

LVADS (Left Ventricular Assist Devices) on a Rehabilitation Unit: Lessons Learned

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Introduction

As traditional rehabilitation units within hospital settings struggle to survive and re-invent themselves to thrive in this economic climate, they must adapt to changing populations. On our rehabilitation unit we no longer see the traditional orthopedic, amputee or multiple sclerosis type populations as these patients are often treated in an outpatient setting. One new population that we have adapted to is the cardiac patient with significant heart failure that has implanted left ventricular assist devices (LVAD). These devices are a bridge to heart transplantation or destination therapy. This poster will describe our rehabilitation nursing experience with this population and how this technology continues to evolve.

Background

Heart failure affects more than five million people in the U.S. and remains one of the leading causes of death in the U.S.¹ The most common reason for heart failure is coronary artery disease.² The modalities to treat this problem include pharmacologic therapies, heart transplantation and the implantation of ventricular assist devices also known as VADs.

Historically, the quest for assistive mechanical heart devices had its origins over forty years ago when in 1964, the National Heart, Lung and Blood Institute began the development of a mechanical heart program. From there in 1974, began development of an electrically powered, totally implantable device which required patients to be tied down to bulky external power sources to 1980 with the first implantation of pneumatic total artificial heart (Jarvik-7-100). In 1994, the FDA approved the use of left ventricular assist devices with external power source as a bridge to transplantation.

In 2002, there was a landmark study completed, the REMATCH study, (Randomized Evaluation of Mechanical Assistance for the Treatment of Congestive Heart Failure) which involved the trial of 129 patients with irreversible heart failure who were ineligible for heart transplantation. The study was aborted prematurely secondary due to remarkable benefits and efficacy of ventricular assist devices. This resulted in the approval of the device by the FDA as a destination therapy.² (Destination therapy with ventricular assist device means to the end of the patient's life.)

Ventricular Assist Devices

Ventricular assist devices can be implanted into the right (R) or left (L) ventricle and the population we have seen these last three years has been those with LVADs. Ventricular Assist Devices take over complete ventricular function, thus improving hemodynamics and coronary perfusion while decreasing mortality.^{3,4}

Functional Outcomes of VAD include:¹

- Improved cardiac and ejection function
- Restored blood flow to organs
- Improved hemodynamic status
- Reduced cardiac workload
- Reversal of pulmonary hypertension

As rehabilitation nurses we have worked with three types of ventricular assist devices in the past three years. The technology continues to evolve so that more power is in a smaller device and the backup battery life is longer. VADs work on the principles of a centrifugal pump, volume displacement pump or axial flow pump and can be placed outside or implanted within the body. We have managed the Novacor, Jarvik and Heartmate type of LVADS on the acute rehabilitation unit. All do the same function in maintaining ventricular blood flow.

The basic components of ventricular assist device include:

- cannula
- pump
- power source

Why Come to the Rehabilitation Unit?

The evidence in the literature is significant in demonstrating efficacy of both physical and occupational therapy interventions in improving the cardiac endurance and conditioning of patients awaiting heart transplant. Many of our patients with LVADs bear this out and through therapies improve in strength, energy level, endurance and mobility. All these indications are important as they await cardiac transplant so that surgical and post surgery outcomes will be on target.

Rehabilitation Nurses' Challenges: Fear and Education

Fear

Once we as staff got over the deer in the headlights fear of "we are not a cardiac unit with monitors" type thinking, each additional management of the patient with LVAD became more comfortable. We adapted to this population. This was accomplished by the exemplary back up resources of the transplant/VAD team that were available 24/7. Initially we relied heavily on the cardiac nurses from the heart failure intensive care unit to answer our questions as they arose with each patient.

Education, initial lack of feeling "competent"

The education of staff was a challenge in the respect that we needed to get all 44 staff members including rehabilitation nurses, nursing assistants, and nurse externs through training and inservicing. We worried that we did not know what we did not know. Would we miss something critical, an alarm, or an important lab? Would we respond quickly and knowledgeably? Training involved hands on demonstration and return demonstration by staff to the VAD coordinator as well as the one-hour inservice related to troubleshooting the device, and case-based patient troubleshooting scenarios. Competence

slowly was achieved through this constant back and forth of questions between the intensive unit clinical nurse specialist, VAD team, both units' nursing staffs, and the rehabilitation interdisciplinary team by managing the patient with this device.

For educational competency, rehabilitation nurses will:

- identify backup resources
- verbalize knowledge of indications and contraindications for VAD placement
- check connections of controller, battery and drive line, controller, back up and indications for exchange of controller
- ensure battery check every 4 hours, battery is fully charged, has back up battery fully charged. Verbalizes battery life in hours
- demonstrate how to extract history from the monitor and alarms and ability to troubleshoot
- perform aseptic site care of the driveline
- document on VAD flowsheet flow rate, pump rate, speed, pulse index; verbalizes parameters of these indicators
- demonstrate ongoing anticoagulation review of labs
- verbalize s/s of right heart failure during LVAD support
- verbalize knowledge of when to initiate CPR, defibrillation
- assist in the education of the patient with the VAD team

Complications of the VAD therapy

Two of the most common complications of ventricular assist device are thromboembolic event such as stroke or transient ischemic attack and infection. If a patient seemed neurologically more lethargic we evaluated with the team whether their pump was low flow volume, were they dehydrated or were there definitive neurological changes? One of our patients with an LVAD did suffer a stroke. The contact of the device with the blood makes it a harbor for developing clots. Rehabilitation nurses daily monitored anticoagulant labs and closely monitored for any signs or symptoms of infection as well. Sepsis, endocarditis, pneumonia, urinary tract infection can seriously affect the health of the LVAD patient.⁴

Rehabilitation Nursing Outcomes and Lessons Learned

One of the outcomes of having this type of patient on an acute rehabilitation unit was the staff developed sharper cardiovascular assessment skills. Staff was able to discern and describe heart sounds better and analyze lab values efficiently. We thought critically about pulmonary hypertension, right-sided heart function, and lungs sounds, all which benefited our other patients.

Another outcome is that we continue to have this population. With each additional patient with LVAD, nursing confidence has grown so that these patients with LVAD now seem to be a little sicker even than three years ago when we first started caring for this population. We learned to troubleshoot the pump parameters as patient situations occurred such as tachycardia,

dehydration, low battery alarm, etc. One other lesson we learned is that we realized we could manage these patients in our environment work due to extensive pre-planning, real-time planning, and excellent and extensive back up, making each staff comfortable in caring for the patient with LVAD.

Discharge planning is a tenet of rehabilitation nursing specialty practice and of the interdisciplinary team. The last lesson we learned was how crucial effective discharge planning was to the LVAD population and their family. The patient with LVAD and family needed to know often what the nurses had come to learn. Patients needed to be able to demonstrate care of the device and so did family, and troubleshooting scenarios such as power failure for home. They had to be competenced too. So discharge planning was intense and initiated by the VAD coordinator and the rehab nursing staff followed through with the planning and education goals of the patient and family. Discharge planning was begun several weeks before discharge, with a care-giver identified and trained weekly. Patients are educated about the device maintenance and preparation for emergencies.

Conclusion

The medically complex cardiac patient with a left ventricular device can do well on an acute rehabilitation unit. Rehabilitation nurses play an important role in adapting the patient to life with an LVAD as they start to mobilize and prepare these patients to adapt for discharge to home. Through extensive discharge planning and educational planning, the patient and family are prepared successfully for ventricular assist device issues at home as they await heart transplantation. This patient population has been a great experience for the rehabilitation nurses and the interdisciplinary rehabilitation team.

References

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