

 NOR-CAL EMS	05-0411	Ventricular Assist Device - VAD
Nor-Cal EMS Policy & Procedure Manual	BLS / ALS Protocols	
Effective Date: 04/23/2020	Next Revision: 04/23/2023	
Approval: Jeffrey Kepple MD – MEDICAL DIRECTOR	SIGNATURE ON FILE	

Authority

Health and Safety Code Division 2.5, California Code of Regulations, Title 22, Division 9.

Definition

The ventricular assist device is for patients who have end stage heart failure. It has been primarily used to be a bridge to heart transplant. However, it has now become a definitive care device for many of these patients both in the adult and pediatric patient population. The VAD assists the native ventricle pumping action and boosts the cardiac output needed to survive.

1. These devices are either pulsatile or continuous flow (non-pulsatile/pulseless).
 - A. They are further divided into Left Ventricular Assist Devices (LVAD). The more common continuous flow pump located in the patient's thorax attached to the patient's left ventricle and aorta.
 - B. Right Ventricular Assist Device (RVAD).
 - C. Biventricular Assist Device (BiVAD).
2. Assess (ask) for the presence of a DNR, POLST, or Advanced Directive.

Assessment

1. First, assess the patient not the device.
 - A. The reason for the call may not be a problem with the VAD.
2. VAD patients frequently have other medical conditions:
 - A. Such as sepsis/infection, bleeding (these patients are anticoagulated), cardiac tamponade, stroke (either hemorrhagic or ischemic), TIA, cardiac arrest, dysrhythmia different than the patient's baseline, and MI.
 - B. Treat non-VAD related medical conditions as normal such as fractures, COPD, amongst others.
3. Patients with a continuous flow device may have no discernable/palpable pulse or blood pressure. This is because the native ventricle may be too weak to pump the blood with sufficient force and the majority of the cardiac output is performed by the VAD.
 - A. Because there may be no palpable pulse or blood pressure, the provider will need to use other parameters for patient assessment: level of consciousness, skin signs (pallor, diaphoresis), capillary refill, and respirations.
4. Pulse oximetry may be unreliable since there is no wave form.
5. Utilize the **C-A-B** method of assessment:
 - A. **C** - Circulation: Circulation/Connections and Functions (device).
 - B. **A** - Airway.
 - C. **B** - Breathing.
 - D. ETCO₂ (Both Waveform and Colormetric Capnography) will definitely be able to read accurately and be useful in the assessment.

Assess the Device

1. Assess if the device is working appropriately.
2. Information regarding the type of device, the implantation hospital, and/or the VAD Coordinator contact telephone number may be available by a tag on the device, on the refrigerator, or on a medical alert bracelet.
3. **MOST** patients have a tag located on the controller around their waist that says what type of device it is, what institution put it in, and a number to call. Most importantly is the color of the tag – it matches this EMS Field Guide and allows you to quickly locate the device you are dealing with.
4. If a caregiver is present, utilize his/her knowledge. The patient and their caregiver are the experts on scene for all issues related to the VAD. Listen to their directions regarding VAD device management until you are able to contact the VAD Coordinator.

5. The VAD Coordinator can help you decide the best course of action regarding assessment of the equipment.
NOTE: Only the base hospital is legally allowed to give orders regarding patient care.
6. If the patient has a continuous flow VAD (non-pulsatile / pulseless), auscultate the left upper quadrant of the patient's abdomen for the "hum" of the VAD, which can help direct the appropriate actions.
 - A. Assess for "whirring sound" and hypoperfusion state as previously mentioned.
7. A pulsatile VAD will make an audible sound without auscultation.
 - A. Measure pulse and blood pressure. If no pulse or blood pressure, then the providers should use the device's "Hand Pump" to maintain perfusion.
 - B. Pulsatile VADs are usually older devices which pump blood via pulsatile mechanism, generating a peripheral pulse.
8. Determine if the device has power.
 - A. Consider changing the batteries and reconnecting cables.
 - B. If the device has power it does not necessarily mean that it is working, so the previous step is very important.
9. If the device has power, you will see a green light on the HeartMate II, the most commonly implanted device.
10. On the HeartWare device, the display will clearly tell you the Liters per Minute (LPM) of blood flow.
11. Check the VAD for secure connections and that the batteries are charged and functional.
12. Remain patient-centric. Check the VAD device as directed but remain aware of how your patient is doing clinically. Deliver routine medical care as required.
13. If the pump is pumping then the problem is usually with the patient, not the device.
14. Do ABCs in conjunction with your VAD assessment.

BLS Care

1. Assess airway to ascertain if patent.
2. Place a pulse oximetry (it may not work or accurate). If working, then keep SpO₂ at 94%.
3. Be prepared to assist ventilations.
4. A patient with a non-pulsatile device might not have a systolic and diastolic blood pressure obtainable by standard methods (using a manual or automatic blood pressure cuff).
5. The mean blood pressure is typically in the range of 65 to 100 mm Hg and is obtained via doppler (auscultation may be possible).

ALS Care

1. Place an IV and give a fluid bolus of 500 ml up to a maximum of 1 liter (these patients are preload dependent).

Note: This may reverse hypoperfusion.

2. Place on cardiac monitor and obtain a 12 lead EKG (neither is affected by the VAD).
3. Treat symptomatic dysrhythmias.
4. If indicated place defib pads away from VAD and ICD.
5. Call VAD coordinator and discuss plans with them and the caregivers.
6. Call the base hospital for discussion.
7. Consider Air Medical Transport.

Considerations

1. Consider NO CPR if no pump sound, no pulse, no blood pressure, and signs of hypoperfusion.
2. Chest compressions, blunt force trauma to the chest and/or abdomen can dislodge the VAD graft/device and cause sudden death.
3. Always talk to the family/caregivers as they have specific knowledge and skills.
4. Call the VAD Coordinator early as per patient/family instructions or as listed on the device.
5. They are available 24/7 and should be an integral part of the treatment.
6. Questions to ask: Does the patient have a DNR or equivalent?
7. Can the patient be cardioverted or defibrillated if needed? (Many of these patients are in chronic Vfib.)
8. If defibrillation or cardioversion is necessary, these devices are insulated. Therefore, the electric therapy should not be an issue.

9. Can chest compressions be performed in case of pump failure?
10. Deciding when to initiate chest compressions can be difficult.
11. Consider that chest compressions may cause death by exsanguination if the device becomes dislodged.
12. However, if the pump has stopped the heart will not maintain perfusion and the patient will most likely die.
13. Ideally, plan the decision in advance with a responsive patient and VAD Coordinator.
14. If the VAD patient is unresponsive and pulseless with a non-functioning pump and has previously indicated a desire for resuscitation efforts, begin chest compressions.
15. Contact the VAD Coordinator and Medical Control.

Transport

1. Transport the patient with ALL device equipment including any instructions, hand pumps, back-up batteries, primary and secondary controllers, as well as any knowledgeable family members or caregiver.
2. If the patient's condition is related to their VAD, and it is safe and reasonable, it is preferred to transport the patient to the nearest VAD Center. If possible, they can be transported to their VAD center given time and distance concerns.
3. For prolonged ground transport consider CCT and/or Air Medical Resources.
4. Suspected STROKE (STROKE ALERT) patient transport to closest Stroke Center.
5. Suspected STEMI (STEMI ALERT) patient transport to closest STEMI Center.
6. Trauma patient (activation): Follow Trauma Care Policy and transport to closest Adult Trauma Center.
7. Cardiac Arrest or critical / unstable patients (poor perfusion): Follow Shock or appropriate resuscitation policy and transport to closest STEMI / Cardiac Arrest Center.
8. Always contact the receiving hospital early to help the facility prepare for this highly specialized patient.
9. Consult the base/modified base hospital for destination consultation.