

FAST FACTS AND CONCEPTS #269 DEACTIVATION OF A LEFT VENTRICULAR ASSIST DEVICE AT THE END-OF-LIFE

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Introduction The increased use of left ventricular assist devices (LVADs) is expected, particularly as destination therapy for patients with advanced heart failure who are not transplant candidates. *Fast Fact #205* discusses LVAD technology in general. This *Fast Fact* discusses important considerations at the time of LVAD deactivation. **Note:** published clinical outcomes with LVAD therapy have improved further after the initial publication of *Fast Fact #205*, please refer to the updated version of #205 for current information (1). A general review of contemporary LVAD management, including images regarding common devices currently in use can be found in Reference (2). *Fast Fact # 296* addresses palliative care issues regarding total artificial hearts.

Common clinical scenarios leading to LVAD deactivation Clinical situations leading to LVAD deactivation include catastrophic complications of the LVAD (e.g. stroke, sepsis and multiorgan failure); poor quality of life despite LVAD treatment (e.g. chronic infections, intolerance of or a decision to forego hemodialysis); and developing serious secondary comorbidities (e.g. cancer, dementia) (3, 4). As with other life-sustaining treatments, patients may request withdrawal of life-sustaining treatments that are no longer consistent with their goals of care.

Important Process Steps in Deactivating LVADs

- Since part of the device is implanted within the patient, an LVAD is 'turned-off,' akin to deactivating an implantable defibrillator. However, LVADs have an external power source and associated controlling unit which are removed from a patient, analogous to removing a ventilator.
- The process regarding LVAD deactivation should be clearly outlined and understood by those who are participating. Any patient/family or professional ethical concerns should be addressed. Families and loved ones should have ample opportunities for visitation. Family members' presence can be based on patient preferences, and a description of what can be expected should be shared.
- DNR and DNI status should be confirmed and documented in the chart and orders, as well as the goals of care and overall medical plan of care.
- Survival after LVAD deactivation at the end-of-life ranges from a few minutes to a few days (5). Providers should carefully explain this variability to families as it can be upsetting if a patient lives *longer* or *shorter* than what family expects.
- Many patients will also be on other forms of life-sustaining treatments such as renal replacement therapy, vasopressors, tube feeds, implantable cardioverter-defibrillators (see *Fast Fact #112*), and mechanical ventilation that generally should be discontinued at the time of LVAD deactivation. Once the care goals are clear, it is usually best to make direct recommendations to the patient/family about the medical plan of care including what treatments should be stopped, as opposed to asking families treatment-by-treatment what they want done. Families should be reassured that patients can be kept comfortable without such treatments.
- All non-symptom-directed monitoring should be discontinued.

Practical LVAD Deactivation Tips

- Clinicians should think of LVAD deactivation as analogous to ventilator withdrawal. They should be prepared to prevent and treat the potentially rapid onset of dyspnea/labored respirations, agitation, or other signs of discomfort. Pharmacologic principles are similar to ventilator withdrawal – see *Fast Facts # 33, 34*.
- Work closely with the individuals in your institution responsible for LVAD management, such as the LVAD nurse coordinators. There are many different LVAD models which have different steps in their deactivation.
- Familiarity with the alarm functions of LVAD devices, and how to turn them off, is critical to prevent unsettling alarming during what is hoped to be a peaceful and intimate process for patients and loved ones. Tips to deactivate the alarms for the HeartMate II device, one of the most commonly implanted adult LVAD devices today, are included in the box below.

- Once the LVAD is deactivated, cardiovascular circulation may greatly diminish. Therefore, clinicians should strongly consider bolusing with comfort medications *prior* to deactivation to ensure adequate circulation of the drugs. Due to diminished drug circulation, the time to peak effect of an opioid or benzodiazepine bolus may be delayed after LVAD discontinuation.

References

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Box: Basic Deactivation Sequence Checklist for HeartMate II LVAD

- a. Unscrew small black nickel-sized battery in “System Driver” (also called controller) to disable back-up alarms.
- b. Press alarm silence button on controller.
- c. Remove power from controller by removing both cables coming from the main power base unit (simultaneous removal of both cables will limit alarms).
- d. Detach controller from patient (cord going from LVAD driveline exiting patient to the controller).

If deactivation occurs sequentially and not simultaneously, there is the risk of the device alarming due to low power or low flow, which can be distressing to families.

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