VAD Program Alert:
Practice Change regarding CPR

March 2018
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 various types of LVADs since 2001.

Over the past 15 years, this technology has continued to evolve as well as our understanding of how to care for this population. In the absence of evidence based data, the UR VAD Program historically has advised *against* chest compressions in LVAD patients if the pump was on.
In May 2017 the AHA published a scientific statement regarding CPR in adults and children with Mechanical Circulatory Support. The UR VAD Program has reviewed this expert consensus statement and has adopted the recommendations regarding CPR in the LVAD population.

Effective immediately, **external chest compressions are advised** for LVAD patients with signs of *inadequate perfusion* even when the pump is noted to be working (+ hum chest).

Link to Circulation:  [http://circ.ahajournals.org/content/135/24/e1115.long](http://circ.ahajournals.org/content/135/24/e1115.long)
The UR VAD program supports approximately 200 LVAD patients. On a daily basis about 25% of these patients can be seen on the medical campus in various areas such as Eastman Dental, outpatient clinics, procedural areas, or inpatient units. While code situations are rare, it is important for all medical center staff 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**

- **Patient without LVAD:**
  - MAP 84, pulse pressure 67

- **Patient with LVAD:**
  - MAP 83, pulse pressure 12

**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 patient's mean pressure. Normal is 70-80mm/Hg.
Closer look at LVAD pumps and controllers

HeartWare HVAD

HeartMate II

HeartMate 3

Advanced Heart Failure Program
Comparison of LVAD Pumps and Parameters

### Types of Continuous Flow Left Ventricular Assist Devices

<table>
<thead>
<tr>
<th>HeartMate II</th>
<th>HVAD</th>
<th>HeartMate 3</th>
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<tbody>
<tr>
<td>Axial Flow Pump</td>
<td>Centrifugal Flow Pump</td>
<td>Centrifugal Flow Pump</td>
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<tr>
<td>FDA Approved BTT/DT</td>
<td>FDA Approved BTT/DT</td>
<td>Investigational &amp; FDA Use</td>
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<tr>
<td>Speed: 8000-10000</td>
<td>Speed: 2400-3200</td>
<td>Speed: 4800-6500</td>
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<tr>
<td>Flow: 4-6 lpm</td>
<td>Flow: 4-6 lpm</td>
<td>Flow: 4-6 lpm</td>
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<tr>
<td>PI: 4-7</td>
<td>PI: Not Applicable</td>
<td>PI: 2-6</td>
</tr>
<tr>
<td>Power: 4-6 watts</td>
<td>Power: 3-5 watts</td>
<td>Power: 3-5 watts</td>
</tr>
<tr>
<td>MAP: 70-90</td>
<td>MAP: 70-90</td>
<td>MAP 70-90</td>
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<tr>
<td>Warfarin/Aspirin</td>
<td>Warfarin/Aspirin</td>
<td>Warfarin/Aspirin</td>
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<tr>
<td>Pair Batteries=10-12 hrs</td>
<td>Pair Batteries=8-12 hrs</td>
<td>Pair Batteries=15 hrs</td>
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<tr>
<td>Backup Emergency 15 min Battery in Controller</td>
<td><strong>No</strong> Emergency Battery in Controller</td>
<td>Backup Emergency 15 min Battery in Controller</td>
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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
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.
Resources

Additional LVAD resources can be found on www.vadresources.urmc.edu

References:


HeartMate II Left Ventricular Assist System Instructions for Use: Thoratec Corporation, 2016.

HeartMate III Left Ventricular Assist System Instructions for Use: Thoratec Corporation, 2017

HeartWare Left Ventricular Assist System Instructions for Use: HeartWare Corporation, 2017.