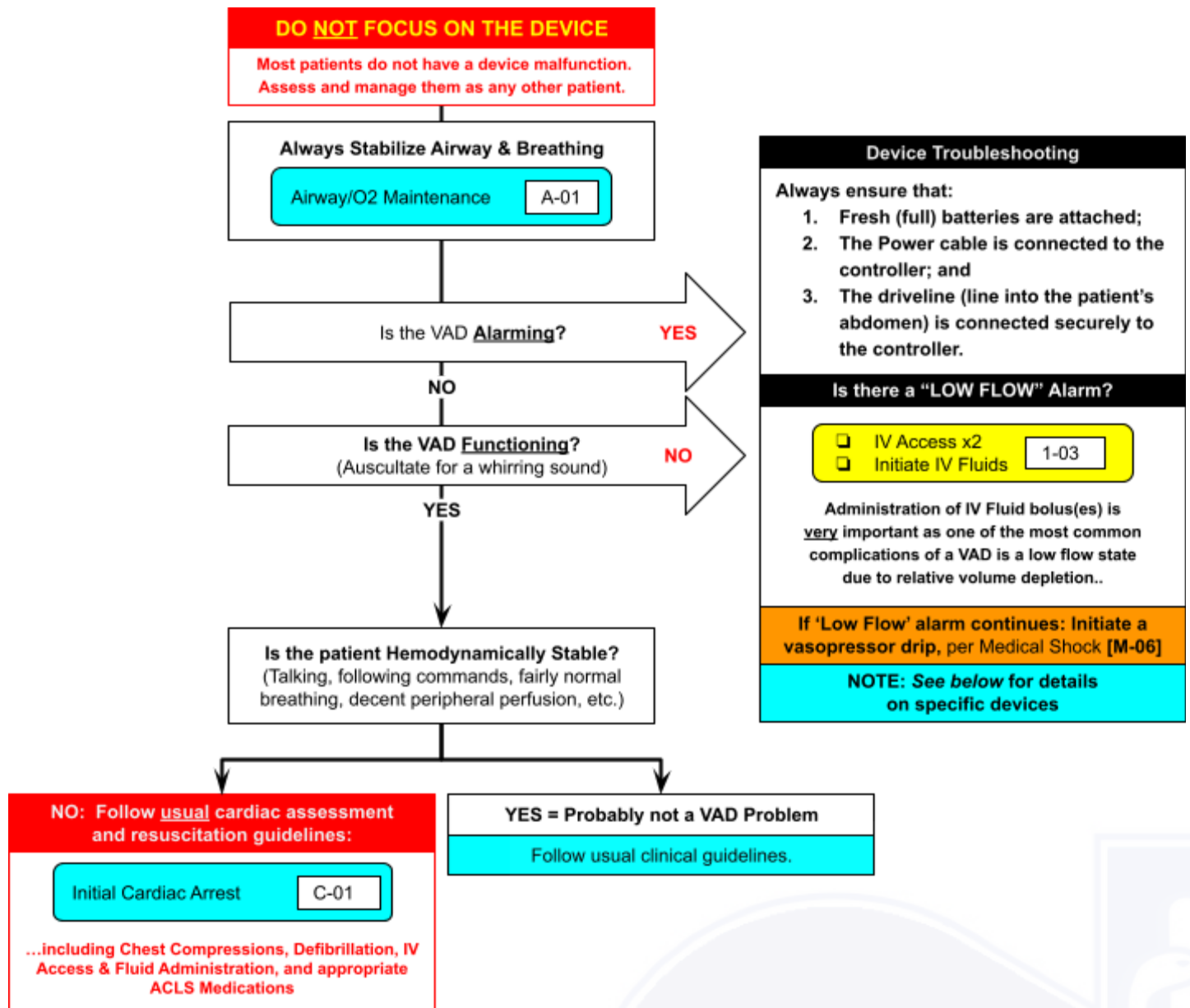


C-10
VENTRICULAR ASSIST
DEVICES (VADs)

First Responder
EMT
AEMT
Paramedic

CAUTION: The majority of complaints/medical problems in patients with a VAD have nothing to do with the device itself. **Quickly confirm device function, stabilize the patient and consider other problems.**



Always:

- Contact the patient's VAD Coordinator as soon as possible
- Bring ALL the patient's equipment and backup supplies
- Allow the patient's significant other/caretaker to act as an expert on the device

C-10
VENTRICULAR ASSIST
DEVICES (VADs)

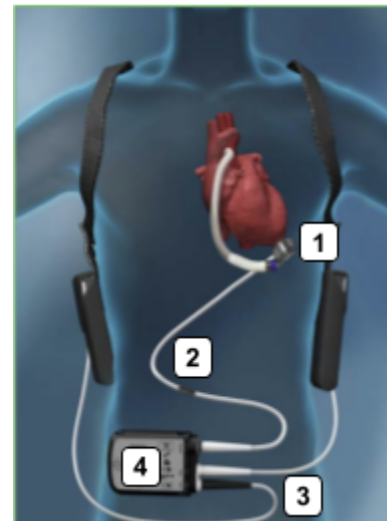


Ventricular Assist Device (VAD)

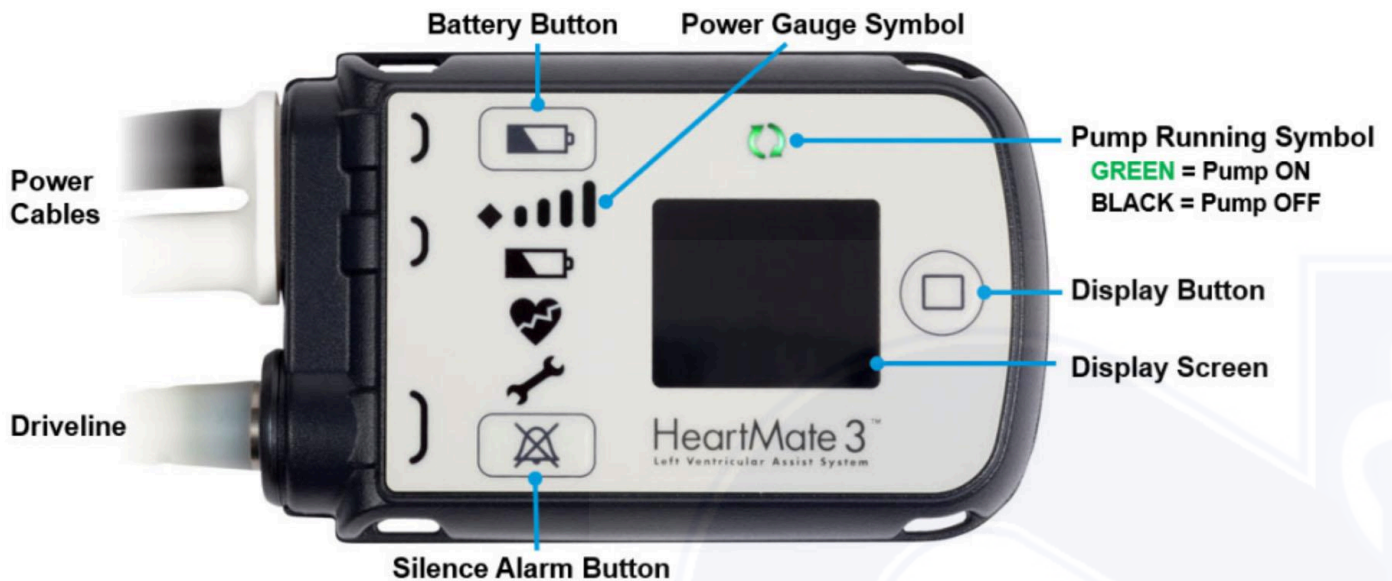
A Ventricular Assist Device (VAD) is a mechanical device used to support circulation in a patient with significant cardiac ventricular dysfunction. The Left Ventricular Assist Device (LVAD) is commonly used to support the left side of the heart and to provide extra cardiac output to the body. This device can be placed short term to bridge patients until they can receive a heart transplant or long term for people who are not candidates for a transplant.

Anatomy of a VAD - All VADs have at least 4 components:

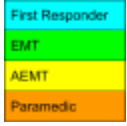
1. The **Pump** consisting of a short tube placed inside the ventricle pulling blood thru the pump and out a tube;
2. A **Driveline** that exits the abdomen and connects to a controller and power source;
3. A **Power Source**: All VADs can be powered by either rechargeable batteries or an AC power adapter.
4. A **Controller** that operates the heart pump. It gives information about pump performance such as blood flow through the pump (L/min), pump speed (RPM) and the amount of power consumed (Watts). It also gives warnings and alarms if there is an alert/problem with the pump or with the power source, such as low battery or low flow.



VAD Controller (HeartMate 3™)



C-10
VENTRICULAR ASSIST
DEVICES (VADs)



Common VAD Complications:

CVA • Arrhythmias • Infections/Sepsis • Obstructions • Heart Failure

VAD Patient Assessment

- VAD patients (typically) have no discernible pulse—this depends on how much (or if) underlying cardiac output (contractility) remains.
- Blood pressure measurement:
 - As VADs typically provide a fixed-speed, continuous outflow, there is generally only a single, constant intravascular pressure—essentially only a mean arterial pressure (no systolic or diastolic pressures).
 - Automatic BP cuffs may or may not register a singular BP.
 - The most accurate blood pressure is generally a palpated or auscultated manual BP.
- Secondary Assessment of Perfusion
 - Level of consciousness
 - Respiratory rate and work of breathing
 - Signs of perfusion: skin color/temperature, capillary refill, etc.

Key Points

- Unstable VAD patients should be transported to the closest appropriate facility.
- Most VAD patients will ultimately require transfer to Vanderbilt (or other implant center) for definitive care, although non-VAD issues can generally be managed by facilities with cardiology and cardiothoracic surgery coverage.
- **Contact the patient's VAD Coordinator as soon as possible at the number provided by the patient/family.**
-
- VAD patient family members are excellent resources to assist with patient history and evaluation/repair of VAD alarms/faults.
- It is vital to transport the patient's back-up batteries and emergency equipment with the patient.

HeartMate 3 (Vanderbilt Patients) - Full Reference

PLEASE SEE BELOW

Additional Device-Specific Information

<https://www.mylvad.com/medical-professionals/resource-library/ems-field-guides>

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.

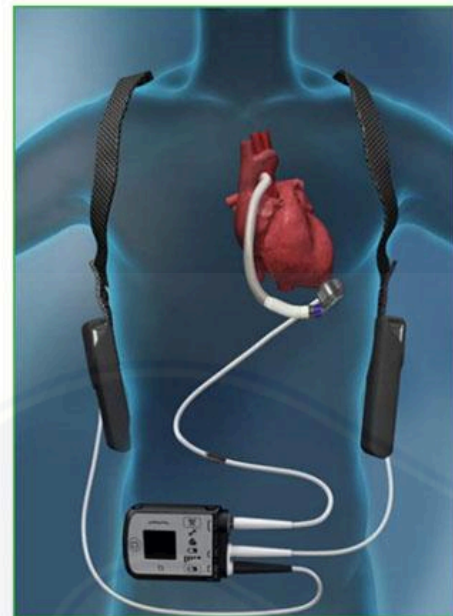
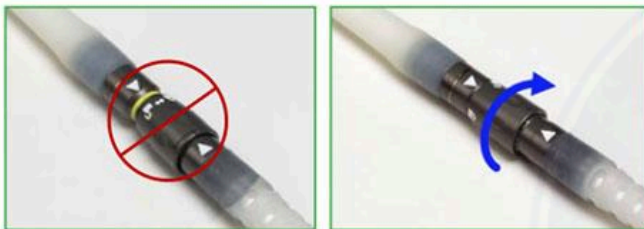
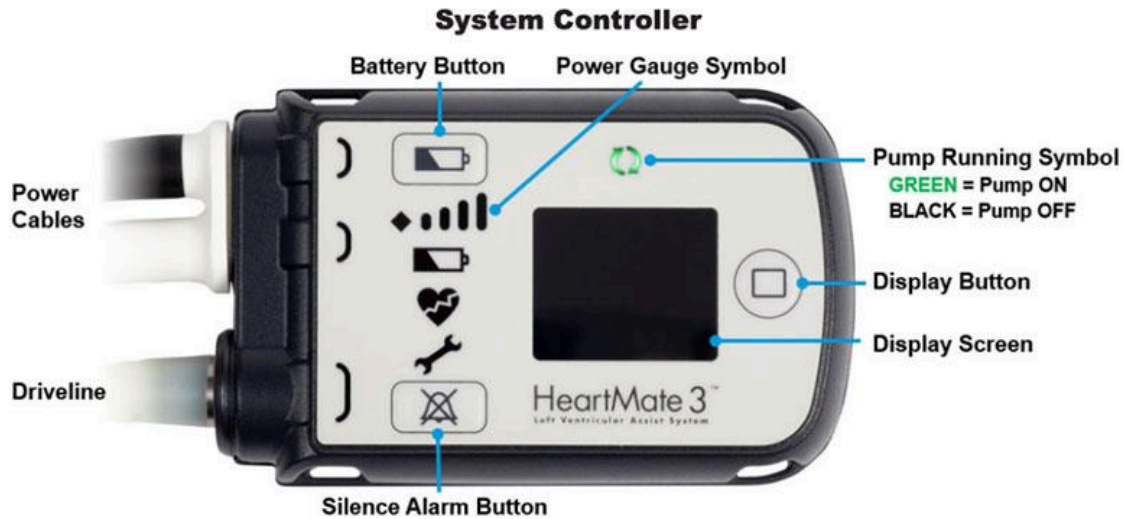


Figure 1

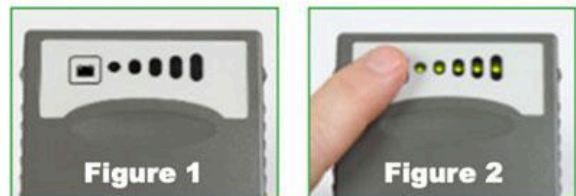
HeartMate 3™ Left Ventricular Assist System



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.

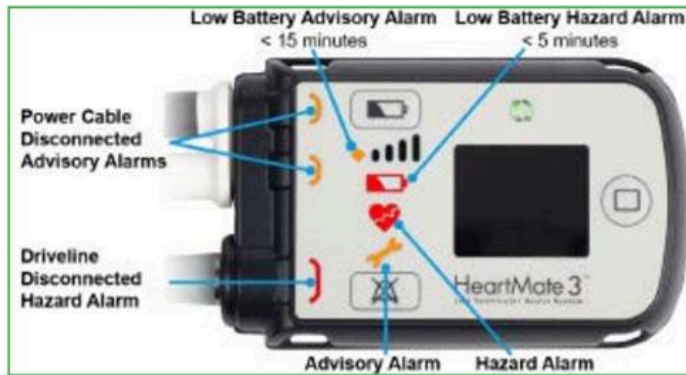


Troubleshooting HeartMate 3™ LVAS

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.