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 \textit{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 \textit{historically advised against} chest compressions in LVAD patients.

In 2017, UR VAD program adopted the AHA expert consensus recommendation indicating \textit{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.long
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

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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
- HeartWare Pump
- Driveline
- Battery
- Controller
- Battery connection

HeartMate II
- HeartMate II Pump
- Driveline
- Battery
- Controller

HeartMate 3
- HeartMate 3 Pump
- Driveline
- Battery
- Modular Driveline
- Controller
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](https://vimeo.com/256842958)
- HVAD Change out: [https://vimeo.com/256850229](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 URMC campus. Assessment of adequate tissue perfusion and a check of the VAD connections is the key to determining if a patient requires chest compressions.

References:

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