

The 4 Ps of the LVAD

Monitor these key parameters on your patient's left ventricular assist device (LVAD):

- **Pump flow** is an estimate of cardiac output based on pump speed and power. It typically ranges from 4 to 6 L/minute. Pump flow is influenced by mean arterial pressure (MAP); a higher MAP increases pump flow, and a lower MAP decreases it.
- **Pump speed** indicates the speed at which the LVAD rotors are spinning. The usual range is 8,600 to 9,800 rpm.
- **Pulse index (PI)** is a measurement of flow through the pump and is determined by pump speed and the patient's native heart function. PI typically ranges from 3 to 7. Lower values reflect less native heart function and greater reliance on the pump, while higher values reflect more native heart function and less support by the pump.
- **Power** is the amount of wattage (W) the device needs to maintain speed and flow. The normal range is 4 to 7 W.

LVAD Patient Assessment

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In this lesson, we will examine some of the key differences you will need to know when assessing an LVAD patient. Some of the information is at the EMS and ER level. However, due to the significant complications that an LVAD patient creates simply by having an embedded mechanical device; the EMT is best served understanding their role in the big picture.

LVAD Patient Assessment

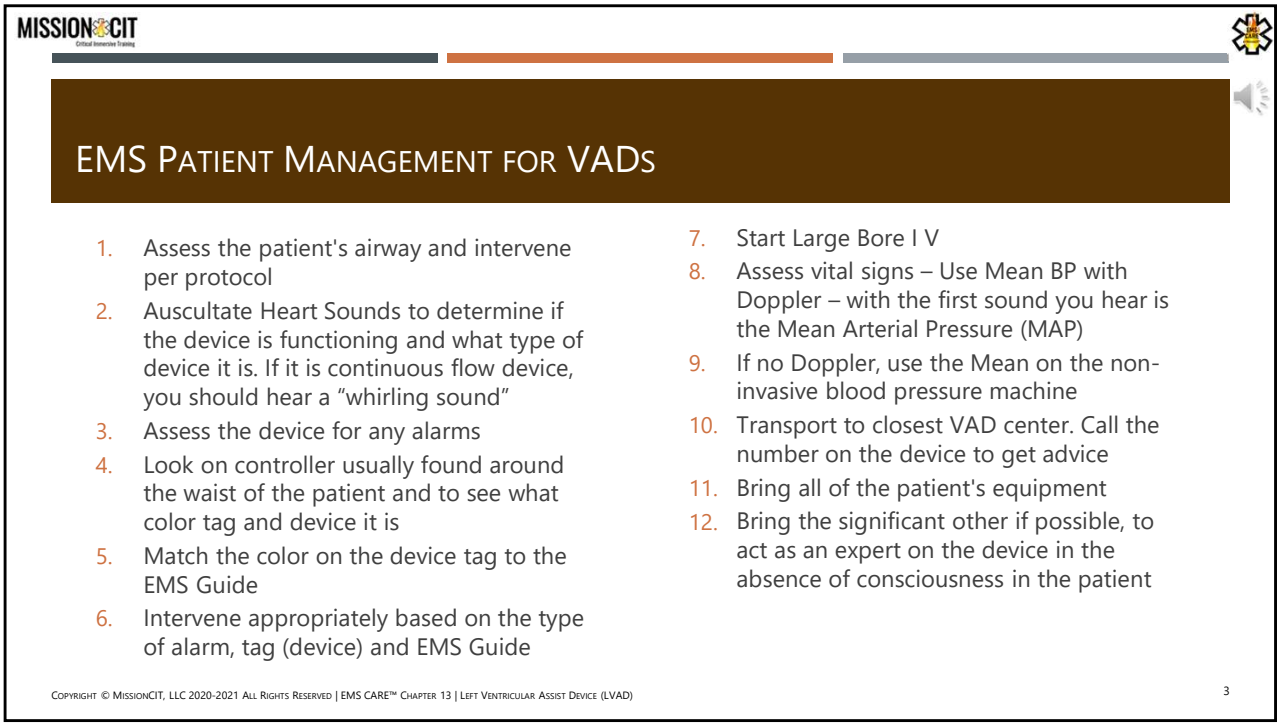
- Color Coding System Identifying the VAD
- In most cases, the patient or caregiver has already talked to the VAD team. They should be able to tell you their normal parameters
  - ✓ Involve VAD team in patient management decisions
- If VAD is alarming, make sure you check all connections
  - ✓ Make sure batteries are charged and connected tightly



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For your reference, be sure to download the EMS Field guide in this lesson.
So, MOST patients have a tag located on the LVAD controller, around their waist, that says what type of device it is, what institution put it in, and a number to call. Note the color of the patient's tag – it matches the type of VAD, and allows you to quickly determine how to proceed.
In most cases, the patient or caregiver has already talked to the VAD team. They should be able to tell you about their normal parameters.
We can't stress enough to involve the VAD team in patient management decisions.
If the VAD is alarming, make sure you check all connections as we have already discussed.
And of course, make sure the batteries are charged and connected tightly.



So, when an EMT arrives on the scene of a medical emergency, the first things they often check, are the patients' pulse and blood pressure. But patients with left ventricular assist devices don't have either!
It's crucial that EMS providers appropriately assess these patients. For example, if an LVAD patient became unconscious due to low blood sugar, that patient would not have a pulse. Usually, the next step is to give chest compressions, but an LVAD patient doesn't need that. The LVAD is circulating the blood around the body continuously.

The following 12 points are for EMS providers including ALS staff. Depending on the EMT's training, you may be able to provide some or all of these steps. Follow your local protocol. However, it's helpful to know the big picture. The 12 steps are:

1. Assess the patient's airway and intervene per your protocol.
2. Auscultate Heart Sounds to determine if the device is functioning and what type of device it is. If it is a continuous flow device, you should hear a "whirring sound".
3. Assess the device for any alarms.
4. Look on the controller usually found around the waist of the patient and to see what color tag and device it is.
5. Match the color on the device tag to the EMS Guide.

6. Intervene appropriately based on the type of alarm, tag (device), and EMS Guide.
7. Start Large Bore I V.
8. Assess vital signs – Use Mean BP with Doppler – with the first sound you hear is the Mean Arterial Pressure (MAP)
9. If no Doppler, use the Mean on the non-invasive blood pressure machine.
10. Transport to the closest VAD center. Call the number on the device to get advice.
11. Bring all of the patient's equipment.
12. Bring the significant other if possible, to act as an expert on the device in the absence of consciousness in the patient.

DOPPLER MAP

- Need to obtain doppler MAP due to continuous blood flow
- You will usually hear 1 number; this is the mean arterial pressure (MAP)
- MAPs should be between 60-80 mmHg
- Automated BPs will not always be accurate
  - ✓ If you can feel a radial pulse, try obtaining an automated cuff pressure



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So, the patient has no blood pressure or pulse. You still need to assess their circulatory vital signs. Hence, if your training, equipment, and protocol permit, you will need to obtain a Doppler Mean Arterial Pressure. If you are able to proceed,
You will usually hear 1 number; this is the mean arterial pressure (MAP).
MAPs should be between 60-80 millimeters mercury.
Automated BPs will not always be accurate.
If you can feel a radial pulse, try obtaining an automated cuff pressure.

No CPR

- CPR SHOULD NOT BE PERFORMED ON LVAD PATIENTS UNLESS DIRECTED
  - ✓ Due to the risk of LVAD dislodgement or regurgitation
  - ✓ May destroy the implanted aortic valve

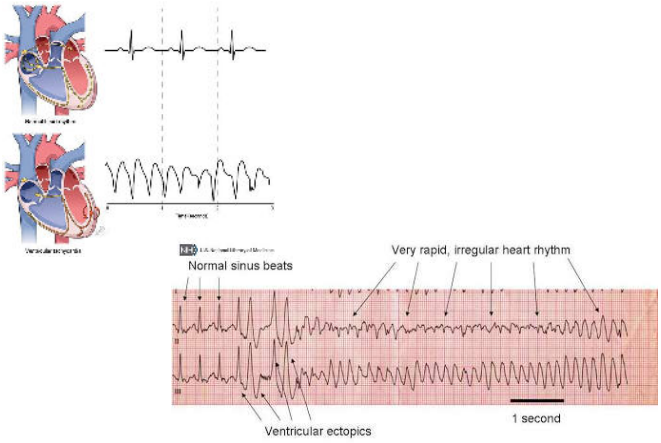


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So, CPR SHOULD NOT BE PERFORMED ON an LVAD PATIENT UNLESS DIRECTED. Hence, it is critical to get connected to Advanced Life Support and VAD support as soon as you suspect an issue that may require help.

Ventricular Fibrillation (VF) or Pulseless Ventricular Tachycardia (VT)

- Stable
  - ✓ Patient may "feel funny" "light-headed" or "different"
  - ✓ Pump speeds and flows are normal, low normal, or very low
  - ✓ Consider cardioversion after consultation with Mechanical Assist Device Coordinator
- Unstable
  - ✓ Patient unresponsive
  - ✓ Treat as unstable VT/VF



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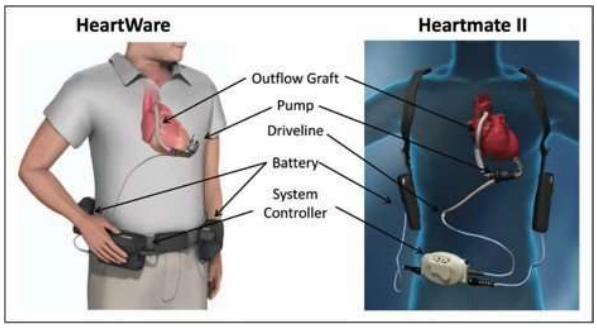
During your assessment, the LVAD patient may be stable, but may exhibit symptoms that need further evaluation. They may include:

1. The Patient may feel funny, light-headed, or different.
2. The Pump speeds and flows are normal, low normal, or very low.
3. Consider cardioversion after consultation with the Mechanical Assist Device Coordinator.

An Unstable situation may occur where the patient is unresponsive. Treat this as an unstable Ventricular Fibrillation or Pulseless Ventricular Tachycardia.

LVAD Patient Transport

- Transport to assigned facility
- Spare batteries, PBU and the display module should be brought to the hospital with the patient
- PBU weighs 29 pounds without batteries
- All modes of emergency transportation are acceptable
- Aviation electronics will NOT interfere with LVAD and visa versa



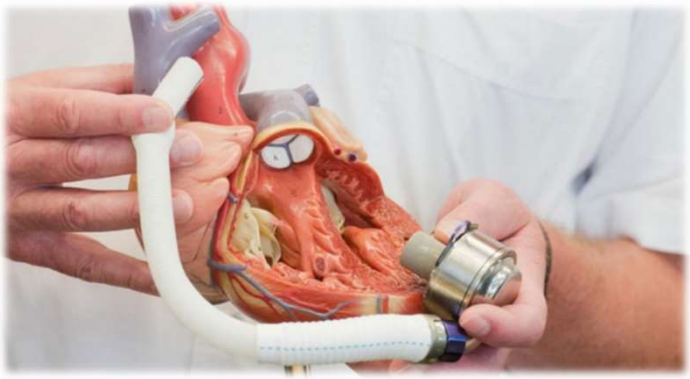
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Here are five helpful notes about transporting the LVAD patient.

1. Transport only to an assigned facility.
2. Bring spare batteries, the PBU, and the display module, to the hospital with the patient.
3. As an FYI, the PBU weighs about 29 pounds without the batteries.
4. All modes of emergency transportation are acceptable; and
5. Aviation electronics will NOT interfere with an LVAD, and vice versa.

Summary of Key Points

- Do not perform CPR
- Patient's contact information
- Device Assessment
- Advanced Life Support
- 12 Step Assessment



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So, the key points for assessing an LVAD patient are:

1. The patient has no pulse.
2. The patient has no blood pressure.
3. The patient's family or caregiver is a good source of information as they most likely have been trained on the device.
4. Obtain the phone number for support from the patient's device card as soon as you can.
5. Do not perform CPR unless directed.
6. Know the 12 step assessment and follow what's appropriate per your protocol.

That's the end of this lesson. In the next lesson, we will look at the most popular VAD devices that you may encounter.