

Indications

Evaluation of patient with implanted Left Ventricular Assist Device. If the patients device is not a HeartMate II contact OHSU consult line.

HeartMate II®

The current LVAD deployed is the HeartMate II. This device provides “pump” assistance to the left ventricle in patients with heart failure. It is implanted in the chest of the patient with connections from the apex of the left ventricle to the ascending aorta. The pump itself is implanted in the chest with the controller external to the chest with a conduit connecting the two.

Troubleshooting

- Two potential treatable device complications may present with an LVAD patient:
 - Battery Failure
 - Controller failure.
- This may present as a catastrophic failure to the pump with the resulting “cardiac arrest in the patient” or a “low flow state”

When the pump has stopped

1. Check the connections between the controller and the pump and the power source
2. Fix any loose connections (2) to restart the pump
3. If the pump does not restart and the patient is connected to batteries, replace the current batteries with a new fully-charged pair of batteries
4. If pump does not start, then change the controller.

Changing batteries

Warning: At least one power lead must be connected to the power source AT ALL TIMES. DO NOT remove both batteries at the same time or the pump will stop.

1. Obtain two (2) charged batteries from the patient’s accessory bag. Charged batteries should be marked with a white fuzzy tab at the end of the battery.
2. Remove only one battery from the clip by pressing the black tab on the battery clip to unlock the battery.
3. Controller will start beeping and flashing green light signals when you remove the battery. This is normal.
4. Replace the new battery by lining up arrows on the battery and clip
5. Slide a new, fully charged battery into the empty battery clip by aligning the black arrows. The battery will click into the clip. Gently tug at battery to assure connection. IF battery is properly secured, the beeping and green flashing lights will stop.
6. Repeat the previous steps with the second battery.

Changing Controllers

1. Place the replacement controller within easy reach, along with the battery and battery clips or PBU/Power Module cable. The spare controller is usually found in the patient's travel case.
2. Make sure patient is sitting or lying down since pump will momentarily stop during this procedure.
3. Rotate the PERC lock on the replacement controller in the direction of the "unlocked icon" until the PERC locks clicks into the fully unlocked position.
4. Repeat this same step for the original controller until the PERC Lock clicks into the unlocked position.
5. Attach the power leads on the new, replacement controller to the battery clips or PBU/Power Module cable.
6. If using battery power, place fully-charged batteries into the battery clips after attaching the power leads.
7. Press the silence alarm button (upside down bell with circle) on the new replacement Controller until the alarm is silenced to silence its Red Heart Alarm for 2 minutes.
8. Disconnect the PERC Lead / Driveline from the original controller by pressing the metal release tab on the connector socket. The pump will stop and an alarm will sound. The alarm will continue until power is removed from the original controller. **Getting the new replacement controller connected and the pump restarted is the first priority.**
9. Connect the new replacement Controller.
 - a. Line up the mark on the PERC Lead connector with the mark on the metal tab of the new Controller
 - b. Fully insert the connector into the socket of the new Controller. The pump should restart /alarms should stop.
 - c. Gently tug on the metal end of the lead to make sure the PERC lead is fully inserted into the socket. DO NOT pull the lead.
10. If the pump restarts, skip to Step 12, or continue with next step.

Changing Controllers - continued

11. If the pump does not restart and the RED Heart Alarm continues:
 - a. Firmly press the Silence Alarm or Test Select Button to restart the pump
 - i. If the pump speed is set below 8,000 rpm, the pump will NOT automatically restart when power is restored. Pressing the Silence Alarm or Test Select button is required to restart the pump if the pump speed is set below 8,000 rpm.
 - b. Check the power source. Make sure that power is going to the controller.
 - c. Gently tug on the metal end of the lead to make sure the PERC lead is fully inserted into the socket. DO NOT pull the lead.
 - d. If the pump still does not restart, then try to restart the pump using the System Controller backup system:
 - i. Press and hold both the Test Select and Silence Alarm Buttons at the same time. The RED Heart Alarm will stop and you will hear a repeating cycle of 1 beep per second for 2 seconds, followed by 2 seconds of silence to indicate that the System Controller is operating on the backup system.
12. After the pump restarts, rotate the PERC lock on the new replacement controller in the direction of the “locked” icon until the PERC Lock clicks into the fully locked position. If unable to engage PERC lock to the locked position, gently push the driveline into the controller to assure a proper connection. Retry to engage PERC Lock.
13. Disconnect power from the original controller. The original controller will stop alarming once power is removed.

For Emergencies call OHSU VAD Coordinator On-Call: 503-494-9000.

For Non-Emergencies call the OHSU Office: 503-494-4170.

NOTES & PRECAUTIONS:

1. Blood pressure may be difficult to obtain on these patients. Most patients have a mean arterial blood pressure of 70-90 with a narrow pulse pressure.
2. Palpable pulse may be weak or absent
3. The conduit from the chest to the controller is the electrical line from the pump which connects to the controller which runs the pump.
4. Common presenting non pump related complications include bleeding and infection.
5. If device slows down, LOW FLOW STATE alarm will go off.
6. Do NOT perform CPR, no hand pump is available
7. All ACLS drugs may be administered.
8. Pump does not affect the patient's ECG.
9. The patient can be defibrillated while connected to the device without any disconnection required
10. The patient can be paced in per our normal standard operating procedures.
11. Set of batteries last approximately 3 hours
12. Any emergency mode of transportation is OK. These patients are permitted to fly.
13. Be sure to bring ALL the patients' equipment with them.

ALARMS:

1. Yellow or Red Battery Alarm
 - a. Need to change batteries
2. Red Heart Flashing Alarm
 - a. This may indicate a Low Flow Hazard. Check patient-the flow may be too low. This alarm will consist of red heart alarm indicator light and steady audio alarm if the flow rate is less than 2.5 liters per minute.
 - b. If the patient is hypovolemic, treat per protocol
 - c. If patient is in right heart failure-treat per protocol
 - d. If pump has stopped, check connections, batteries, and controllers as instructed in the section above.

Left Ventricular Assist Devices – 30.120

