

# VAD Community CPR Guideline

April 2020

Advanced Heart Failure Program



# Background

The left ventricular assist device (LVAD) is a mechanical internal heart pump used to treat heart failure. The pump provides ***continuous*** blood flow from the left ventricle to the aorta and requires an external controller and power source to run the pump. The UR VAD program has been implanting LVAD pumps since 2001. In the absence of evidence based data, the UR VAD Program *historically advised against* chest compressions in LVAD patients.

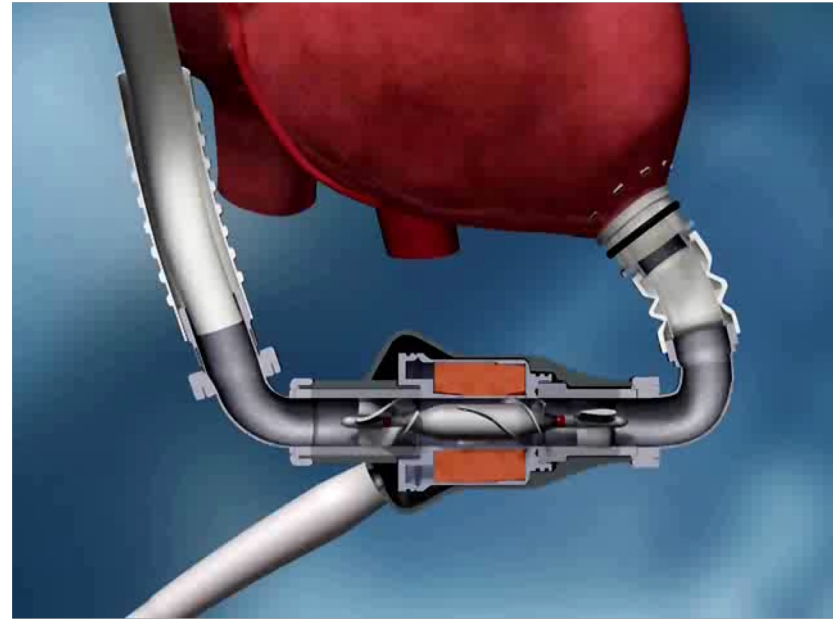


Image: HeartMate II LVAD courtesy of Abbott

In 2017, UR VAD program adopted the AHA expert consensus recommendation indicating ***external chest compressions are advised for LVAD patients with signs of inadequate perfusion even when the pump is working (+ hum chest).***

<http://circ.ahajournals.org/content/135/24/e1115.long2>

# Comparison of LVAD Pumps and Parameters

## TYPES OF CONTINUOUS FLOW LEFT VENTRICULAR ASSIST DEVICES



### HeartMate II™

Axial Flow Pump

Speed: 8000-10000 rpms

Flow: 4 – 6 lpm

Power: 4 – 6 watts

Pulsatility Index: 4 – 7

MAP: 70 – 90 mm Hg

Warfarin/Aspirin

Pair of Batteries = 10 – 12 hours

Emergency Battery in Controller



### Heartware HVAD™

Centrifugal Flow Pump

Speed: 2400-3200 rpms

Flow: 4 – 6 lpm

Power: 3 – 5 watts

Pulsatility Index: Not applicable

MAP: 70 – 90 mm Hg

Warfarin/Aspirin

Pair of Batteries = 8 – 12 hours

No Emergency Battery in Controller



### HeartMate 3™

Centrifugal Flow Pump

Speed: 4800-6500 rpms

Flow: 4 – 6 lpm

Power: 3 – 5 watts

Pulsatility Index: 2 – 6

MAP: 70 – 90 mm Hg

Warfarin/Aspirin

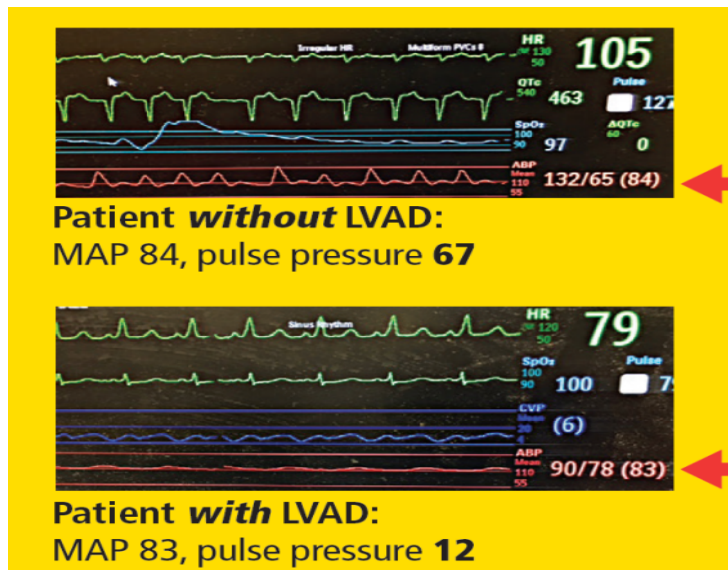
Pair of Batteries = 15 hours

Emergency Battery in Controller

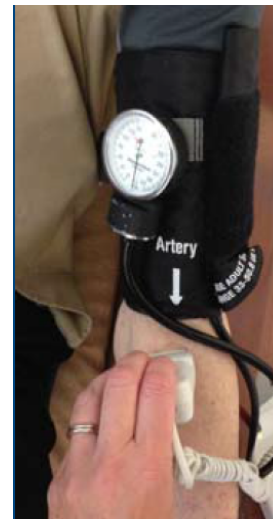
The UR VAD program supports approximately 250 LVAD patients across NY State. While code situations are rare, it is important for community first responders to understand how to respond to an LVAD patient in an emergency.

LVADs provide continuous blood flow; as such palpable pulses are often absent in these patients and blood pressure measurement by an automated cuff may be inaccurate. Pulse oximetry readings also can be inaccurate due to the lack of pulsatile flow. A normal pulse ox reading is likely true, however a low pulse ox reading may not indicate true hypoxemia and the probe should be repositioned.

### Understanding LVAD Vital Signs



### Standard BP monitoring by Doppler

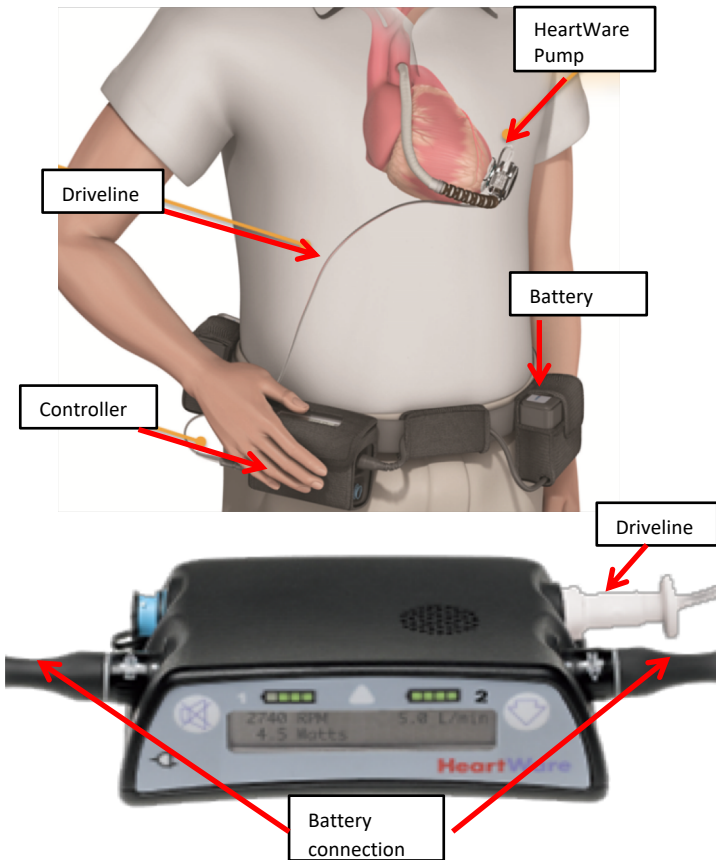


1. Find arterial flow with Doppler
2. Increase cuff pressure till signal goes away
3. Decrease pressure till signal returns.

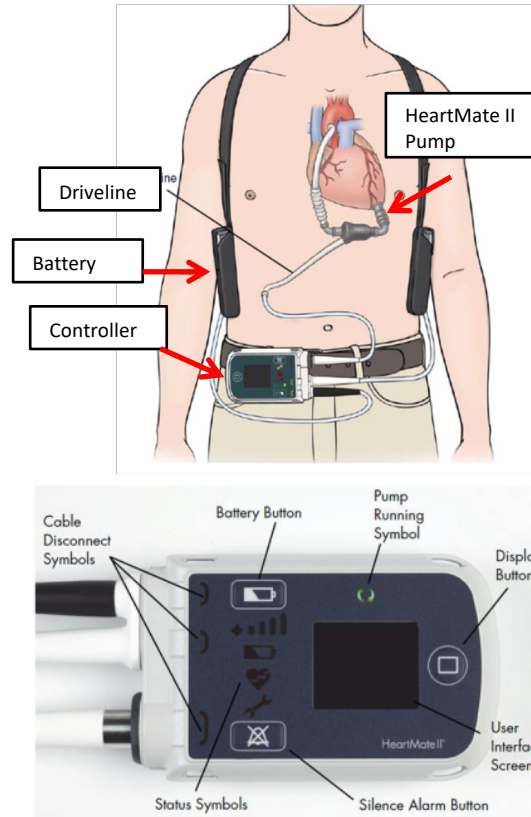
This pressure is the patients mean pressure.  
**Normal is 70-80mm/Hg**

# Closer look at LVAD pumps and controllers

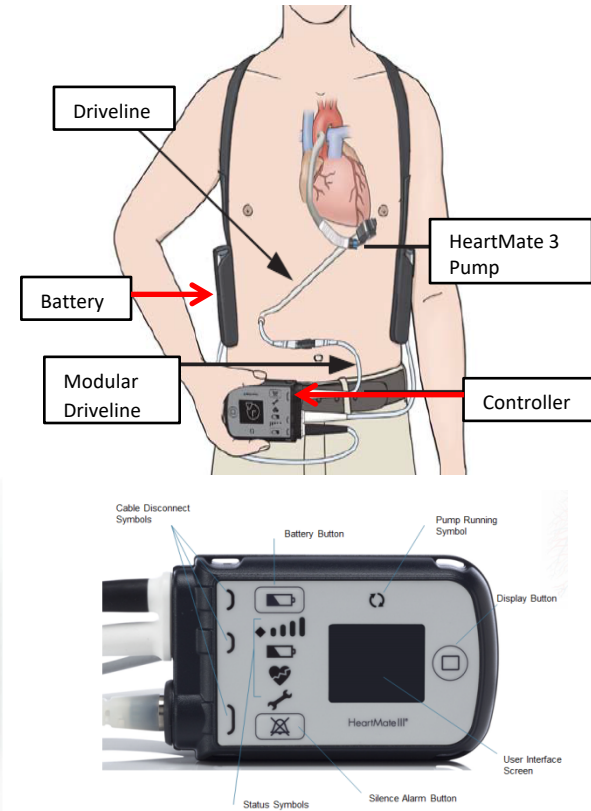
## HeartWare HVAD



## HeartMate II



## HeartMate 3



# Assessment of the LVAD patient

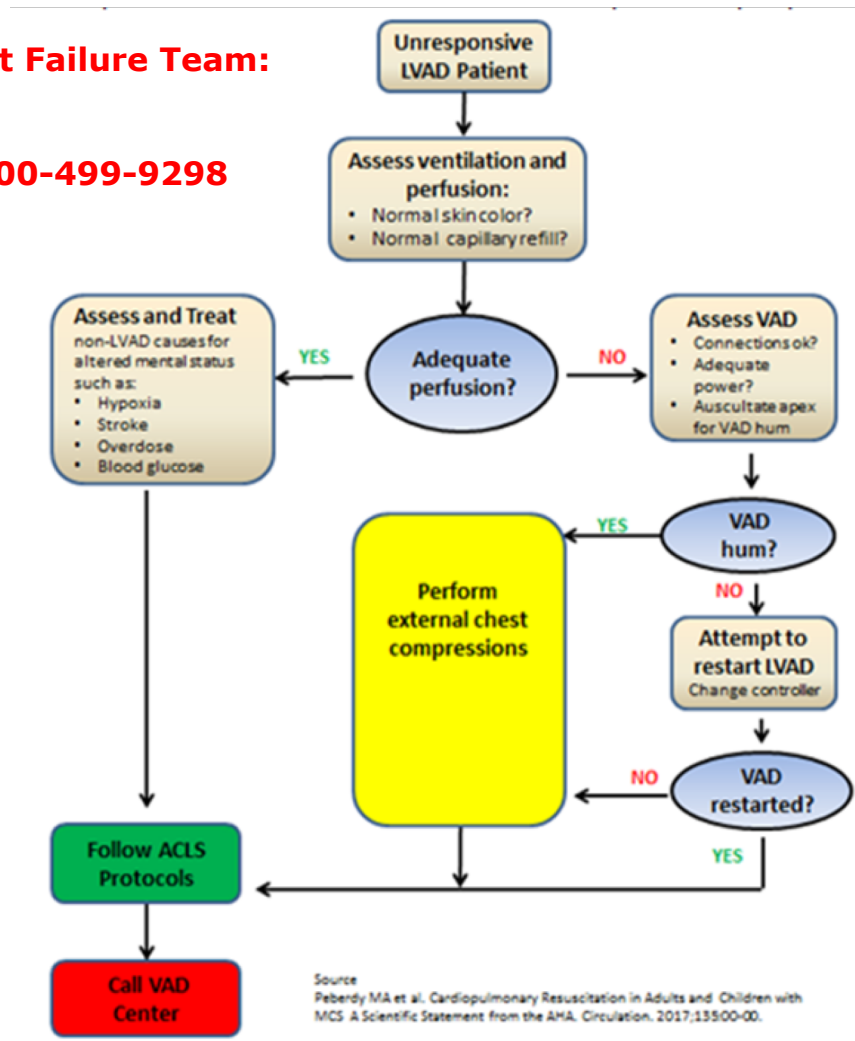
- *Assess adequate perfusion based on mentation, skin color, capillary refill.*
  - *If patient has signs of adequate perfusion, assess and treat for non-lvad causes for patient deterioration.*
  - *If patient does not have signs of adequate perfusion, check LVAD system*
    - Check connections: Is the driveline connected to the controller?
    - Is the controller connected to power?
    - Listen for a humming sound where the heart is.
      - *If there is no VAD hum after thorough check of connections and change of power, the controller will need to be changed out.*

## **Links to Controller Change out Videos:**

- HM2/HM3 Change out: <https://vimeo.com/256842958>
- HVAD Change out: <https://vimeo.com/256850229>

**24/7 UR Advanced Heart Failure Team:  
1-800-892-4964**

**UR Transfer Center: 1-800-499-9298**



# Summary

LVAD patients are prevalent in the community and on the URMCCampus. Assessment of adequate tissue perfusion and a check of the VAD connections is the key to determining if a patient requires chest compressions.

## References:

1. Givertz, M., Bonnell, M. et al. Consensus Statement HFSA/SAEM/ISHLT clinical expert consensus document on the emergency management of patients with ventricular assist devices. JHLT 2019. Vol.38(7) 677-698.
2. Peberdy, M et al. Cardiopulmonary Resuscitation in Adults and Children with MCS. Circulation 2017;135:e1115-e1134
3. Yuzelfpolskaya, M et al. Advanced cardiovascular life support algorithm for the management of the hospitalized unresponsive patient on CFLVAD support outside the intensive care unit. European Heart Journal: Acute Cardiovascular Care 2016. Vol. 5(8) 522-526.

Additional LVAD resources can be found at [www.vadresources.urmc.edu](http://www.vadresources.urmc.edu)