



Ventricular Assist Devices and Emergency Services

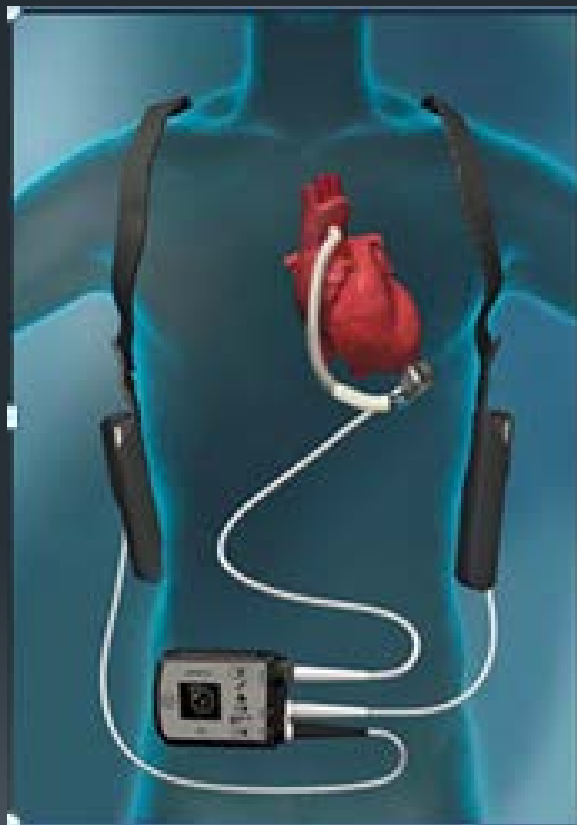
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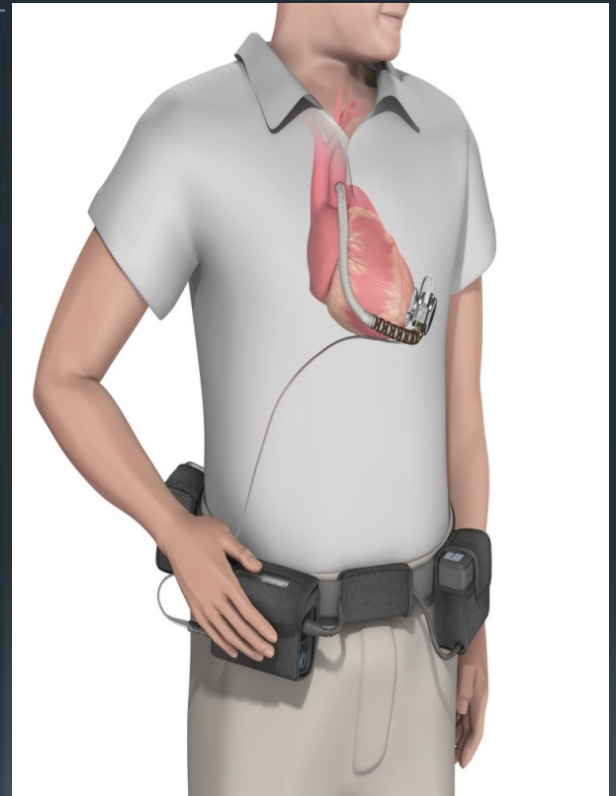
Left VAD Systems



HeartMate II



HeartMate 3



Heartware HVAD

What is the goal for therapy?

- Transplant candidates
- Not transplant candidates

Vital Signs: Non-pulsatile

- NO Palpable pulse
- Cannot routinely get a blood pressure using NIBP
- ED: Doppler & Sphygmo
 - MAP Goal 60-80 mmHg
- Pulse ox

Assessment Algorithm for Mechanical Circulatory Assist Device Patients

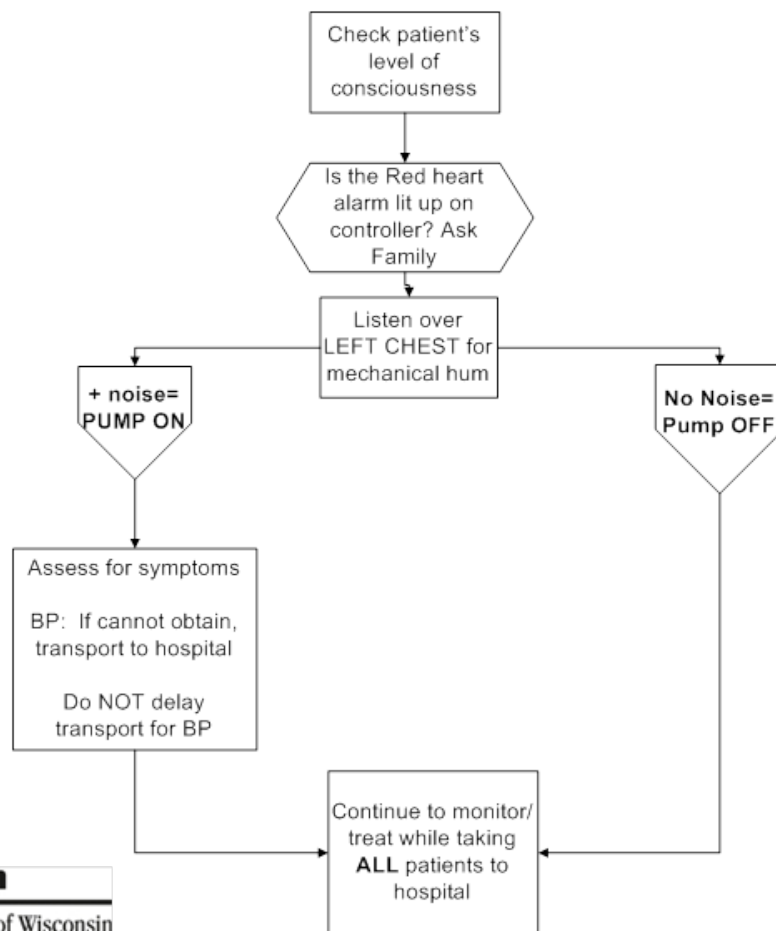
Non-Pulsatile Device= No Audible Noise

First Responders, EMTs, Paramedics

PARAMEDICS: Follow ACLS Protocols

EMT/ First Responders: Follow Own Protocols

EXCEPT: No Chest Compressions or Thrombolytics



Assessment Considerations

- Perfusion- skin temperature/color
- Alarm sounding?
- Arrhythmia?
- Potential MI concerns?
- Pulmonary Embolism?
- Stroke?
- Signs of bleeding?
- Trauma/MVA?
- Abdominal pain?
- Signs of Infection?

Management Concerns?

- RV : Prevent decrease flow from RV
 - Be careful with Nitrates but can give them
 - Be careful to prevent fluid overload
- Oxygen/CPAP/BiPAP/intubation/LMA ok
- Defibrillate:
 - External: pads/process is same as standard process
 - Implantable Defibrillator: Not present for every pt

Pt specific information

- VAD pts can drive
- VAD pts can be alone
- Medic alert bracelet
- Device specific equipment
- INR goal is 2-3 (standard)

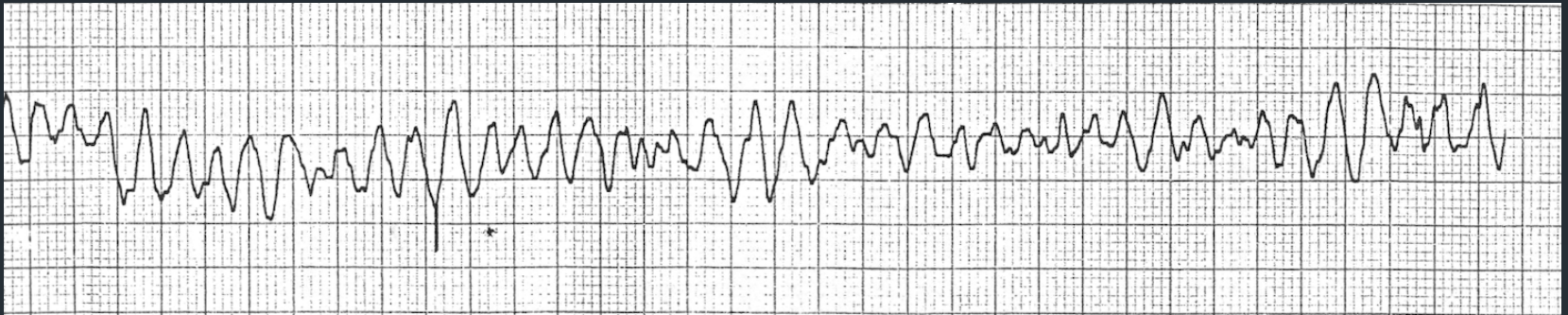


Kahoot

A “Shocking” Case

- 50 year old male s/p LVAD implant x 4 years
- Diarrhea x 1 day
- Woke this am after receiving a shock from ICD
- Then several more shocks
- Instructed to go to local ED—called EMS

- Ventricular Rhythm– Ventricular Fibrillation



- Initial Labs at Outside Hospital:
 - K+ 4.0
 - Mg 1.88
- Given 1 Gram of Magnesium IV
- Rhythm: Primarily VFib
- Transfer to UW

Transport to UW

- Continues to receive shocks
- Alert, uncomfortable
- “Is Vfib normal for a VAD patient?”
- Attempt pad reposition
- NOPE!
- Give more magnesium
- Amiodarone 300 mg
- ETA: 1 ½ hours

Arrives at UW

- Physical Assessment by Heart Failure Team:
 - **General:** Sedate but opens eyes to verbal stimuli. Uncomfortable when alert.
 - **Skin:** Diaphoretic, cool, area of erythema in left upper chest wall
 - **Neck:** No carotid pulse, no visible JVD
 - **Chest:** No heart tones appreciated only constant hum of VAD
 - **CVS:** fine VTACH vs Torsades on monitor
 - **Extremities:** cool with no palpable pulses
 - **Neuro:** awakens to voice and follows commands. Returns to sleep between shocks.
 - VAD numbers “stable” and MAP 80-90s



- Repeat Labs

- K+ 6.0

- Mg 2.3

- Cr 1.67

- LDH 401

- Electrophysiology consult

- ICD turned off

- Amiodarone bolus & drip (no response)

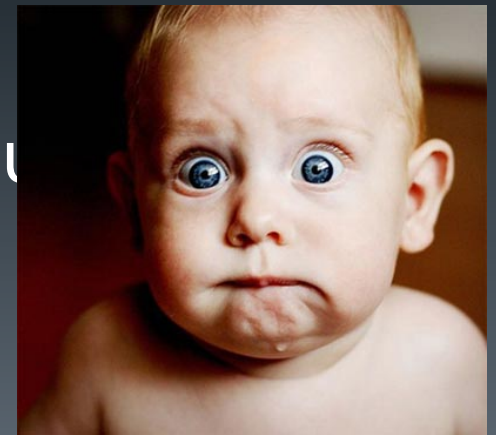
- Lidocaine bolus and drip (no response)

- Intubation and Arterial Line Placement

- pH @ 1300 is **7.28** CO2 is 54

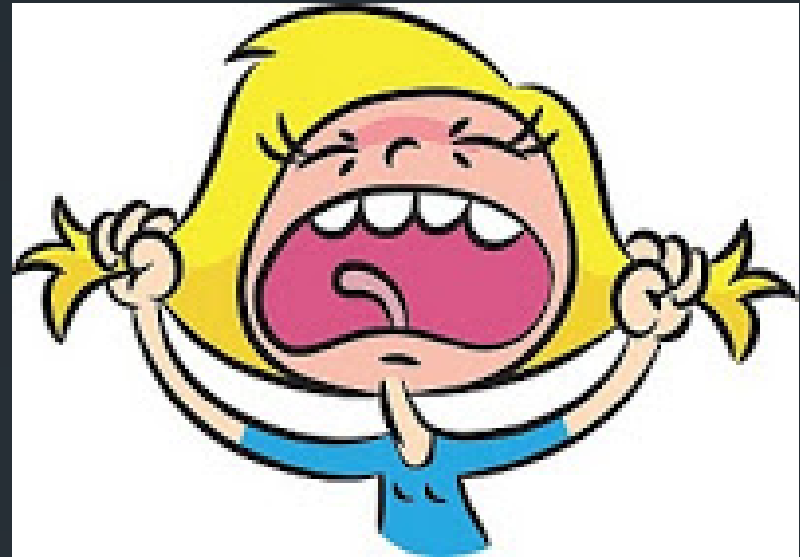
- 1 hour later pH is **7.16**, CO2 is 78 and K+ is 6.3

- Treat the acidosis
 - Vent changes
 - Bicarb
- Treat the Hyperkalemia
 - Dextrose, Insulin, & Calcium
- Slight improvement in pH and CO₂
- Then, started to decompensate quickly
 - MAP to 30s-40s
 - O₂ sats 70-80s
 - Decreasing VAD flows



Time to move!

- Phenylephrine
- Dobutamine gtt
- More Bicarb
- More Calcium
- More Magnesium
- Attempts at defibrillation with ICD
- **IT'S NOT WORKING!!!**



Go Big or Go Home



360 J



FINALLY!

- Converted to a ventricular paced rhythm
- Internal pacer set to 90 ppm
- Hemodynamics and VAD numbers improved quickly
- Pressors weaned off
- Blood gas rechecked and greatly improved
- K+ recheck was 4.6





Kahoot

Case Study # 2

- Pt BY is a 50 year old pt s/p VAD implant. He is passenger in car driving down I-94 to UW Hospital.
- Pt's daughter's vehicle is side swiped and hits the median on passenger side. Pt speaks some English/Spanish. Daughter only speaks Spanish.
- Your assessment:
 - Pt hit his head against the air bag but conversant.
 - Pt complaining of headache.
 - Moves all extremities x 4 without deficit



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Case Study # 3

- Pt. AV: You are asked to come to pt's house who has fallen and hit his head. The fall was witnessed by his family and occurred 15 minutes prior to arrival.
- Pt's VAD is **not alarming** when you start to assess pt.
- Pt is unresponsive
- Pt's skin is cool, very pale to grey
- Pt is not breathing-start BVM.
- No palpable pulse
- Pt's rhythm on monitor is slow JR at 50 bpm.
- Pt has pacemaker/ICD

- How do you proceed?



Kahoot

Cardiopulmonary Resuscitation in Adults and Children With Mechanical Circulatory Support

A Scientific Statement From the American Heart Association

ABSTRACT: Cardiac arrest in patients on mechanical support is a new phenomenon brought about by the increased use of this therapy in patients with end-stage heart failure. This American Heart Association scientific statement highlights the recognition and treatment of cardiovascular collapse or cardiopulmonary arrest in an adult or pediatric patient who has a ventricular assist device or total artificial heart. Specific, expert consensus recommendations are provided for the role of external chest compressions in such patients.

Mechanical circulatory support (MCS) has evolved from a rarely used therapy reserved for the most critically ill hospitalized patients to an accepted long-term outpatient therapy for treating patients with advanced heart failure. This growth is attributable to improved technology, improved survival, reduced adverse event profiles, greater reliability and mechanical durability, and limited numbers of organs available for donation. With the number of patients supported by durable MCS systems increasing in the community, so too is the need for emergency care providers to receive specific guidance on how to assess and treat a patient with MCS who is unresponsive or hypotensive.

No evidence-based or consensus recommendations currently exist for the evaluation and treatment of cardiovascular emergencies in patients with MCS. Because of the unique characteristics of mechanical support, these patients have physical findings that cannot be interpreted the same as for patients without MCS. For example, stable patients supported by a durable, continuous-flow ventricular assist device (VAD) often do not have a palpable pulse. Unfortunately, different and sometimes conflicting instructions are given by hospital providers and emergency medical ser-

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On behalf of the American Heart Association Emergency Cardiovascular Care Committee; Council on

Cardiopulmonary, Critical

Care, Perioperative, and

Resuscitation; Council on

Cardiovascular Diseases

in the Young; Council on

Cardiovascular Surgery

and Anesthesia; Council on

Stroke and Stroke Prevention

When do I call the medical control, VAD coordinator or receiving hospital?

Medical Control

- Clarification on protocols given recommendation for no chest compressions
- Question if pt is dead & want to pronounce in field

VAD coordinator

- Any red heart or red alarm sounding from VAD
- Concerns if pump is running
- Intercept being done
- Change in hospital pt is being taken to

Receiving Hospital

- Change in pt condition requiring additional personnel available (specialized teams-neuro, trauma as examples)
- Flight request

When do I intercept?

- Ground vs. flight
- Pt needs advanced care- neuro/stroke, cath lab, persistent VT/VF, Trauma
- Critical care level needed
 - Need specialized medications- multiple infusions, advanced airway, Heparin for clotted pump

Key Points

- EMS:
 - No palpable pulse
 - Unable to obtain BP
 - Assessment- signs of perfusion
 - Recommend no chest compressions
- Paramedics:
 - The above
 - Plus: any medication is okay except thrombolytics
- ED:
 - The above
 - Doppler BP = MAP
 - May need echo to determine if RV feeding LV + pump



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Thanks for your attention.....

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