Should We Deactivate LVAD?
End of Life Care for Patients with Left Ventricular Assist Device

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Objective
• Understand Clinical situations leading to LVAD deactivation
• Prevent and treat the potentially rapid onset of symptoms after deactivation
• The process regarding LVAD deactivation
• Life expectancy and care before and after deactivation of LVAD

What is A VAD?
A ventricular assist device (VAD) is a battery-operated mechanical pump (MCS) that helps a weakened heart pump blood throughout the body.

LVAD
BiVAD
Who are eligible for VAD

- End stage heart failure (stage D) patients refractory to medical management
  (1) Used as a bridge to heart transplant
  (2) Recently as destination therapy (an alternative to transplant) who are not eligible / unwilling to undergo a heart transplant

How VAD help end stage heart failure patient?

Allow a near normal quality of life

Complication of VAD treatment

- Bleeding both in the perioperative period and in the long term due to antithrombotic therapy
- Device thrombosis and embolic stroke
- Hemolysis
- Infection
- Acquired von Willebrand disease (aVWD)
- Acute and chronic right heart failure
- Aortic regurgitation
- Ventricular arrhythmias
- Technical problems: malposition of the inflow cannula, kinking of outflow grafts, bend relief disconnection, cable damage, and device failure
Conditions leading to VAD deactivation

- Thrombotic / Hemorrhagic stroke effecting quality of life
- Overwhelming Sepsis
- Multi organs failure
- Poor quality of life despite LVAD treatment
  e.g. chronic infections, recurrent bleeding
- Development of serious secondary comorbidities
  e.g. cancer, advance dementia, renal failure needing HD

Ms. Taylor (42 years old lady with end stage heart failure s/p LVAD 6 months ago)

- Comorbidities include CVA 4 months ago with minimal left sided residual weakness, chronic smoker, hypertension, CAD, dyslipidemia.
- She was admitted to hospital 7 days ago for altered mental status. She was intubated for airway protection. MRI of the brain showed acute acute infarcts in the parieto occipital regions. She was also found to have high LDH due to hemolysis and pump thrombosis so she was started on heparin drip.
- Her hospital stay further complicated by GI bleed requiring 3 units of PRBC transfusion. Heparin drip was on hold due to GI bleed. Bedside EGD did not showed significant bleeding. She has worsening acute renal failure requiring continuous renal replacement therapy (CRRT) and vasopressors for hypotension. She has pulmonary edema due to dysfuntioning VAD.

Ms. Taylor (42 years old lady with end stage heart failure s/p LVAD 6 months ago)

- Respiratory failure on vent
- Systolic heart failure with worsening pump thrombosis
- Hypotension on vasopressor
- Acute renal failure on CRRT
- Acute ischemic stroke
- Encephalopathy
- Acute GI bleed
Mr. Robinson (65 year old gentleman with end stage heart failure s/p LVAD 7 months ago)

- Comorbidities include hypertension, CAD, COPD, early pump thrombosis requiring pump exchange 6 months ago, driveline infection requiring driveline placement and prolong antibiotic treatment for recurrent infection.
- He was admitted to hospital 10 days ago for sepsis. Currently he is on antibiotics, one vasopressor for hypotension with acute renal failure. This is the 4th time driveline infection. Patient has been hospitalized 4 times within last 7 months. Since LVAD operation he has been at home for a week, the rest of the time he was either in hospital or sub acute rehab facility. He is awake, alert and able to make decision. He has poor quality of life despite LVAD placement.

Mr. Robinson (65 year old gentleman with end stage heart failure s/p LVAD 7 months ago)

- Recovering septic shock
- Hypotension on one vasopressor
- Acute renal failure not on renal replacement therapy
- No sign of worsening Heart failure
- Awake, alert and able to make decision: requesting LVAD deactivation

Ethical Dilemma

- Patients may request withdrawal of life-sustaining treatments that are no longer consistent with their goals of care
Important Steps prior to Deactivation of VADs:

- Confirm and document DNR and DNI status
- Confirm the treatment plan goals
- Address any patient/family or professional ethical concerns
- Make direct recommendations about what treatments should be stopped, instead of asking families treatment-by-treatment what they want
- Reassured that patients can be kept comfortable without life sustaining treatments.
- Allow ample opportunities of visitation for families and loved ones

Important Steps prior to Deactivation of VADs:

- Describe what can be expected after deactivation
- Inform life expectancy (minutes to days) to patient and family in advance
- Discontinue all non-symptom-directed monitoring
- Establish adequate symptom control prior to deactivation to ensure adequate circulation of the drugs
- Discontinue other life-sustaining treatments (e.g. artificial nutrition/hydration, antibiotics, dialysis, ventilator)

Medication Protocol prior to Deactivation of VADs:

- IV bolus dose of an opioid (i.e. morphine 2-20 mg IV) for rapid onset of dyspnea/labored respirations
- IV bolus dose of a benzodiazepine (lorazepam 0.5-2 mg IV) if anxiety is anticipated.
- IV bolus dose of glycopyrrolate (Robinul®) 0.2 to 0.4 mg IV 20-30 minutes prior to deactivation to inhibit secretions.
- Consider an IV continuous infusion of sedating medications
- Titrate medications to control labored respirations and achieve the desired state of sedation prior to deactivation.
- Have additional medication drawn up and ready to administer at the bedside if needed.
- If distress is noted, utilize additional bolus doses of opioids and benzodiazepines (e.g. morphine 5-10 mg IV push ± 10 min, and/or midazolam 2-4 mg IV push ± 10 min, until distress is relieved).
- The symptom relief is more important than specific dose. A goal should be to keep the respiratory rate < 20 and eliminate grimacing, agitation, and labored respirations.
How to Deactivating LVADs:

- Unplug power cord from LVAD controller.
- Remove power from controller by removing both cables coming from the main power source (simultaneous removal of both cables will trip alarm).
- Unplug power cord from patient (potentially trip LVAD alarms in the patient).
- If LVAD continues to alarm, there is risk of device damage due to lack of power or flow, which can distress the family.

After Deactivation:

- Be prepared to spend additional time with the family discussing questions and concerns.
- After death occurs, encourage the family to spend as much time at the bedside as they require.
- Provide acute grief support and follow-up bereavement support.

Reference: