Psychosomatics 2016:57:229–237

Review Article

What the Psychiatrist Needs to Know About Ventricular Assist Devices: A Comprehensive Review

Mario A. Caro, M.D., Julie L. Rosenthal, M.D., Kay Kendall, M.S.W., Leopoldo Pozuelo, M.D., Margo C. Funk, M.D., M.A.

Background: *The number of patients with end-stage heart failure using mechanical circulatory support has dramatically increased over the past decade. Left ventricular assist devices, the most common type of mechanical circulatory support, can be used as a bridge to transplant, destination therapy, and as a bridge to recovery. As this patient population continues to grow, consultation-liaison psychiatrists will become increasingly involved in their care. A thorough biopsychosocial assessment is required to ensure adequate recognition and management of medical, psychiatric, social, and ethical challenges posed by this population.* **Methods:** *We performed a literature review to identify key issues relevant to the practice of consultation-liaison psychiatrists.* **Results:** *General functioning of left ventricular assist devices, device types, system components, life with a left ventricular assist device, preoperative evaluation, treatment of psychiatric comorbidities, and end-of-life decision-making are discussed.* **Conclusions:** *Consultation-liaison psychiatrists need to be familiar with the high prevalence of psychopathology in patients implanted with left ventricular assist devices. A detailed biopsychosocial formulation is required to adequately identify and, if possible, resolve a myriad of medical, psychiatric, social, and ethical challenges presented by this population. Future efforts should accurately identify and report specific psychiatric disorders and adverse events within this cohort.*

(Psychosomatics 2016; 57:229–237)

Key words: ventricular assist device, psychiatry, mechanical circulatory, support, psychopharmacology, psychosocial, heart failure.

INTRODUCTION TO LEFT VENTRICULAR ASSIST DEVICES

Implantable left ventricular assist devices (LVADs) are the most common type of mechanical circulatory support (MCS) devices used in patients with heart failure. LVADs are used to ensure adequate systemic blood flow in three clinical scenarios: as a bridge to transplantation in patients requiring MCS until a transplant organ becomes available, as a bridge to recovery in patients whose ventricular function is expected to improve, and as destination therapy (DT) in patients requiring life-long MCS owing to inability to be listed for cardiac transplantation.[1–3]

LVAD systems unload the left ventricle and generate blood flow to the systemic circulation by creating a circuit between the left ventricle, a blood pump, and the systemic circulation. The left ventricle and the blood pump connect via an influx cannula. In

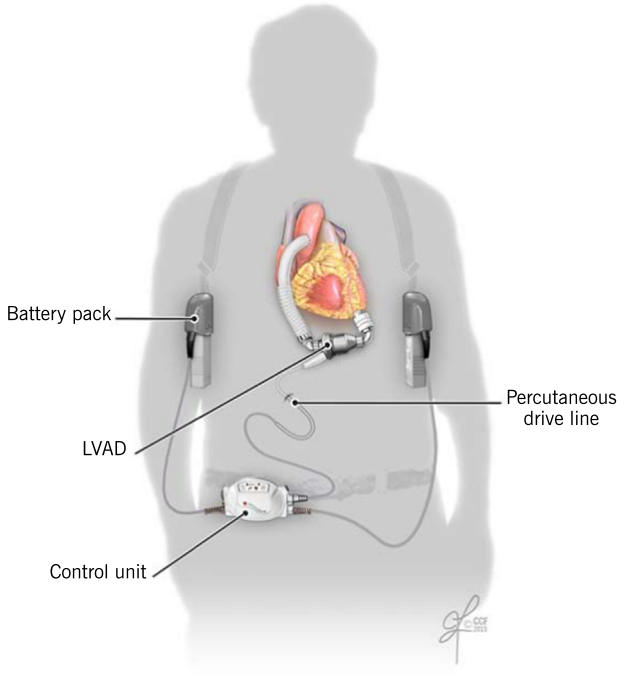
Received June 8, 2015; revised January 7, 2016; accepted January 7, 2016. From Department of Psychiatry and Psychology, Cleveland Clinic, Cleveland, OH (MAC, LP, MCF); Department of Cardiovascular Medicine, Cleveland Clinic, Cleveland, OH (JLR, KK). Send correspondence and reprint requests to Margo C. Funk, M.D., M.A., Department of Psychiatry and Psychology, Cleveland Clinic Foundation, 9500 Euclid Ave P57, Cleveland, OH; e-mail: margofunk@gmail.com

turn, the pump connects to the ascending aorta via an outflow cannula. A percutaneous lead connects the pump with an external system controller, and a power source connects to the system controller to provide energy for the pump (Figure).[4,5]

First-generation LVADs have a large, mechanically complex blood pump that contains inflow and outflow prosthetic valves and a chamber. The chamber fills with blood passively or via suction mechanisms and sequentially empties via pneumatically or electromagnetically driven mechanisms. Pneumatically-driven pumps send a predetermined air pressure through a series of tubes to produce a pulsatile blood flow, whereas electromagnetic-driven pumps use a pusher plate to generate a pulsatile blood flow.[2,5] For this reason, first-generation devices are also called pulsatile-flow LVADs.

Second- and third-generation devices are smaller, mechanically-simpler devices that contain a single rotor within the blood pump body. These pumps work by moving blood around a centrally-located spinning impeller (axial pumps) or by centrifugal displacement of blood by a bladed disk spinning in a cavity (centrifugal pumps).[2,6] The constant spinning of the moving component of these pumps results in a constant, nonpulsatile blood flow. Advantages of continuous-flow devices over older devices include a smaller size, easier surgical implantation, lower cost, and a higher lifespan of the device.[1,5,7]

FIGURE. The Thoratec HeartMate II is the Only LVAD Approved by the FDA for Both BTT and DT. This Schematic Illustrates Key Internal and External Components of the Device. (Reprinted with Permission, Cleveland Clinic Center for Medical Art & Photography 2015. All Rights Reserved.)



The number of LVAD recipients has consistently increased in the past decade, with the Interagency Registry for Mechanically Assisted Circulatory Support reporting a 15-fold increase in MCS implants between 2006 and 2013. In the latter year, 2432 patients were implanted with continuous-flow LVADs.[8] This trend is expected to continue, with some authors estimating the number of ventricular assist device candidates to be as high as 150,000–200,000 in the United States alone.[3] Furthermore, the proportion of patients implanted with LVADs for DT is increasing at a rapid rate, accounting for 14.7% of LVAD implantations between 2006 and 2007 and for 42.8% between 2012 and 2014.[8,9] Owing to the increase in the use of LVADs, mental health care professionals should be familiar with basic functioning of these systems, the changes in life following LVAD implantation, psychiatric comorbidity and treatment, and end-of-life decision-making.

LIFE WITH AN LVAD

LVAD recipients and their caregivers must adapt to many changes in their lifestyle, body image, and sexual life. Recipients and their caregivers are responsible for ensuring proper operation of the system after hospital discharge. They need to maintain the LVAD system by inspecting cables and connections for damage, periodically vacuuming the power supply unit, properly securing access to adequate electric and battery supply, responding to device alarms, and monitoring for complications. Moreover, they need to know when to contact their LVAD coordinator for additional guidance.[2,10,11]

After device implantation, recipients are required to follow a specific wound management protocol and to ensure proper hand hygiene to minimize the risk of infection. The percutaneous lead exit site should be immobile and kept clean and dry (no swimming or baths). Showers are allowed once the surgical site has healed, as long as the system components are properly shielded from water.[10,11] Additional recommendations involve abstaining from strenuous physical activities or