. If patient is in immediate danger to him/her/them self or others and transport is NOT feasible, attempt to enlist support from police (POH) or Behavioral Health Professional (Directors Hold).
5. If deemed necessary, consider pharmacological or physical restraint.
6. Complete full patient care report *(see documentation requirements)*.

D. Special Procedure for Consent and Refusal guidelines for minors above the age of 15 years or older and less than 18 years (reflecting Oregon Statutes):

1. A child under the age of 10 years cannot be left alone even if he or she is not a patient. If no responsible adult is present and the child is not a patient, contact law enforcement.
2. Minors who are 15 years or older and less than 18 years can consent or refuse treatment.
   a. Minors who are 15 years or older and less than 18 years can consent for treatment without parent or guardian consent.
   b. If a minor age 15 years or older and less than 18 years is refusing treatment/transport contact OLMC.
3. If a minor age 15 years or older and less than 18 years is not transported, attempt to obtain consent by minor to contact parents or responsible guardian to inform them of EMS call.
   a. Explain and complete **Juvenile under 15 years without presence of parent/patient with healthcare POA** section of the EMS Discharge from Scene if parents will not be arriving on scene to collect their child.

E. Lift Assists:

1. If before or after moving the person off the ground, further assessment is needed (i.e. they have new complaints of pain, a possible injury is suspected or there is a potential medical cause for the fall), the now identified patient should be encouraged to seek medical evaluation. A full set of vital signs should be obtained, and other assessments should be completed as necessary. If the patient refuses medical treatment and ambulance transport or ambulance transport only, complete the applicable section of the EMS Discharge From Scene. A complete patient care report should accompany this paperwork. *(see documentation requirements)*.
2. In the case where lift assistance only is needed, and the person does not have new injuries or complaints, EMS Discharge From Scene documentation is not necessary, and the no patient identified disposition may be used. The narrative of the patient care report should explain the need for lift assistance only and the absence of complaint or injury before and after the move.

Documentation Requirements:

A. All instances of an identified patient, with or without decision-making capacity, must be fully documented on a patient care report. A signed EMS Discharge From Scene form must be obtained on all patients with decision-making capacity who are refusing medical treatment and/or ambulance transport. The following is considered minimum documentation criteria:

1. Reason for EMS response.
2. General appearance and level of consciousness (mental status).
3. History, vital signs (BP, HR and RR), and physical exam (if patient allows).
4. Medications and allergies.
5. Presence of any intoxicants.
6. Assessment of the patient's decision-making capacity.
7. Specific risks of refusal that were explained to the patient.
8. Communication with family, friends, police, and/or OLMC.

B. For "**no patient identified**" persons, the narrative should include information about why EMS was called and indicate how the "no patient identified" situation was determined.

High Risk Medical Conditions Requiring OLMC Contact:

A. EMS providers are required to contact OLMC for the following refusal situations:
- **1.** Suspected impaired decision making capacity.
- **2.** Suspected high risk medical conditions such as:
  - **a.** Age younger than 3 months.
  - **b.** Minor (age 17 years or younger) without a parent or guardian who is refusing care.
  - **c.** Serious chief complaint (including but not limited to): chest pain/dysrhythmia, shortness of breath, first time seizure, poison/OD, suspected sepsis, suspected cervical spine injury, stroke/TIA.
  - **d.** Significant mechanism of injury, or suspicion of injury.
- **3.** EMS provider believes patient should have an evaluation.
- **4.** Conflict on scene regarding refusal of medical treatment.
- **5.** Suspected abuse situation involving a minor, elderly person, or a person with a disability.
- **6.** An unconscious or alter mental status (person or parent/guardian for a minor).

B. Sustained abnormal vital signs:
- **1.** Pulse greater than 120/min or less than 60/min without explanation.
- **2.** Systolic BP greater than 200 mmHg or less than 90 mmHg.
- **3.** Respirations greater than 30/min or less than 10/min.
- **4.** SpO_2 < 90%.

Patient Disposition Flow Chart

Assess Patient's Medical Need

No Patient Identified

- Person is 18 years or older
- Denies illness or injury
- Has no signs or symptoms of illness or injury
- Has minimal or absent mechanism of injury
- Appears competent to decline EMS services

- **Discharge from Scene paperwork not necessary**
- Document in narrative complete circumstance of why you were called to scene and how you determined the person is not a patient.

Identified Patient

- Chief compliant and/or EMS medical assessment suggestive of illness or injury
- Requests evaluation or assessment
- Has obvious evidence of illness or injury
- Has experienced an acute event that could reasonably lead to illness or injury
- Is in a circumstance that could reasonably lead to illness or injury

Able to make decisions and transport is advised---refuses ambulance transport against medical advice

- **Explain risks of refusing care and/or transport**
- If serious medical need exists contact OLMC
- Enlist others to help convince patient
- **Complete Refusal of EMS care and Transport AMA section of Discharge from Scene form**
- Fully document circumstances in PCR

Able to make decisions---does not require ambulance transport, agrees to seek medical attention

- **PIC must agree with patient's course of action**
- Fully document vital signs and physical findings
- **Complete Assessment and/ or Treatment without EMS Transport section of Discharge from Scene form**
- Fully document circumstances in PCR

Impaired capacity to make decision about treatment and/or transport

- Treat and transport if medical emergency exists. Use restraint protocol if needed.
- Make all reasonable efforts to assure patient gets medical care
- **Consult OLMC**
- **Do not complete Discharge from Scene form**
- Fully document circumstances in PCR
- Document results of OLMC call and who you spoke to in PCR

Minimum Documentation Requirements for ALL Identified Patients

- General appearance and level of consciousness
- History, one complete set of vital signs, and physical exam
- Medications and allergies
- Presence of any intoxicants
- Mental capacity assessment
- Any specific risks that were explained to patient
- Communication with others on scene or OLMC

OLMC Contact Requirement

- Impaired decision making capacity
- Suspected serious medical condition
- Suspected abuse - child or elderly
- Scene conflict regarding medical care
- Minor without guardian refusing care
- Sustained abnormal vital signs
- Significant mechanism of injury or suspicion of injury
- Pediatric patients under 3 months

Emergency Medical Service (EMS) Discharge from Scene

Date: _____ **Incident Location:** _____

Patient Name: _____ **Agency Run Number:** _____

Refusal of EMS Care and Transport Against Medical Advice: I have been assessed and/or treated for illness or injuries by EMS. I have been advised that I have at least one potentially serious illness or injury, which needs further treatment. I understand that failure to treat this illness/injury may lead to permanent disability or death. I understand that signing this form does not preclude me from later obtaining medical care on my own or by requesting another EMS response by calling 911.

My initials here indicates that this section applies to me: _____

Assessment and/or Treatment without EMS Transport: I have been assessed and/or treated for illness or injury by EMS. I have been advised and understand I may need further assessment and treatment. I refuse to be transported by EMS to the hospital for further evaluation. I have decided to use an alternate mode of transportation to seek medical attention. I understand that signing this form does not preclude me from later obtaining medical care by requesting another EMS response by calling 911.

My initials here indicates that this section applies to me: _____

Juvenile under 15 without presence of parent/Patient with Healthcare POA:
_____ has been assessed and/or treated for illness or injury by EMS. As their parent/guardian/POA/school representative (**Circle one**) I have been advised that they may need further assessment and treatment by a healthcare professional. I refuse further treatment on behalf of him/her by EMS, as well as transport to the hospital. I also understand that signing this form does not preclude me from later obtaining medical care for him/her or requesting another EMS response by calling 911.

My initials here indicates that this section applies to me: _____

Acceptance of Responsibility and Release of EMS ***(Completion of this area required for all sections)***

I understand that EMS has made a good faith determination that I am alert, oriented, and able to make decisions for my ward or for myself. I have read, or have had read to me, the section I have initialed above. My EMS assessment and treatment options were explained to me and I understand them. I have no further questions of EMS at this time. I now knowingly and voluntarily release all individuals, organizations, and entities participating under current protocols, from any liability for any and all claims arising from my decision regarding me or my ward's healthcare.

Patient Name (Printed): _____

Patient Signature: _____

Translator/Parent/ Guardian Name (If applicable): _____

EMS Provider Name: _____

EMS Provider Signature: _____

Pediatric Field Initial Survey

Initial Survey:

A. Establish level of consciousness.
B. Evaluate airway and protective airway reflexes.
C. Basic airway skills, and spinal immobilization, as needed.
D. Start O_2, follow ***Airway Management*** procedure.
E. Assist ventilation as needed.
F. Stop hemorrhage. Evaluate and support circulation.
G. Perform environmental assessment, including consideration of intentional injury.
H. Determine appropriate treatment protocol.

Treatment: See specific protocol for pediatric considerations.

Special Considerations:

A. Identify sign of airway obstruction and respiratory distress, including:
  1. Cyanosis
  2. Stridor
  3. Drooling
  4. Nasal flaring
  5. Choking
  6. Grunting
  7. Intercostal retraction
  8. Absent breath sounds
  9. Bradycardia, tachycardia
  10. Apnea, bradypnea or tachypnea

B. Open airway, using jaw thrust and chin-lift (and/or head tilt if no suspected spinal trauma), and if indicated, use suction. Consider placement of OPA if child is unconscious.

C. If cervical spine trauma is suspected, immobilize spine with cervical immobilization device and backboard. Infants and young children may require under-shoulder support to achieve neutral spine position.

D. Use OPA, (NPA's are not recommended), partial rebreather mask, or O_2 blow-by, as tolerated, with child in position of comfort.

E. Use chest rise as indicator of adequacy of ventilation. If chest rise is inadequate, consider:
  1. Repositioning the airway
  2. Foreign body in the airway
  3. Inadequate bag volume or activated pop-off valve

F. Rescue breathing
   1. 2 initial breaths (approx. 1.3 seconds)
   2. Then rate of 30 breaths per minute for neonates and 8-10 breaths per minute for infant or child.

G. Assess perfusion using:

   1. Heart rate
   2. Skin signs
   3. Capillary refill
   4. Mental status
   5. Quality of pulse
   6. Blood pressure

H. Compression /ventilation rate

Pediatric		
	No advanced airway	Advanced airway present
Compressions / minute	100	100
Breaths / minute	8-10	8-10
Compressions / Breath ratio	15:2	100-120
Neonatal		
	No advanced airway	Advanced airway present
Compressions / minute	90	100
Breaths / minute	30	30
Compressions / Breath ratio	3:1	120

Pelvic Wrap

Purpose:

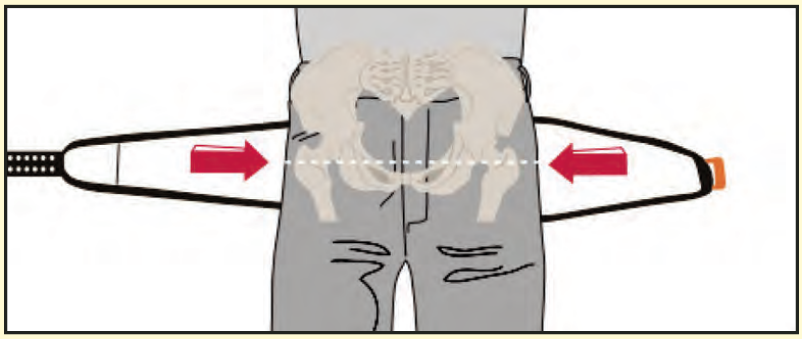
The initial reduction of an unstable pelvic fracture (to lessen ongoing internal bleeding and to ease the pain by splinting the fracture) using either a specifically applied sheet or another approved device.

Indications:

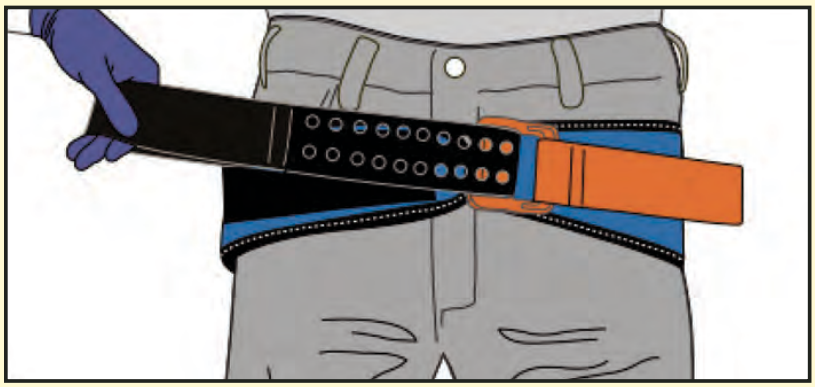
A. To be applied in all trauma patients who have appropriate mechanism(s) of injury and who present with either pelvic pain or pelvic instability.
B. Consider pelvic wrap in unconscious trauma patients who have appropriate mechanism(s) of injury and who are in shock.

Procedure: Application of a SAM Pelvic Sling II™

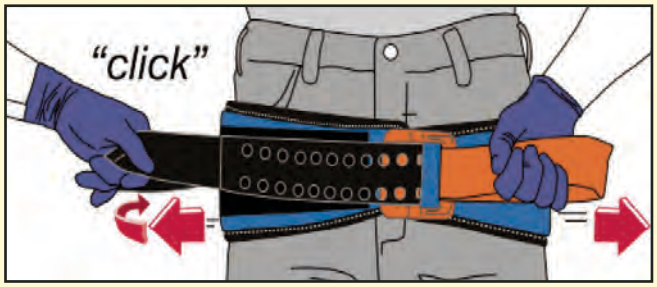
A. Remove objects from patient's pocket or pelvic area. Place SAM Pelvic Sling II™ gray side up beneath patient at level of trochanters (hips).



B. Place BLACK STRAP through buckle and pull completely through.



C. Hold ORANGE STRAP and pull BLACK STRAP in opposite direction until you hear and feel the buckle click. Maintain tension and immediately press BLACK STRAP onto surface of SAM Pelvic Sling II™ to secure.



Procedure: Application of a Pelvic Sheet Wrap

A. For high-energy mechanisms, consider advanced placement of a pelvic sheet wrap on the backboard in case it is needed.

B. Fold the sheet smoothly several times lengthwise (do not roll it) until it is about 9 inches wide, and apply underneath the pelvis, centered on the greater trochanters of the femurs. The greater trochanter of each femur is the bony prominence on the lateral upper thigh; it is typically found to be even with the level from the patient's distal wrist to the base of the thumb, in the supine patient with arms down at the side.

C. Before tightening the sheet around the pelvis, ensure all the objects are removed from pockets so the pressure of the sheet doesn't press on items causing additional pain.

D. Tighten the sheet around the pelvis, adjusting the tension to try to return the pelvis to the normal anatomic position based on the initial assessment of instability. Cross the sheet in the middle, twist it, and then secure it laterally with a knot or clamp. The sheet should feel tightly wrapped around the pelvis allowing for two fingers to be inserted between sheet and pelvis.

Precautions:

A. Always re-check the position of the sheet (in terms of up and down). You should still be able to feel the anterior superior iliac spines after placement. If not, the sheet may be too high on the pelvis and must be repositioned.

B. If the pelvis is unstable on initial exam, do not repeat the exam.

C. The pelvic wrap is not indicated for suspected isolated hip fractures, i.e., ground level falls.

Physical Restraint

Purpose:

Restraint is used to protect the safety of patients and responders. Physical restraint should be utilized only if the patient is exhibiting behavior that is a danger to self or others.

Procedure:

A. Physical Restraint Guidelines:

1. ***Perform the Broset Violence Assessment (see below)***

a. If Broset is ≥ 1, consider oral benzodiazepine or oral anti-psychotic if patient is cooperative. Consider physical restraints if patient does not wish to take oral medications.

b. If Broset is ≥ 3 or if attacks against objects/individuals are present, patient must be either sedated or restrained or both prior to transport.

c. DO NOT initiate transport unless safety to patient and EMS/Fire crew members are insured.

B. Physical Restraint Procedures:

1. Use the minimum level of physical restraint required to accomplish patient care and ensure safe transportation (soft restraints may be sufficient). If law enforcement is needed, call for it prior to attempting restraint procedures. Do not endanger yourself or your crew.

2. Avoid placing restraints in such a way as to preclude evaluation of the patient's medical status.

3. Place patient face up on backboard or gurney, NOT PRONE. Closely monitor the patient's respiratory status.

4. Secure ALL extremities to backboard or gurney. Try to restrain lower extremities first using restraints around both ankles. Next, restrain the patient's arms at his/her sides.

5. If necessary, utilize cervical spine precautions (tape, foam bags, etc.) to control violent head or body movements.

6. If patient is on backboard, secure the backboard onto gurney using additional straps if necessary. Secure additional straps to the upper part of the gurney to avoid restricting the wheeled carriage.

7. Evaluate the patient's respiratory and cardiac status to ensure that no airway compromise exists. Monitor SpO_2 and CMS if possible.

8. DO NOT tighten chest straps to the point that they restrict breathing.

9. If feasible, document the RASS score(s). See next page.

Broset Violence Assessment checklist

Score 0 = Low risk of violence

Score 1-2 = Moderate risk of violence
(preventative measures should be taken)

Score ≥ 3 = High risk of violence
(preventative measuresare required)

Attacks on objects	0 point 1 point
Physical Threats	0 point 1 point
Verbal Threats	0 point 1 point
Boisterousness	0 point 1 point
Irritability	0 point 1 point
Confusion	0 point 1 point

Richmond Agitation Sedation Scale (RASS)

Score	Term	Description
+4	Combative	Overtly combative and violent; immediate danger to EMS.
+3	Very agitated	Aggressive; verbally and physically uncooperative towards EMS.
+2	Agitated	Frequent non-purposeful movement; agitated when touched or moved.
+1	Restless	Anxious but movements not aggressive or dangerous to EMS or self.
0	Alert and calm	
-1	Drowsy	Not fully alert, but has sustained awakening (eye opening/eye contact) to voice (> 10 seconds).
-2	Light Sedation	Briefly awakens with eye contact to voice (< 10 seconds).
-3	Moderate sedation	Movement or eye opening to voice (but no eye contact).
-4	Deep sedation	No response to voice but movement or eye opening to physical stimulation.
-5	Unarousable	No response to voice or physical stimulation.

PICC Line Access

A Peripherally Inserted Central Line (PICC) is a common method of maintaining long-term venous access in select patients. PICC lines are typically inserted into the antecubital fossa, and then threaded into central circulation. PICC lines are flushed with heparin to maintain patency and therefore it is imperative to aspirate 5 mL of blood from the line prior to use.

Indications:

A. PICC lines may be accessed when there is a need for drug or fluid administration and traditional means of venous access are unsuccessful.

B. Patient or patient's caregiver requests use of PICC line.

Contraindications:

A. Inability to aspirate or infuse through the catheter.
B. Catheter located in any place other than the patient's upper arm.
C. Need for rapid fluid resuscitation.

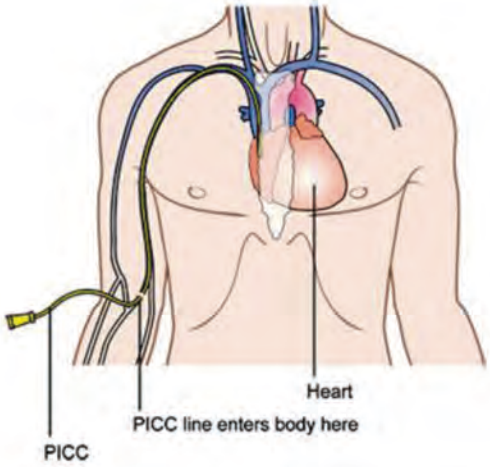
Procedure:

A. Use clean gloves and maintain sterility as much as possible.
B. If there is a needleless type port on the distal end of the catheter, perform the following: (figure 1)
   1. Scrub the port with an alcohol pad and allow to dry for 5 seconds.
   2. Attach a 10 mL syringe (without saline) to the port.
   3. Unclamp if necessary (needless port may not have a clamp).
   4. Attempt to aspirate at least 5 mL of blood. Blood should draw freely. If it does not, remove the syringe and DO NOT use the catheter for access.
   5. If blood aspirates freely, remove the 10 mL syringe with blood and discard.
   6. Attach a 10 mL syringe with NS and gently flush the line. Never use a smaller syringe. If line does not flush, remove the syringe and DO NOT use the catheter for access.
   7. If line flushes, remove the syringe and attach the catheter to the end of the IV tubing and begin infusion of NS. Adjust the rate to the needs of the patient within the limits of the catheter.
   8. Administer medications though IV tubing port if indicated.

C. If there is a capped needle-type port on the distal end of the catheter, perform the following: (figure 2)
   1. Scrub the cap with an alcohol pad and allow to dry for 5 seconds.
   2. Clamp the catheter tubing using ONLY the existing clamp on the catheter and then remove the cap. Never allow a central line to be open to air.
   3. Attach a 10 mL syringe on the catheter end.
   4. Unclamp the catheter.
   5. Attempt to aspirate at least 5 mL of blood. Blood should draw freely. If it does not, re-clamp the line and remove the syringe. DO NOT use the catheter for access.
   6. If blood aspirates freely, clamp the catheter again.
   7. Remove the 10 mL syringe with blood and discard.
   8. Attach a 10 mL syringe with NS.
   9. Unclamp and gently flush the line. Never use a smaller syringe. If line does not flush, re-clamp the line and remove the syringe. DO NOT use the catheter for access.
   10. If line flushes, re-clamp and remove the syringe.
   11. Attach the catheter to the end of the IV tubing.
   12. Unclamp the catheter and begin infusion of NS. Adjust the rate according to the needs of the patient within the limits of the catheter.
   13. Administer medications though IV tubing port if indicated.

Notes and Precautions:

A. Do not administer medications, flush or aspirate with less than a 10 cc syringe. Smaller size syringes generate too much pressure and can damage the catheter.
B. Do not attempt to reinject aspirated blood as it may contain clots.
C. The maximum flow rates for a PICC line is 125 mL/hr for less than size 2.0 French, and 250 mL/hr for catheters over 2.0 size French.
D. Keep patient's arm straight to avoiding kinking the PICC line and obstructing flow.
E. Ensure all line connections are secure.
F. PICC lines access the patient's central circulation and the risk of infection is high. Avoid contamination to ports and connections while accessing.
G. Do not administer the following medications through a PICC line:
   a. Adenosine – The line may rupture during rapid infusion due to over pressurization.
   b. Dextrose 50% – The catheter can be damaged due to the viscosity of the fluid.



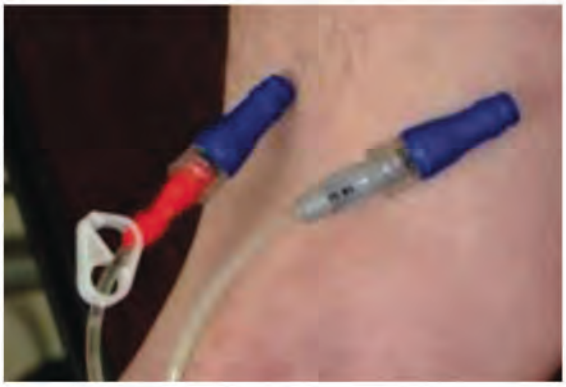


Figure 1- Needleless port

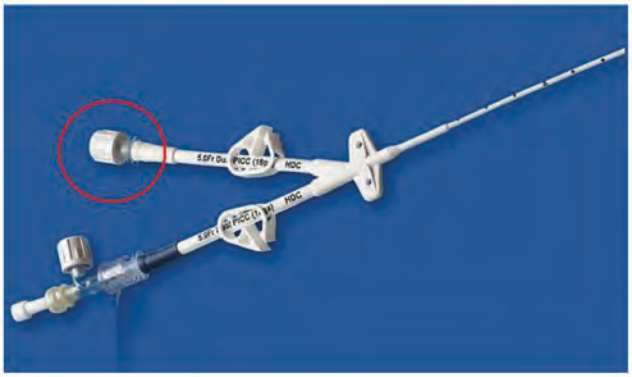


Figure 2 – Needle type port with cap

Positive End-Expiratory Pressure (PEEP)

Positive end-expiratory pressure (PEEP) is a method of ventilation in which airway pressure is maintained above atmospheric pressure at the end of exhalation by means of a mechanical impedance (PEEP valve). PEEP has some similarity to CPAP/BiPAP although it is delivered through bag instead of a facemask. ADDING PEEP IS DONE TO IMPROVE OXYGENATION. The disadvantage to PEEP is that it may increase intrathoracic pressure, which may reduce blood flow in cardiac arrest or a shock state.

Indications:

Hypoxia, either prior to or post intubation, despite appropriate bag ventilation with 100% oxygen.

Contraindications:

A. During resuscitation of cardiac arrest (okay after sustained ROSC with stable vital signs).
B. Hypotension or shock state. May still choose to apply PEEP when preparing to RSI a hypoxic/hypotensive patient.

Procedure:

A. If not already applied, apply PEEP valve to bag device.
B. Dial PEEP valve to 5cm H2O and bag per usual.
C. Increase PEEP by 5cm H2O every 3 - 5 minutes until hypoxia resolves (oxygen saturation > 95%).
D. Maximum PEEP is 15 cm H2O.
E. Monitor blood pressure during each change in PEEP pressure. If blood pressure decreases after change in PEEP, return to previous setting.

Notes and Precautions

A. Increasing bagging rate will not necessarily improve oxygenation but can cause hyperventilation, which can be detrimental to patients.
B. PEEP valve may come out of the package set to five or zero. Be aware of valve settings.
C. **Maximum PEEP in pediatrics is 5cm H2O**.

Selective Spinal Immobilization

Immobilize using a **Full Spinal Immobilization** or **Spinal Motion Restriction** if the patient has a mechanism with the potential for causing spinal injury and meets **ANY** of the following clinical criteria:

A. Spinal pain or tenderness.

B. Neurologic deficit (numbness, tingling, paralysis).

C. Altered mental status (e.g GCS < 15, evidence of intoxication, etc).

D. Distracting pain/injury (extremity fracture, drowning, etc.).

E. Distracting situation (communication barrier, emotional distress, etc.).

F. Comorbid age factors (< 12 yrs or > 65 yrs).

Key Considerations:

A. If any immobilization techniques cause an increase in pain or neurologic deficits, immobilize patient in the position found or position of greatest comfort.

B. For isolated penetrating head, neck, or torso trauma, immobilization of the spine is unnecessary unless there is overt neurologic deficit or an adequate physical examination cannot be performed, e.g., a patient with altered mental status or a patient with distracting injury.

C. For patients who are awake and alert and who do not have neurological deficits, spinal precautions can be maintained by **application of a rigid cervical collar and securing the patient firmly to the EMS stretcher,** and may be most appropriate for:

- Patients who are found to be ambulatory at the scene
- Patients who must be transported for a protracted time, in particular interfacility transfers.

D. Regularly assess the patient's respiratory status during transport. Loosen straps as needed to avoid respiratory compromise.

E. For patients in spinal motion restriction, position patient in a supine position on gurney during transport when feasible.

F. Patients in the third trimester of pregnancy should have the right side of the backboard elevated six inches.

G. Pad backboards for all inter-facility transports. If feasible, especially in prolonged scene transports, pad backboards.

H. If sports injury, immobilize patient per ***Sports Equipment Removal*** protocol.

Procedure for Full Spinal Immobilization:

A. Temporarily immobilize the cervical spine with rigid extrication collar and continuous manual in-line support. Immobilize thoracic and lumbosacral spine to long backboard, when possible, and/or other appropriate device as patient condition allows (KED, OSS, orthopedic, etc.). In the severely traumatized patient requiring rapid transport, use a rigid C-collar with continuous manual in-line support during rapid extrication onto a long backboard.

B. After immobilizing patient's body from the neck down, secure head and cervical spine to long backboard using dense, soft support material on both sides of the head, and tape. Use 4 straps (or equivalent) and head padding to maintain neutral anatomic position. Secure the patient diagonally across the shoulders, chest, and straight across the hips and thighs. During this procedure, the patient should be moved as little as possible, and always as a unit.

C. Chin straps, which could compromise the airway, should be removed as the patient is immobilized to the long backboard. Leg straps, which were placed on the patient while in a sitting position prior to extrication, should also be removed if they compromise C-spine immobilization.

D. Patient should be securely strapped to long back board to enable board and patient to be turned as a unit because of possibility of vomiting. Additional help may be necessary during transport to turn patient and manage the airway while maintaining C-spine integrity.

E. Complete a secondary exam to include serial neurological status after immobilization.

F. Treat pain per ***Pain Management*** protocol.

Pediatric Considerations:

A. Children require extra padding behind the T-spine and shoulders and are best immobilized on a pediatric backboard.

B. If using an adult backboard:

1. Since the pediatric patient is at risk of sliding from side to side on a backboard, it is recommended that the EMS Provider place rolled up blankets or other dense, soft support material on both sides of the pediatric patient prior to securing the chest and hip straps.

2. The location of the straps on the backboard may have to be adjusted so they securely hold the pediatric patient in place and do not compress the abdomen.

C. Consider using an available child safety restraint device for immobilization (e.g., car seat, Pedi Mate® device).

Sports Equipment Removal

Purpose:

To provide direction on the safe removal of protective sports equipment that includes helmet and shoulder pads. This procedure page uses football gear as an example, but these guidelines can be used with other sports equipment as well.

Procedure:

A. Initial Evaluation

1. The initial evaluation should begin by assessing level of consciousness, breathing, and circulation. If the athlete is breathing and stable, but a neck injury is suspected-quick sensory and motor nerve exam should be initiated.
2. After the quick neurological exam on a stable athlete, the facemask should always be removed.

B. Face Mask Removal

1. Stabilize head.
2. Cut side and top attachments at loop to remove face mask.

C. Guidelines for Helmet Removal on the Field

1. If athlete has neck pain, numbness or tingling, extremity weakness or is unconscious, the helmet should not be removed on the playing field.
2. If access to airway is compromised, removal of helmet and shoulder pads as a unit may be initiated.

While backboard and straps are being prepared:

D. Chest Access

1. Cut jersey and front laces of shoulder pads.
2. Flip out shoulder pads.
3. Place hands on shoulders with thumbs grasping the clavicle and fingers surrounding the upper trapezius muscles.
4. Secure the athlete's head between the EMS Provider's forearms.

E. Back Board Utilization

1. Person at head initiates commands and oversees proper placement and techniques.
2. Three on each side of body: one at shoulders, one at hips, and one at legs.
3. One other person is in charge of backboard and slides it into place.
4. Person at head gives command to lift athlete and slide backboard into place from feet. If helmet is not resting on board, padding can be added to fill space.
5. Fasten straps and tape helmet to board.
6. Chinstrap remains in place unless it interferes with airway.
7. Recheck sensory and motor nerve vitals for changes and document.

F. If Removal of Helmet and/or Shoulder Pads are necessary, remove as a unit

1. Cut chin straps.
2. Release cheek pad snaps with 3 tongue depressors.
3. Cut shoulder pad straps.
4. Cut both the jersey and shirt up sleeves towards midline of body.
5. Person at head stabilizes maxilla and occiput and gives commands.
6. Three people on each side, with one stabilizing head. Another person removes the equipment. Person tilts helmet slightly forward and slides off head. **CAUTION: DO NOT SPREAD APART SIDES OF HELMET.** Shoulder pads, jersey, and shirt are then slid off with great care as a unit.

NOTE:
If athlete is face down, person at head crosses arms and a log roll technique is used to initiate evaluation.

Removal of TASER Barbs

Indication:

To remove the remaining barb after use of a TASER by Law Enforcement agencies.

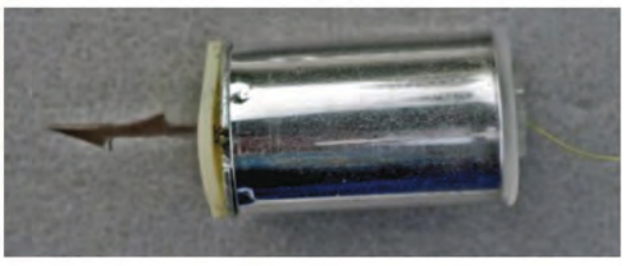
Procedure:

A. Perform patient assessment. Always wear PPE.
B. Monitor vitals and LOC. Insure that vitals are in the normal limits for the situation.
C. Contact OLMC if unsure whether to transport.
D. Expose the area where TASER barb has implanted under the skin.
E. Cut wires from the barb if they are still attached.
F. Make an "L" with your non-dominant hand and stabilize the extremity (or area) in the general proximity of the probe. Keep your hand several inches away from the probe itself, and do not attempt to stretch the skin immediately around the probe.
G. While holding tension:
  1. **For Gresham PD** - use needle-nose pliers (or similar tool) with gripping strength and grasp the end of the barb protruding out of the skin near the wire lead and firmly pull out the barb with one quick jerking motion.
  2. **For Portland PD** - use the cartridge safety clip to pull the probe straight out. Place your thumb on top of the base of the probe to stabilize it. Do not twist the safety clip or probe as the barbed tip may cause additional injury. Be sure that the barbs are visible after removal.

H. Assess the skin where the barb was removed. Control any bleeding and dress the wound.

Precautions:

A. Patients should be in police custody and monitored by Police for the safety of medical personnel.
B. Do not remove TASER barbs from the face, neck or groin area, or imbedded in bone. These patients must be seen at the emergency department.
C. TASERs emit two barbs. Make sure both are removed.
D. Treat all barbs as a bio-hazard and dispose as you would any other sharps.
E. Some law enforcement agencies may direct you to place the probe back into the cartridge as evidence.



Caution:

A. Where both implanted barbs and wires are still connected to the TASER gun, shock can still be delivered.

B. Do not forget the potential trauma that may have occurred before or after the patient was hit by the TASER (i.e. falls, bean bagged, mace etc).

C. Remember that the process of removing a TASER probe is not a time-critical emergency. Calm and decisive actions by the EMS provider will deliver the best patient care and help prevent biohazard exposure

Documentation:

Fully document your assessment and care on a patient care report.

Tension Pneumothorax Decompression (Thoracentesis)

Definition:

The emergency decompression of a tension pneumothorax using an over the needle catheter.

Indications:

To warrant chest decompression in the field, the patient must be in immediate risk of dying with:

A. High clinical suspicion **AND**;
B. Progressive respiratory distress **AND**;
C. Shock symptoms with low or rapidly decreasing blood pressure.
AND at least **ONE** of the following:
1. Decreased or absent breath sounds.
2. Consistent history (i.e., chest trauma, COPD, asthma).
3. Distended neck veins.
4. Tracheal shift away from affected side (late sign).
5. Asymmetrical movement on inspiration.
6. Hyper-expanded chest on affected side.
7. Drum-like percussion on affected side.
8. Increased resistance to positive pressure ventilation, especially if intubated.

EMS witnessed traumatic arrest patients with abdominal or chest trauma for whom resuscitation is indicated should have bilateral chest decompression performed even in the absence of the above signs.

Procedures:

A. Expose the entire chest.
B. Establish landmarks to identify second intercostal space, mid-clavicular line.
C. Clean chest vigorously with appropriate antiseptic.
D. On affected side, locate the mid-clavicular line and insert a large gauge over-the-needle catheter with syringe attached along the superior margin of the third rib.
E. If the air is under tension, the barrel will pull easily and "pop" out of the syringe.
F. Remove syringe, advance catheter, and remove needle.

Specific Precautions:

A. Patient's chest should be auscultated often for return of tension or other respiratory complications.

B. Tension pneumothorax is a rare condition, but can occur with trauma, spontaneously, or as a complication of intubation. Tension takes time to develop, but forceful positive ventilation may increase the rate of development.

C. Simple or non-tension pneumothorax is not life threatening and should not be decompressed in the field.

D. The ideal decompression catheter length is three inches.

E. Possible complications:
1. Creation of pneumothorax if none existed previously.
2. Laceration of lung or pericardium. Stop needle advancement once it has popped through the pleura and advance the catheter only.
3. Laceration of blood vessels (always slide the needle above the rib).
4. Infection. Clean rapidly but vigorously (use sterile gloves if possible).

F. Tension pneumothorax can be precipitated by the occlusion of an open chest wound. If the patient deteriorates after dressing an open chest wound, remove the dressing.

Transcutaneous Pacing

Definition:

Transcutaneous pacing is the technique of electronic cardiac pacing accomplished by using skin electrodes to pass repetitive electrical impulses through the thorax.

Indications:

Transcutaneous pacing should be considered in bradycardia (heart rate less than 50 bpm) and evidence of inadequate perfusion (e.g., hypotension (BP less than 90 mm/Hg) altered mental status).

Procedure:

A. Ensure that the pacemaker leads are attached and the monitor is displaying a cardiac rhythm.

B. Attach pacing electrodes to anterior and posterior chest just to the left of the sternum and spinal column, respectively.

C. Begin pacing at a heart rate of 80 bpm and "zero" current output.

D. Increase current by increments of 10 mAs while observing cardiac monitor for evidence of electrical capture*, then confirm mechanical capture by checking pulses and BP.

E. If the patient is comfortable at this point, continue pacing. If the patient is uncomfortable at this point, decrease current output by increments of 5 mA to a point just above electrical and mechanical capture.

F. If the patient still complains of pain during pacing despite reduced current output, consider sedation and /or analgesia.

G. If the patient remains unconscious during pacing, assess capture by observing the monitor and evaluating pulse or blood pressure changes. In case of electrical capture and no pulses, follow ***Cardiac Arrest — PEA*** protocol.

H. If there is no response to pacing **and** ACLS drugs, consult OLMC.

NOTES:
A sudden and sustained rise in $EtCO_2$ indicates increased pulmonary blood flow and may confirm mechanical capture.

Precautions:

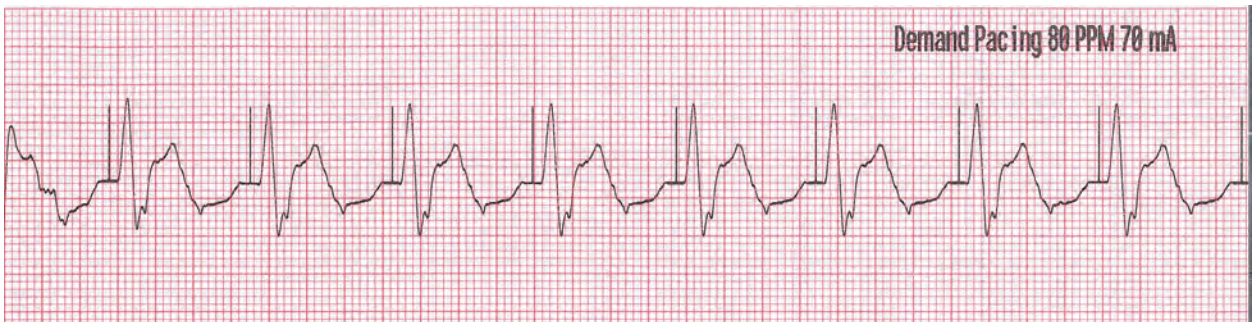
Transcutaneous should not be used in the following settings:

A. Asystole

B. Patients meeting death in the field criteria.

C. Patients with signs of penetrating or blunt trauma.

* Example of electrical capture:



Unity Center for Behavioral Health Emergencies

Purpose:

To establish criteria for EMS assessment, triage and treatment of patients with potential behavioral/mental health emergencies and direct transport to the Unity Center for Behavioral Health (UCBH).

Definition:

Behavioral health encompasses behavioral factors in chronic illness care, care of physical symptoms associated with stress rather than diseases, and health behaviors, as well as mental health and substance abuse conditions and diagnoses.

Inclusion:

A. Voluntary patient or patient on police or mental health director hold.

B. Primary 911 call or police request.

C. Age between 18-70 years.

D. Mental health complaint (depression, psychosis, suicide or homicidal ideation), substance abuse or behavioral disorder with no acute medical or traumatic condition requiring treatment.

E. Alert and oriented to person, place, and time.

F. No evidence of trauma other than minor abrasions.

G. Able to perform activities of daily living (ambulate, bathe, toileting, eat and drink) independently.

H. If CBG is obtained, between 60 and 300 mg/dl.

Vital Signs:

A. HR 60-130.

B. O_2 sat > 90%.

C. Systolic BP 90-200 mmHg.

D. Diastolic BP <110 mmHg.

E. Temperature between 96.0 F and 100.4 F (38 C) if taken.

Exclusion:

A. Possible drug overdose or acute intoxication impairing ability to ambulate or perform activities of daily living.

B. Acute medical or traumatic condition including altered level of consciousness, chest or abdominal pain, significant bleeding, respiratory distress, or other acute illness or injury.

C. Patients with abnormal vital signs or physical findings.

D. Patients who require pharmacological restraint (olanzapine ODT or IM Geodon ALONE is NOT an exclusion).

E. Signs/symptoms of acute drug/alcohol withdrawal (tachycardia, hypertension, tremor, visual hallucinations).

F. Central or peripheral IV lines.
G. Gastric or nasogastric tube feedings.
H. Pregnancy greater than 20 weeks.
I. Requiring CPAP or BiPAP for treatment of acute respiratory distress.
J. Requires continuous supplemental oxygen.
K. Patients requiring dialysis therapy.
L. Patient weight ≥500 lbs.

Procedure:

A. Assess and assure scene safety.

B. If police or Crisis Intervention Team (CIT) is on scene, EMS assessment and intervention should not be delayed, however, police or the CIT may need to diffuse the situation in order to allow for EMS to safely assess the patient. EMS crews should get an initial report from the officer before approaching the patient. If EMS is first on scene, give an initial report to officer.

C. Approach the patient in a calm, slow, reassuring and honest manner. Multiple people attempting to intervene may increase the patient's confusion and agitation.

D. Consider offering alprazolam (Xanax) 0.25 mg or olanazapine (Zyprexa) ODT 10 mg for severe agitation or anxiety.

E. Protect the patient, bystanders and rescuers from injury. Consider restraint and follow ***Physical Restraint*** protocol, if indicated.

F. Obtain history, physical and mental status examination.

G. Assess and treat any medical conditions per EMS protocol and then determine if patient is eligible for transport to UBHH.

H. All patients will be assessed and evaluated by EMS regardless of transport status.

Specific Precautions:

A. Red Flags that this might not be a psychiatric condition:
  1. Waxing and waning level of consciousness.
  2. Abnormal vital signs.
  3. Dilated or pinpoint pupils.
  4. First psychotic episode over the age of 30.
  5. Acute onset over hours/days (consider substance abuse).

B. Psychiatric signs/symptoms.
  1. Mood disorder: depression, mania, suicide ideation, anxiety.
  2. Thought disorder: hallucinations, pressured speech, racing thoughts, grandiose or paranoid ideation, delusions.

C. Medical illnesses including hypoglycemia, hypoxia, stroke, head injury, CNS infection may mimic psychiatric illness. Do not assume the patient's condition is purely psychiatric.

Video Laryngoscope

Device should not be used until training has been received by a qualified trainer.
The video laryngoscope is an intubation device used to improve grade of view as well as provide better confirmation of tube placement. The device incorporates a LED light source and a miniature camera to view the larynx during the procedure of laryngoscopy.

Indications:

A. The video laryngoscope may be used in all adult patients who require endotracheal intubation (pediatric VL with agency approval).
B. Device can be used for Direct Laryngoscopy (DL) and/or Video Laryngoscopy (VL).

Procedure:

A. Ensure patient requires intubation. Follow ***Endotracheal Intubation*** protocol.

B. Position the patient in the optimal position for laryngoscopy.

C. Turn on the device.

D. **Look into the mouth and suction**, if needed; identify possible difficulties of intubation

E. IMPORTANT: *Insert the blade into the mouth following the mid-line position over the tongue. Slide the blade* ***slowly*** *down the tongue until you see the epiglottis.*

F. Apply distal pressure on the device blade until vocal cords or arytenoids are visualized on the screen. Care must be taken not to get the camera too close to the glottic opening or it will obstruct the view of the advancing ET tube or bougie.

G. **Visualize the epiglottis on the screen**. Lift the tongue forward and upward to expose a view of the vocal cords or arytenoids.

H. When the device is in the optimal position, the vocal cords or arytenoids should be viewed in the central upper section of the screen. The vocal cords or arytenoids should not take up more that 25% of the screen. If the blade is too close to the vocal cords or arytenoids, it will make it difficult to place ET tube or bougie through the vocal cords.

I. **While looking through the mouth under direct visualization,** place the bougie into the mouth and advance through the cords, then intubate with ET tube.

J. **Look back to the screen**. Locate the tip of the ET tube or bougie and gently advance the ET tube or bougie through the vocal cords.

K. The screen view can be used to confirm the correct insertion depth of the ET tube. Stop advancing the ET tube when the black line reaches the vocal cords.

L. Turn off device.

Notes and Precautions:

A. If not using the bougie, it is recommended to use a stylet in the ET tube for stability purposes.

B. If resistance is encountered after the ET tube passes through the vocal chords, rotate the ET tube 90 degrees clockwise or withdraw the stylet approximately 3-5 cm and then advance the ET tube.

C. If unable to visualize under VL, perform DL in the usual fashion.

D. Discard disposable blade after every use.

E. Device should be decontaminated after each patient use.

Whole Blood (LTOWB+)

Background:

The administration of whole blood instead of crystalloid as a primary resuscitation fluid has evidence for enhancing survival in patients with severe hemorrhage.

Indications:

A. Blunt or penetrating trauma patients

-AND-

B. Suspected hemorrhagic shock as defined by:

1. MAP < 55 mmHg (SBP < 70 mmHg) regardless of heart rate

-OR-

2. MAP < 65 mmHg (SBP < 90 mmHg) -AND- heart rate > 110 beats per minute

-OR-

3. Witnessed traumatic arrest during transport to trauma hospital

Contraindications:

A. Patients < 2 years old.

B. Any objection (e.g. personal or religious belief) to receiving blood products.

C. Unable to establish vascular access.

Required Equipment:

Equipment to be carried on Fire Command unit and/or AMR Supervisor vehicle.

A. Normal IV tubing with Lactated Ringers or Normal Saline.

B. Y-type Blood Set with filter.

C. Normal Saline

1. 250 mL or larger.
2. Prefer warm crystalloid fluid, if available.

D. Blood storage container (Delta Development APRU refrigerator).

E. OHSU Transfusion Services Low Titer O+ whole blood (two units).

F. Fluid warming equipment.

1. Qin Flow Warrior Lite base unit with battery.
2. Compact Disposable Unit (CDU).

G. Pressure bag.

Procedure:

A. Fire Battalion Chief and/or AMR Supervisor will bring blood and blood warming equipment to the scene or rendezvous with the transporting ambulance en route to the hospital. The decision will be at the discretion of fire command or AMR Supervisor.

B. On scene of each trauma call, the fire/EMS provider will prepare for whole blood administration.

C. EMS Transporting unit:
1. Establish large bore IV/IO (i.e. 18 g or larger), preferably two (2) lines.
2. Determine if patient meets indications for whole blood administration.
3. Connect Qin Flow Compact Disposable Unit (CDU) to end of Y-type Blood Set.
4. Prime Y-type Blood Set with 250 mL Normal Saline, including CDU.
5. Once Y-type Blood Set is primed with Normal Saline, connect tubing to extension set attached to IV/IO at patient.

D. When blood arrives on scene (or rendezvous):
1. Fire paramedic and EMS paramedic perform safety blood check.

E. Spike one (1) unit of blood to available port of Y-type blood set.

F. Shut off roller clamp on Normal Saline bag.

G. Confirm CDU is connected to Qin Flow Warrior Lite blood warmer.

H. Disconnect Lactated Ringers line from extension set.

I. Open port of whole blood.

J. Administer whole blood to patient using pressure bag.

K. Reassess patient meets indications for second unit of blood, if necessary.

L. If patient does not meet indications for second unit of blood, flush remaining blood in tubing with Normal Saline (on Y-type blood set) to ensure complete administration of blood unit.

M. Keep blood tubing line TKO with Normal Saline.

N. Consider establishing second IV/IO, if feasible.

Pediatrics

A. Blunt or penetrating trauma patients ≥ 2 years old.

-AND-

B. Suspected hemorrhagic shock as defined by:
1. See Pediatric Guidebook for age appropriate vital signs.
2. Witnessed traumatic arrest during transport to trauma hospital.

Precautions

A. Monitor patient for transfusion reaction, which typically occurs during first 10-15 minutes of administration. Typical signs and symptoms include:
  1. Febrile transfusion reaction.
  2. Acute hemolytic reaction (i.e. fever, low back pain, hypotension, bleeding, respiratory failure).
  3. Allergic reaction (i.e. urticarial, bronchospasm, hypotension, anaphylaxis).

B. Transfusion associated circulatory overload.

C. Transfusion related acute lung injury.

D. If transfusion reaction is observed:
  1. Immediately STOP whole blood infusion.
  2. Remove Y-type Blood Set tubing from extension set.
  3. Keep all tubing and blood bags for evaluation by the blood bank personnel.
  4. Treat per ***Anaphylactic & Allergic Reaction*** protocol.

E. Give medications through second IV line, if feasible. If not feasible to obtain second line, then flush the line prior to and following administration of medications.

F. Do not administer blood product simultaneously in same line as Lactated Ringers.

Dose:

Adult - one (1) unit of blood.

Pediatric - 15 mL/**kg**.

Notes:

- The administration of whole blood should not delay transport to the hospital.
- Do not prime Y-type blood tubing with Lactated Ringers. Only prime tubing with Normal Saline.
- No medication should be administered with blood products in the same IV/IO line.
- Document the administration of whole blood product in narrative and flowsheet.
- If patient refuses whole blood administration for religious, social or personal reasons, document in narrative.
- Following the administration of whole blood, dispose of the blood tubing and bag in the biohazard bag in emergency department.
- If indicated, administer TXA in primary line with Lactated Ringers.
- Disconnect Lactated Ringers tubing if using same vascular access site when administering whole blood. Do not administer blood product simultaneously in same line as Lactated Ringers.