

Interfacility Management Guidelines

1. **Devices**
2. **Chest Tube**
3. **OB Management**
4. **Intubation Sedation Interfacility Transport**
5. **Septic Shock Diagnosis**
6. **Thrombolytic**
7. **Tracheostomy**
8. **VAD Management**

Purpose

To ensure the patient will receive the most appropriate care possible for their condition in the management of devices in place for Interfacility Transports.

Guidelines

1. All Interfacility Transport Protocols will be followed during transport.
2. EMS personnel should be familiar and/or trained on transporting these devices if approved by the Administrative Medical Direction.
3. Training for devices as listed in their guideline with have training every two (2) years or as defined by the Administrative Medical Direction.
4. Consider additional personnel (such as a second paramedic or EMT) because of types of drugs/devices that are require for patient.

EMT Monitor Devices

1. Central Venous Catheters (Caped)
2. Feeding tubes clamped
3. Foley Catheters
4. Heimlich Valve (Prior Insertion)
5. Jackson Pratt Drains (other surgical drains and devices)
6. Medication Infusion Pumps (family or patient in control)
7. Nasogastric Tubes
8. Other tubes (nasoduodenal, nasojejunal, gastrostomy, jejunostomy, percutaneous endoscopic gastrostomy (PEG), percutaneous endoscopic jejunostomy (PEJ))
9. Tracheostomy Tube
10. Ventricular Assist Devices

Paramedics Monitor Devices

1. Central Venous Catheters
2. Chest Tubes (Management)
3. External Pacemaker Devices
4. Feeding tubes clamped
5. Femoral Lines (not in use)
6. Foley Catheters
7. Heimlich Valve
8. Internal Pace Maker Wires (not in use)
9. Jackson Pratt Drains (or other surgical drains and devices)
10. Medication Infusion Pumps
11. Nasogastric Tubes
12. Other tubes (nasoduodenal, nasojejunal, gastrostomy, jejunostomy, percutaneous endoscopic gastrostomy (PEG), Percutaneous endoscopic jejunostomy (PEJ))
13. Tracheostomy Tube
14. Ventilators if trained
15. Ventricular Assist Devices



Chest Tube Management Interfacility Transports

Purpose

To provide guidelines for the transport of patients with chest tubes

Guidelines

Maintaining and troubleshooting a patient's chest tube ensures proper function and prevents infection. It is the paramedic's responsibility for making respiratory and chest tube assessments, obtaining vital signs that reflect effectiveness of therapy, identifying impending complications, and knowing the appropriate interventions to perform in response to changes in the patient's therapy.

1. Follow all other Interfacility Transport guidelines for all patients.
2. Review transferring physician's orders regarding chest tube care and to determine if mechanical suction, gravity, Heimlich valve, or clamp will be used during transport.
3. Carefully assess the chest tube and drainage set-up before transferring the patient. Make sure all connections are taped or secured with a tie to prevent accidental separation.
4. Mark/document the drainage level by documenting time and date and the drainage level on the drainage collection prior to leaving and upon arrival.
5. Perform pain assessment using techniques that are appropriate for the patient's age, condition, and ability to understand. Ask for pain management orders if indicated.
6. Coil the system's tubing and secure it to the edge of the stretcher.
 - Be sure the tubing remains at the level of the patient
 - Avoid creating dependent loops, kinks, or pressure on tubing
 - Avoid lifting the drainage system above the chest or tipping the drainage system as fluid may flow back into the pleural space.
7. Assess and document the presence or absence of bubbling in the water seal (does not have to be continuous), any output in the collection chamber, and its type (e.g. frank blood).
8. Evaluate breath sounds and all other vital signs and reassess for development of a tension pneumothorax.
9. If chest tube is partially pulled out:
 - Do not push tube back into chest
 - Secure the tube in place
10. If chest tube is pulled out:
 - Place occlusive dressing over the insertion site.
11. If patient becomes dyspneic:
 - Assess breath sounds
 - Needle thoracostomy may need to be performed

Documentation

1. Document the reason for the placement of the chest tube and chest tube size (typically in French (Fr.) units)
2. Record the type of system used, amount of suction applied to the pleural cavity, presence or absence of bubbling or fluctuation in the water-seal or air leak monitor chamber.
3. Document initial amount and type of drainage:
 - At the beginning and at the end of the transfer
 - Record the frequency of system inspection; amount, color, and consistency of drainage; presence or absence of bubbling or fluctuation in the water-seal or air leak monitor chamber (if applicable).



Chest Tube Management Interfacility Transports

Special Note

1. Gentle rise and fall of the water level in the water seal chamber that corresponds with the patient's respirations is called "tidalling" and indicates that the system is functioning properly.
2. Continuous air bubbling in the water seal chamber confirms a constant air leak from a tube connection or from the patient's chest (e.g., unresolved pneumothorax).
3. Intermittent bubbling in the water seal chamber confirms an intermittent air leak from the patient's chest.
4. No air bubbling in the water seal chamber confirms no air leak from the patient's chest and no air leak from a tube connection.



Base Hospital

PURPOSE

To provide guidelines for Obstetrical and Gynecologic Interfacility Transports.

GUIDELINES

1. Follow all Interfacility protocols pertinent and OB/GYN Standing Order as applicable; take into consideration the SAEMS High Risk OB Triage Protocol, as applicable.
2. Follow guidelines below, and at any point, if the EMTC does not feel comfortable with the transport or concern the transport requires a higher level transport team, call Medical Direction Authority with concern. (i.e. needs paramedic or air medical team).

PRETERM LABOR**EMT Transport:**

1. Patients with one or more of the following characteristics 32-37 week's gestation in pre-labor.
 - General Supportive Measures
 - Transport patient in lateral recumbent position
 - Monitor vital signs every 15 minutes. Temperature prior to leaving facility
 - Verify and record fetal heart rate prior to leaving referring facility
 - Verify fetal movement frequently in route
 - IV access with large bore IV should be in place, if not start in route
 - Frequently assess labor pattern (intensity, duration, and frequency of contractions)
 - Ask physician/nurse to assess cervical status prior to departure from referring facility to verify safety of transfer
 - Assess for vaginal discharge (bloody show, amniotic fluid, and meconium)
 - **Patients in active labor who are dilated ≥ 5 cm should be transported by a Paramedic**
 - Medical Treatment: Treatment of a patient in *active, pre-term labor with contractions* is based upon what has already been done at the transferring facility. If treatment has not been started, consider the following:
 - Hydrate with 500 ml bolus of NS/LR, and then maintain IV at 125 ml/hour.
 - Patient could have received a tocolytic (eg Terbutaline (*Brethine*) 0.25 mg SQ). Terbutaline may be used in addition to magnesium sulfate

Paramedic Transport:

1. Patients with one or more of the following characteristics 20-37 week's gestation in labor.
 - General Supportive Measures
 - Follow EMT transport
 - Medical Treatment follow EMT transport and:
 - If patient still contracting, consider magnesium sulfate load and drip. Call medical direction authority for consult and order for this. (Magnesium sulfate loading dose is typically 4 gm IV over 10-15 min; followed by an infusion of 2 gm/hour. **MUST** be on a pump. Please refer to Table 5.3)
 - If patient on magnesium sulfate drip place on cardiac monitor
 - If patient on drip, continuing per transferring physician orders, assess deep tendon reflexes (DTRs), respiration depression, decreased mental status along with VS every 15 minutes or more frequently if indicated



OB/GYN Interfacility Transport Protocol

Base Hospital

- If patient develops any symptoms of toxicity (e.g. respiratory depression, decreased mental status, decreased deep tendon reflexes) , consider stopping drip and call for medical direction authority for direction

PREMATURE RUPTURE OF MEMBRANE

EMT Transport:

1. Patients with one or more of the following characteristics 32-37 week's with premature rupture of Membranes.
 - General Supportive Measures
 - Perform the general supportive measures as listed in preterm labor
 - Medical Treatment
 - IV NS/LR at 125 mL/hour via large bore IV

Paramedic Transport:

2. Patients with one or more of the following characteristics 20-37 week's with premature rupture of Membranes.
 - General Supportive Measures
 - Follow EMT Transport
 - Medical Treatment
 - Follow EMT Transport
 - Consider the need for tocolytic's if contractions are present (see Preterm Labor)

PRE-ECLAMPSIA

EMT Transport: NO

Paramedic Transport:

1. General Supportive Measures
 - Transport patient in lateral recumbent position
 - Monitor vital signs and DTRs every 15 minutes. If patient on magnesium sulfate drip, continuing per transferring physician orders, assess deep tendon reflexes (DTRs), respiration depression, decreased mental status along with VS every 15 minutes or more frequently if indicated
 - Place patient on non-rebreather with high flow oxygen
 - Place on cardiac monitor
 - Verify and record fetal heart rate prior to leaving referring facility
 - Verify fetal movement frequently in route (?)
 - Assess patient for level of consciousness, visual disturbances, nausea, headache, pupillary reaction, edema, pulmonary status, peripheral perfusion, and recent urinary output
 - Assess patient for labor
 - Protect patient from excessive stimuli, like from sirens using headphones, eye shields if available
2. Medical Treatment

General principles:

- Elevated blood pressure should not be treated unless diastolic ≥ 110 , and ideally treatment should not drop diastolic ≥ 90
- Only 5% of pre-eclamptic patient develop eclampsia, but all should have magnesium sulfate therapy initiated as seizure prophylaxis
- Transport patient with 2 large bore IV's with total fluids at 100 ml/hour using NS/LR
- If **not** already on magnesium sulfate, consider magnesium sulfate loading dose of 4 gm slow IV push over 10-15 minutes, consult with referring physician and/or medical direction authority. Assess vital signs, DTRs, and patient response every 5 minutes



OB/GYN Interfacility Transport Protocol

Base Hospital

during IV push. After load is given, then consider magnesium sulfate drip at 2 gm/hr on pump

- If eclampsia develops implement Eclampsia guidelines below

ECLAMPSIA

EMT Transport: NO

Paramedic Transport

1. General Supportive Measure
 - Monitor vital signs every 15 minutes
 - Place patient on non-rebreather
 - Place on cardiac monitor
 - Place patient on left side if possible to prevent aspiration, and enhance uterine blood flow
 - Protect patient from excessive stimulation (use headphones if available)
 - Assess mental status, pulmonary status, and peripheral perfusion
 - Maintain airway: Consider oral airway. Consider intubation if seizing continuously, or at risk for aspiration, or hypoxic, or if respiratory depression
 - Prevent patient from self-injury during seizure
 - Verify and record fetal heart rate prior to leaving referring facility
 - Verify fetal movement frequently in route
 - **REMEMBER postpartum can have eclampsia**
2. Medical Treatment
 - IV NS/LR via 2 large bore IV's at TKO
 - Eclamptic seizure (tonic clonic):
 - If not already on magnesium, consider 4 gm IV magnesium sulfate loading dose, then a magnesium sulfate infusion at 2 gm/hr on a pump. If seizure continues after above treatment or reoccurs, consider additional magnesium sulfate. Call medical direction authority for direction on increased drip rate or more bolus
 - Make sure reflexes are still brisk, and mental status is normal prior to above
 - If seizure continues, call medical direction authority and consider Midazolam.
 - Observe closely for drop in BP and hypoventilation. Be prepared to intubate and/or fluid resuscitate.

POSTPARTUM HEMORRHAGE

EMT Transport: NO

Paramedic Transport

1. General Supportive Measure
 - Monitor vital signs every 15 minutes
 - Place on cardiac monitor
 - Consider oxygen therapy
2. Medical Treatment
 - Consider massage of uterus if not done in referring facility
 - Continue oxytocin (Pitocin) 20-40 units in 1000 mL of NS wide open, if not started consult referring physician and medical direction authority
 - Assess uterine tone and massage as needed to maintain a firm fundus



Intubation Sedation Interfacility Transports Protocol

Purpose

To ensure patient safety with sedation while intubated during Interfacility Transports

Mechanical Ventilation

1. Follow all other Interfacility Transport guidelines for all patients.
2. Assess and document correct tracheal tube placement and secure appropriately.
3. Be aware of arterial blood gas prior to transport and report this to Medical Direction Authority along with all other pertinent information.
4. Maintain oxygen flow rate for an oxygen saturation of greater than or equal to 94%. Or per transferring physician written orders.
5. Cardiac monitor, EtCO₂ monitor must be recorded and documented every 5- 10 minutes.
6. Maintain oxygen flow rate for an oxygen saturation of greater than or equal to 94%. Or per physician written orders.
7. Assess and record vital signs, prior to transfer and every 5 to 10 minutes en route.
8. Reassess patient frequently during transport and document findings.

Bagging

1. Ventilation rate 10-12 a minute, adjusting ventilation for EtCO₂ 35-45.
2. Goals:
 - O₂ Sat 94%-99% and EtCO₂ 35-45
 - Consider use of PEEP is available (order needed)
3. Maintain adequate sedation:
 - Midazolam: 1-10 mg IV/IO over 30-60 seconds. Keep patient sedated in route and repeat dosing as needed up to 20 mg
 - Lorazepam: 2mg IV slow push over 2 minutes (dilute with equal mL of NS)
 - Pre-existing Propofol drip 5-50 mcg/kg/min
 - Or per referring physician orders and/or medical direction authority. Confirm dosage and rate of infusion, for both medications given by referring facility by bolus and infusion
4. Do not give sedatives in an IV line with any other medication. Flush line with 5 mL NS before and after giving the drug.
5. Consider analgesic concurrent with sedatives when pain is suspected in the intubated patient.
 - Fentanyl 25-100mcg IV/IO or Morphine 2-10 mg IV/IO repeat 10-15 minutes as needed for pain management (Max dose?)

Ventilator

1. Follow auto vent protocol for all management and documentation.
2. Follow above sedation and analgesic dosing.

Special Notes

1. Inadequate sedation may present as an unexplained increase n heart rate or blood pressure; the non-paralyzed patient may also demonstrate agitation, anxiety and/or restlessness.



Septic/Shock Diagnosis Interfacility Transport Protocol

Base Hospital

Purpose

To offer critical care paramedic transport general management guidelines for patients with Sepsis or in Septic Shock. The primary goal of sepsis treatment is to maintain organ perfusion while enhancing tissue oxygenation. Achieving this requires balancing preload, afterload, and contractility to achieve an optimal level of homeostasis. Target criteria for maintenance levels have been established as follows:

1. MAP greater than 70 mm Hg or systolic BP greater than 90 mm Hg
2. Urine output greater than 0.5 ml/kg/h

Signs and Symptoms

1. Distributive shock; initially presents with a hyperdynamic warm shock (compensatory tachycardia, mild hypotension in response to vasodilation of peripheral blood vessels) progressing to cold shock (progressive failure to compensate and maintain cardiac output resulting in profound hypotension and hypoperfusion).
2. Infection confirmed or highly suspicious
3. Fever may or may not be present
4. Hypothermia may be present in later stages
5. Cardiovascular changes
6. Tachycardia
7. Normal to low-normal blood pressure initially; hypotension once in septic shock
8. Normal skin color, normal mucous membrane color, but warm skin initially
9. Cold clammy skin with pallor or cyanosis when sepsis is more progressed
10. Petechiae
11. Blood oozing from mucous membranes and procedure sites
12. Decreased pulse pressure
13. Increased respiratory rate

Transport Management Guidelines

1. Orders received will be focused on maintaining the following:
 - MAP greater than 70mmHg or systolic BP greater than 90 mmHg
 - Urine output greater than 0.5 ml/hg/h
2. Administer Oxygen, monitor and maintain patient airway, intervene as needed.
3. Continue to provide fluid resuscitation as ordered by referring physician (refer to Sepsis AO).
4. When fluid resuscitation is inadequate to maintain blood pressure, vasoactive agents are considered. Norepinephrine and dopamine are the vasopressor of choice in hypotensive patients with sepsis.
 - Norepinephrine typically starts at 2 mcg/kg/min and titrated to desired MAP, range between 2-30 mcg/min
 - Dopamine dose may range between 5 – 30 mcg/kg/min
5. Patient could be intubated.
 - Maintain low tidal volumes at 6 ml/kg
 - Provide high PEEP at ranges of 5 to 14 cm H₂O. The PEEP is increased as the need arises for higher oxygen saturation.
 - Make FIO₂ adjustments for oxygen saturation as needed
 - The oxygen saturation goal is greater than 92%
6. Sedation, if needed, must be monitored closely, get order from referring physician or medical direction authority
7. Give antibiotic therapy as ordered



Post Thrombolytic Administration Interfacility Transport Protocol

Purpose

To ensure patient safety during Interfacility Transports

Uses

- Dissolves clots in blood vessels
- Generally used in the setting of Acute MI or CVA; occasionally used for Pulmonary Embolus

Drugs

- Tissue Plasminogen Activator (*tPA*)
 - *Alteplase (Activase) CVA, Tenecteplase (TNKase)*

Adverse Effects

- Minor hemorrhages from IV sites and gums
- Major hemorrhage from GI and intracranial
- Reperfusion dysrhythmias often occur about 30-60 minutes after starting infusion
- Allergic reactions including anaphylaxis may occur with Streptokinase

Guidelines

1. Follow all Interfacility protocols approved by TMC Administrative Medical Direction.
2. Thrombolytic transfers approved only if air medical transport unavailable.
3. Thrombolytic infusion has been initiated at the transferring hospital and completed for a time frame of 60 minutes.
4. Patient has remained stable during the infusion period.

Stroke Patient: Hand Off at Transferring Facility

1. Family/caregiver contact information, including phone number
2. Time patient last known normal
3. Time patient arrived at sending facility for treatment
4. Time the EMS was called for transport
5. All information about tPA dose and administration times (Bolus and infusion times)
6. Ensure all copies of transfer paper work. For stroke patients, should have imaging (radiology report, CD with copying of imaging if possible).

Treatment and Assessment

1. Cardiac monitor and continuous pulse oximetry monitoring, keeping SPO₂ of greater than or equal to 94%. Or per physician written orders.
2. Ensure patient has peripheral IV access
 - Preferably two large-bore IV's (if not, do not start)
3. Assess patient's neuro status prior to leaving, ensuring no changes in patients' condition. And during transport every 15 minutes or more frequently if indicated.
4. Keep patient NPO.



Post Thrombolytic Administration Interfacility Transport Protocol

5. Monitor for any signs/symptoms of bleeding internally or externally. Notify Medical Direction Authority of any signs of bleeding or changes in patient's condition.
6. Monitor VS including BP, HR, RR and neuro status every 15 minutes or more frequently if indicated with patient changes.
7. For cardiac patients, treat re-perfusion arrhythmias per ACLS protocols.

Stroke Patient: Upon Arrival at Receiving Facility

1. Family/caregiver contact information, including phone number
2. All paperwork, imaging provided by referring facility.
3. Leave copy of PCR/ePCR.
4. Report any changes in condition status
5. Report all care provided during transport

Documentation

Stroke patients:

1. Document onset information, hospital's assessment including exam and NIH Stroke Scale, test results.
2. Document all paperwork and imaging handed-off for transport.
3. t-PA information including exact dose, bolus start time and infusion end time and if any reactions.
4. Document patients' status just prior to transport.
5. Document all VS, rhythm and neuro status every 15 minutes.

Special Notes

1. Monitor for signs of orolingual angioedema
If angioedema is noted, call Medical Direction Authority for Direction.
 - Rapid swelling (edema) of the dermis, subcutaneous tissue, mucosa and submucosal tissues. Typically involves the face, lips, tongue and neck. Almost always self limiting but may progress to interfere with airway/ breathing so close monitoring is warranted.



Tracheostomy Tube Management Protocol

Purpose

To provide guidelines for the care of tracheostomy tube and patients with respiratory distress

History

- Birth defect
- Surgical complications (accidental damage to phrenic nerve)
- Trauma (post-traumatic brain or spinal cord injury)
- Medical condition (bronchial or pulmonary dysplasia, muscular dystrophy)

Signs and Symptoms

- Nasal flaring
- Chest wall retractions (with or without abnormal breath sounds)
- Attempts to cough
- Copious secretions noted coming out of the tube
- Faint breath sounds on both sides of chest despite significant respiratory effort
- Altered Mental Status
- Cyanosis

Differential

- Allergic reaction, asthma, aspiration, foreign body, medication or toxin, trauma, blocked or displaced

Tracheostomy Tube

- **DOPE** for trouble shooting
 - Dislodged/displaced/disconnected
 - Obstruction
 - Pneumothorax
 - Equipment; malfunction of mechanical ventilator or loss of O2 supply
- Is the tube cuffed or cuffless
 - Cuffed tubes are needed for airway protection and positive pressure ventilation
 - A cuff leak may be present

Procedures

In the patient with an obstructed tracheostomy tube, in whom no effective ventilation/oxygenation is possible, the following are to be considered Administrative Orders:

Bronchodilator Administration EMT or Paramedic

- Assemble nebulizer assembly as usual
- Attach trach collar to reservoir tubing
- Connect to oxygen source at a flow rate sufficient to produce misting
- Fit trach collar over stoma and have patient breathe slowly and deeply

EMT

1. Assess ABCs
2. Administer high flow oxygen to the mouth/nose and to the stoma site
3. If tracheostomy tube is blocked or displaced
 - Clearing of the tube and re-insertion
 - Have care giver insert tracheostomy tube
4. Once airway is open, begin ventilations as possible/necessary



Tracheostomy Tube Management Protocol

Paramedic

1. Assess ABCs, use EtCO₂
2. If tracheostomy tube is blocked or displaced
 - Clearing of the tube and re-insertion (can have care giver help with this procedure)
 - Wipe neck opening with gauze
 - Remove Obturator as needed
 - If mucus plugs/thick secretions-may instill 3-5 mL sterile saline
 - Once airway is open, begin ventilations as possible/necessary
 - If speaking valve decannulation plugged, remove, suction tracheostomy tube
3. Remove tracheostomy tube. In patients unable to be oxygenated and ventilated by the above criteria, may attempt to intubate the patient.

Stoma Intubation

1. Paramedics may attempt intubation of the patient if no other means of ventilating/oxygenating the patient are possible.
 - Select largest tube able to fit in stoma without force; cuffed for adult, uncuffed for pediatric
 - Hyperventilate with 100% O₂ by mouth, if unsuccessful attempt oxygenation and ventilation via stoma (use a pediatric mask)
 - Suction, if necessary
 - Pass the ET tube and inflate the cuff. The tube will protrude several inches. Hold the tube and watch for chest rise with ventilation; secure the tube
 - Auscultate the lung fields. Check for subcutaneous emphysema
 - Allow no longer than 30 seconds for the procedure

Special Considerations

- Always talk to family/caregivers as they have specific knowledge and skills
- Use patients' equipment if available and functioning properly
- Estimate suction catheter size by doubling the inner tracheostomy tube diameter and rounding down
- Suction depth: Ask family/caregiver. No more than 3-6 cm typically. Should instill 2-3 mL of NS before suctioning
- Do not suction more than 10 seconds each attempt and pre-oxygenate before and between attempts.
- DO NOT force suction catheter. If unable to pass, then tracheostomy tube should be changed
- Only safe to reinsert tracheostomy tube if >7 days



Management of Ventricular Assist Devices (VADs) Protocol

Base Hospital

Purpose

To provide an overview of how a Left Ventricular Assist Device (LVAD) works and how EMS provider assessment and treatment differs for a patient with an LVAD.

Highlights of Assessing and Treating an LVAD patient

- Recognize that you have a patient with an LVAD .
- Determine if your patient has an LVAD problem, or an unrelated illness or injury
- A completely stable patient may have no palpable pulse or measurable blood pressure
- Mental status and skin color must be used to determine patient stability
- CPR should almost never be performed on an LVAD patient
- Patients with an LVAD should almost never be pronounced dead at the scene
- Overview of an LVAD

Overview of LVAD

The LVAD, or Left Ventricular Assist Device, is a mechanical device that takes over some or all of the pumping function of the heart's left ventricle. This device is used for patients of any age or gender with advanced heart failure who would not otherwise survive without this device. Heart failure can result from chronic/long-term hypertension and heart disease, congenital heart defects, mechanical damage to the heart, infection, postpartum complications and many other reasons.

Some LVAD patients will have an LVAD while they are waiting for a heart transplant (called Bridge-to-Transplant). Other LVAD patients, who are not eligible for a heart transplant for some reason, will live with the device for the rest of their lives (called Destination Therapy, or Lifetime use)

How the Heart Works versus How LVAD Works

The normal pumping function of the heart is achieved by the contraction of the left ventricular muscle, which pushes a bolus of blood forward in the cardiovascular system with each contraction. This contraction is what we feel when checking a pulse, and what we hear when taking a blood pressure. If the heart is not contracting, blood is not moving forward in the system, and we don't feel or hear a pulse. The LVAD, in contrast, uses a continuously moving centrifugal pump that creates no "pulse" to feel or hear.

The LVAD is a tube that is about 1/2 -1 inch in diameter with a pump in the middle. One end of the tube (inflow) is surgically inserted into the left ventricle, and the other end (outflow) is sewn into the aorta, just above where it exits the heart.

The pump on the LVAD spins constantly. The right side of the heart still pushes blood through the lungs and back to the left ventricle, but then the LVAD pump pulls the blood out of the left ventricle and pumps it out to the body, taking over most or all of the failed pumping action of the left ventricle.



Management of Ventricular Assist Devices (VADs) Protocol

Base Hospital

The drive unit for the pump, which includes the power source and programming controls, is outside of the body and connects to the LVAD by a cord that exits the body through the abdomen, usually in the right upper quadrant.

NOTE

The important part to us as EMS providers is that the pump is a constant flow pump. There is no rhythmic pumping as there is with the ventricle, and therefore there is little to no pulse. This means you can have a perfectly stable and healthy looking person who has no palpable pulse and whom you may or may not be able to take a blood pressure!

Assessing the LVAD Patient

1. **Recognize** you have an LVAD patient. The LVAD patient has a control unit attached to their waist, or in a shoulder bag. The control unit is attached to a power cord exiting from the patients' abdomen. The control unit will be attached to batteries mounted to the belt, in shoulder holsters, or in a shoulder bag. At home, it could be attached to a long cord that connects to a large power unit.
2. **Decide** if you have a patient with an LVAD problem, or a patient with a medical problem who just happens to have an LVAD. Patients with LVADS will have all the same illnesses and injuries as any other patient you see. Their LVAD may have nothing to do with the reason you were called.
3. **Look:** Alarms on the control unit will most likely indicate an LVAD problem. Follow resource guides with the patient to trouble shoot. Skin color and mental status are the most reliable indicators of patient stability for the LVAD patient.
4. **Listen:** Listen over the LVAD pump location to make sure you can hear it running. This will be just to the left of the epigastrium, immediately below the base of the heart. You should hear a low hum with a stethoscope if the pump is running. Don't assume the pump is running just because the control unit looks OK. **The patient and their family are experts on this device.** Listen to what they have to say about any problems with the LVAD.
5. **Feel:** Feel the control unit. A hot control unit indicates the pump is working harder than it should and often indicates a pump problem such as a thrombosis (clot) in the pump. The use of pulse and blood pressure to assess stability can be unreliable in an LVAD patient, even if they are very stable.
6. **Vitals:**
 - Pulse:** generally, you will be unable to feel a pulse.
 - Blood Pressure:** you may or may not be able to obtain one, standard readings are unreliable and may vary from attempt to attempt. If NIBP machine can detect a blood pressure, adjust it to display Mean Arterial Pressure (MAP). This is a more reliable measure of perfusion and the calculation for MAP can overcome variations in standard readings. A MAP of 60-70 is normal.
 - Pulse-oximetry:** readings seem to be fairly accurate and consistent, according to data, despite the manufacturer stating that pulse oximetry often doesn't work.
 - Quantitative Continuous Waveform Capnography:** This should remain accurate, as it relies on respiration, not pulse. Normal (printed) waveform shape



Management of Ventricular Assist Devices (VADs) Protocol

Base Hospital

with a normal respiratory rate and low CO₂ readings (<30) can indicate low perfusion = poor pump function.

Temperature: infection and sepsis are common, check temperatures!

7. If **Interfacility Transports**, request from the transferring facility, specific guidelines in the event of cardiac arrest. With some VAD it is inadvisable to perform CPR. Treatment of arrhythmias either pharmacologically or with defibrillation is typically attempted before consideration of CPR.

