



Monroe Livingston Region Program Agency


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To: All Providers and Agencies

From: Jeremy T. Cushman, MD, MS, EMT-P 
Regional Medical Director

Date: June 18, 2014

Re: Advisory 14-08: Total Artificial Heart Protocol

Patients with Total Artificial Hearts are becoming increasingly common in our community. In response to this, the REMAC developed [Protocol 2.37B – Total Artificial Hearts \(TAHs\)](#), to help guide prehospital personnel in their management of patients with these devices. The Total Artificial Heart Protocol is attached to this Advisory and available online. This protocol is effective immediately.

With the support of the University of Rochester Heart Center, an educational [vodcast](#) has been created to provide information about the indications, normal operation, and troubleshooting of a Total Artificial Heart device. The vodcast training is not mandatory, but highly encouraged and providers are eligible for one half (0.5) hour of BLS or ALS CME following a review of the vodcast and satisfactory completion of the post test.

Importantly, this Total Artificial Heart protocol does not in any way replace [Protocol 2.37A – Left Ventricular Assistance Devices \(LVAD\)](#). LVADs and TAHs are two very different devices, each with very different emergent management. An updated LVAD [vodcast](#) remains available online and providers are eligible for one (1) hour of BLS or ALS CME following a review of the vodcast and satisfactory completion of the post test.

With any questions, please do not hesitate to contact our office.

2.37A LEFT VENTRICULAR ASSIST DEVICES – LVAD

CRITERIA

Any request for service that requires evaluation and transport of a patient with a Left Ventricular Assist Device (VAD)

1. Assess airway and breathing. Treat airway obstruction or respiratory distress per protocol. Treat medical or traumatic condition per protocol.
2. Assess pump function and circulation:
 - Listen to motor of pump over heart and observe green light on system control device.
 - Assess perfusion based on mental status, capillary refill, and skin color. The absence of a palpable pulse is normal for patients with a functioning VAD. They may not have a blood pressure.
 - **DO NOT PERFORM CPR** unless there is no evidence of the pump functioning (no motor noise) and the person is unresponsive and without a pulse.
3. Perform secondary assessment, treat per protocol.
4. **Notify the receiving hospital immediately**, regardless of the patient's complaint.
5. Bring patient's power unit and batteries to the Emergency Department. Unless otherwise directed by Medical Control, transport patient to a facility capable of managing a VAD patient.
6. Trained support member should remain with patient.
7. Do not delay transport to hospital.

EMT STOP

8. If hypotensive (defined as poor perfusion based on mental status, capillary refill, or skin color):

Establish IV/IO access and administer 500ml NS bolus.

Reassess and repeat up to 1000ml total. Contact Medical Control for additional fluid boluses.
9. If patient does not have evidence of adequate perfusion and oxygenation with treatment, despite the device being on, treat with standard ACLS measures.

CONSIDERATIONS

1. Community patients are entirely mobile and independent.
2. Keep device and components dry.
3. Batteries and the emergency power pack can provide 24-36 hours of power.
4. Trained support members include family and caregivers who have extensive knowledge of the device, its function, and its battery units and are a resource to the EMS provider when caring for a VAD patient.
5. Patients are frequently on three different anticoagulants and are prone to bleeding complications.
6. Patient may have VF/VT and be asymptomatic. Contact Medical Control for treatment instructions.

2.37B TOTAL ARTIFICIAL HEART – TAH

GENERAL INFORMATION

1. Patients with the Syncardia[®] Total Artificial Heart (TAH) have had a total cardiectomy (removal of their heart) and replacement by two pneumatically operated ventricles attached to the remnants of the left and right atria. An electrically powered air compressor operates the artificial heart.
2. The TAH patient has a normal pulse and blood pressure detectable by conventional methods:
 - Target Blood Pressure is < 130 mmHg
 - Pulse rate is set and regular, between 120-135 bpm
 - Normal fill volume (stroke volume) is variable, should be 50-60ml /beat, and is displayed on the driver unit
3. The TAH patient has no cardiac electrical activity as they have no remaining myocardium. Monitor leads will display asystole despite the presence of perfusion.
4. **IN THE ABSENCE OF PULSE DO NOT PERFORM CHEST COMPRESSIONS**

CRITERIA

Any request for service that requires evaluation and transport of a patient with a Total Artificial Heart.

1. Assess airway and breathing. Hypertension or volume overload can quickly cause pulmonary edema to develop.
2. Assess Artificial Heart function and device operation:
 - Assess adequacy of power and any fault alarms from the driver unit (compressor).
 - If driver is not operating, the patient has no pulse or blood pressure or fault alarming; immediately change to back up driver or hand pump.
 - Hand pump at a rate of 120 bpm where 1 beat is equivalent to '1 down and up'
 - Assess blood pressure: goal blood pressure is < 130 mmHg
3. Perform a secondary assessment, treat per MLREMS protocol.
 - The TAH patient should not receive chest compressions, pacing, or defibrillation.
4. Notify the receiving hospital once en route regardless of patient's complaints
5. Transport patient with both drivers (compressors), hand pump, and all batteries and power cords; any trained support member should remain with patient.

EMT STOP

6. If blood pressure is > 130mmHg administer sublingual nitroglycerin 0.4 mg

Repeat sublingual nitroglycerin 0.4 mg every 5 minutes if BP > 130 mmHg

7. Assess for hypovolemia. If blood pressure < 90mmHg, or fill volumes < 45ml with evidence of distributive shock, blood loss or dehydration:

IV 0.9% NS in 250ml boluses; may be repeated to one liter total if hypotension and low fill volumes persist.

Contact Medical Control for additional fluids beyond one liter.

CONSIDERATIONS

- TAH patients are on multi-agent anticoagulation and may have significant bleeding with minor injury.
- Insufficient cardiac support may be due to:
 - Hypervolemia, not hypotension and hypovolemia as the Kevlar chambers can accommodate no more than 70ml at a time.
 - Degradation or damage to the drivelines. Examine drivelines for venting air. Repair kit is in patient support kit.