Management of a Depressed Patient with a Left Ventricular Assist System in an Inpatient Psychiatric Setting

ABSTRACT
A depressed patient with a left ventricular assist device (LVAD) due to heart failure presented a unique challenge for staff in an inpatient psychiatric facility. Although depression in this patient population has been recognized and treated on an outpatient basis, the example described in this article may be the first known case to be treated in an acute inpatient psychiatric hospital setting. A variety of steps had to be taken to ensure the highest standards of care, as well as an optimal outcome for this patient. In addition to the individualized plan of care for depression, a more medically oriented and technologically advanced plan of care was also instituted. The inpatient psychiatric setting provides the necessary care and treatment to help the patient move beyond severe depression to engage in activities essential for health and the proper care and function of the LVAD. This article highlights an unusual psychiatric-mental health nursing situation to help others who may face this challenge in the future.

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Medical technology has progressed to the point that patients with end-stage heart failure now have the option of having a left ventricular assist device (LVAD) implanted regardless of their viability as a cardiac transplant candidate. The HeartMate II® left ventricular assist system (LVAS) (Thoratec Corporation, Pleasanton, CA) has made it possible for this patient population to not only survive but also enjoy a good quality of life. Unfortunately, depression may complicate an already difficult medical condition. The psychiatric-mental health unit (East Wing II) nursing staff at Sharp Mesa Vista Hospital (SMVH) in San Diego, California, had the opportunity to take on a unique challenge when a severely depressed patient with the HeartMate II LVAS was admitted to their unit.

In this article, information on depression in the cardiac patient population with heart failure will be presented. In particular, discussion will focus on the management of a depressed patient with an LVAD who was admitted to a cognitive-behavioral therapy (CBT) inpatient unit. In addition, a technological overview of the HeartMate II LVAS will be offered, along with the steps taken from a nursing perspective to ensure effective care for this patient. Finally, nursing and clinical implications will be reviewed.

DEPRESSION IN CARDIAC PATIENTS

Cardiac patients, particularly those with heart failure, are at risk for depression. Depending on the setting, diagnostic method, and severity of depression, prevalence rates in this patient population are reported to range between 15% and 77.5% (Jurgens, Dumas, & Messina, 2007). In the United States, more than 5 million patients live with heart failure, and 550,000 new cases are diagnosed every year (Thomas et al., 2008). Depressed patients with heart failure are at increased risk for morbidity and mortality due to physiological changes such as: (a) neurohormonal activation leading to increased cortisol release, which causes elevated serum lipids, insulin resistance, abdominal obesity, and elevated blood pressure; (b) hypercoagulability due to increased platelet aggregation, which places patients at risk for stroke and myocardial infarction as a result of thrombus formation; (c) autonomic neurocardiac dysfunction resulting in decreased parasympathetic activity with an increased likelihood of cardiac arrhythmias, which portends increased mortality; and (d) cytokine release, which produces inflammation that may ultimately result in pulmonary edema and myocardial necrosis (Thomas et al., 2008). It is especially important for patients with heart failure to recognize the symptoms of depression and to seek treatment because delay will likely result in exacerbation of their medical condition and place them at increased risk for suicide.

LEFT VENTRICAL ASSIST SYSTEM TECHNOLOGY

The number of LVAD implantations for end-stage heart failure patients is growing as a result of increased waiting periods for cardiac transplantation due to the decreased availability of organ donors. In January 2006, 7 patients in the authors’ hospital system had LVADs, in January 2007, there were 10, in January 2008, 23, and in January 2009, 42. Patients waiting for heart transplantation can be placed on a LVAD as a bridge to transplantation. Furthermore, on the basis of the Randomized Evaluation of Mechanical Assistance for the Treatment of Congestive Heart Failure (REMATCH) study results, the U.S. Food and Drug Administration approved permanent LVAD support in 2002, and since then, the destination therapy LVAD patient population has been growing even faster (Long et al., 2005). Destination therapy patients either do not qualify for transplantation or do not want a cardiac transplant, and will remain on LVAD support for the rest of their lives.

During the past 25 years, LVAD applications and technology have evolved dramatically. Originally, pumps were used to salvage adult patients who failed to be weaned from cardiopulmonary bypass. These pumps were large and required intensive nursing support for both the machinery and the patient being supported. The pumps physicians are currently implanting are much smaller and more patient friendly. Patients are routinely discharged
home after implantation and resume activities of daily living, returning to work and travel. Increased patient satisfaction and improved quality of life resulting from increased mobility and independence continues to motivate growing numbers of patients to seek implantation of these devices.

The specific device with which our depressed patient was implanted is the HeartMate II LVAD, designed for long-term implantation. This device has a small internal axial flow pump connected in parallel with the native circulation and can provide up to 10 liters per minute of blood flow (Thoratec Corporation, 2008b). The inflow cannula is placed in the apex of the left ventricle, and an outflow graft is connected to the ascending aorta (Figure 1). Within the pump is a rotor that contains a magnet. The rotor assembly is rotated by the electromagnetic force generated by the motor (Thoratec Corporation, 2008b). Rotation of the rotor provides the driving force to propel the blood from the inflow cannula out to native circulation. Pump output depends on the clinician-set rotational speed of the rotor, as well as the pressure difference between the inlet and outlet of the pump (Thoratec Corporation, 2008b).

Control of and power to the LVAD is transmitted via a percutaneous cable from the external system controller and power rechargeable batteries, and battery clips (Figure 2). The HeartMate II LVAS system controller is a microprocessor unit that controls pump operation and management (Thoratec Corporation, 2008b). The system controller is wearable with a belt clip and can be powered by either the power base unit or rechargeable batteries. The controller provides the patient and clinician with indicator lights and audible alarms signaling pump function and power supply information. The system controller has a keypad, which allows the patient to perform a system check, silence alarms, and determine how much power is left in the batteries.

The power base unit has three purposes: providing power to the HeartMate II LVAS during tethered operation, such as when the patient sleeps at night; testing and charging the batteries; and providing power to the system monitor or display unit. The power base unit has an internal 30-minute battery that is automatically brought online if main power fails or if the rear panel power switch is turned off while the patient is tethered to the unit (Thoratec Corporation, 2008a).

A system monitor or display unit attached to the back of the power base unit communicates with the blood pump and the system controller through the power base unit, providing continuous information including the patient’s blood flow through the LVAD, motor speed, pulsatility index, power usage, and any alarms when the patient is attached to the power base unit for power supply (Thoratec Corporation, 2008a). The in-

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formation provided by the display unit should be treated and recorded the same as any other vital sign.

When the patient is not tethered to the power base unit, power is provided to the LVAD by rechargeable batteries that are inserted into battery clips. One pair of batteries will provide power to the LVAD for approximately 3 to 5 hours of support under “normal conditions” (i.e., flow of 6 liters per minute with a mean arterial pressure of 115 mmHg) (Thoratec Corporation, 2008a). Under stable physiological conditions, the use of automated blood pressure monitoring devices may not yield accurate blood pressure data. Manual auscultation is recommended to assess blood pressure, and in most cases, a Doppler device will be required to record the mean arterial pressure (Thoratec Corporation, 2008b). In all cases, the accuracy of the automated blood pressure monitoring device should be verified with a manual blood pressure reading at the start of each shift.

The manufacturer recommends that patients using the HeartMate II LVAS receive warfarin (Coumadin®), and we routinely maintain patients at the international normalized ratio in the range of 1.8 to 2.2 PT/INR (prothrombin time/international normalized ratio), but this may be individualized for the patient by the physician (Thoratec Corporation, 2008b). Patients are also given aspirin to prevent platelet aggregation and further reduce the risk of thrombus formation. Emergency and back-up equipment should be kept with patients at all times when they are away from their care unit. Extra power (usually at least two extra batteries), as well as a back-up system controller and an emergency identification card should be with the patient at all times. Loss of power will stop the pump and endanger the patient’s life.

COGNITIVE-BEHAVIORAL THERAPY UNIT

At SMVH, East Wing II is an open 28-bed psychiatric unit that specializes in cognitive-behavioral therapy (CBT). The principles outlined in Burns’ (1999) work are followed on the unit and have been incorporated into the treatment program. In particular, the unit program recognizes that thoughts create moods, negativity dominates
thoughts during a depressed state, and that gross distortions are nearly always present in the negative thoughts that create moods such as depression (Burns, 1999). The use of thought records as a mood control technique helps our patients gain understanding, achieve self-control, engage in personal growth and mood swing prevention, and achieve symptom relief.

Patients admitted to the unit are generally high functioning and not considered to be high safety risks. Self-care and minimal supervision are unit admission requirements. Personalized nursing care planning is of primary importance, and patients are offered daily individual and group therapy, recreational therapy, and instruction on journaling and thought record construction. Patients meet one-on-one daily with their contact nurse, psychiatrist, social worker, and medical doctor (if needed). Nursing staff thoroughly assess each patient at the beginning of each shift to determine the patient’s current psychological and physical status. A treatment team convenes twice weekly to review and discuss each patient on the unit using a multidisciplinary approach to treatment and care.

**Staff Education and Preparation Related to This Patient**

There is a strong culture of teamwork and customer service on East Wing II, and it is this culture that supported and essentially facilitated Mr. A.’s admission. The focus of psychiatric nursing is the promotion of mental health, and Mr. A.’s admission prompted a slight shift from this focus to one that included the management of medical conditions, as well as an advanced technological device.

Prior to Mr. A.’s admission, the Chief Nursing Officer coordinated information gathering with the referring hospital. A mechanical assist device coordinator provided the initial staff training on the HeartMate II LVAS, as well as related educational materials. Mechanical assist device coordinators were available 24 hours per day, 7 days per week to answer questions, handle any device-related problems, and generally assist in the care of this patient. Although the mechanical assist device coordinators provided supplies, such as additional batteries, and collaborated occasionally by telephone, the East Wing II staff accepted and embraced this challenge independently and successfully. To ensure staff competence regarding the operation and care of the HeartMate II LVAS, one-on-one education was provided for each staff member by the East Wing II unit lead. The East Wing II unit lead has an extensive intensive care unit background, including experience with a variety of mechanical assist devices, and had been a member of the cardiopulmonary support team. It was imperative for the East Wing II staff to be trained on the operation of the HeartMate II LVAS to handle emergency situations involving the device. The skills outlined in the HeartMate II LVAS competency were verbalized or demonstrated by each East Wing II staff member.

**INDIVIDUAL EXAMPLE**

Mr. A., a 62-year-old man implanted with the HeartMate II LVAS due to end-stage heart failure, was admitted to East Wing II at SMVH in May 2008 with a diagnosis of major depressive disorder. His medical history prior to implantation of the HeartMate II was complex and included diagnoses of atrial fibrillation, refractory heart failure.
failure, hyperlipidemia, hypothyroidism, myocardial infarctions, ischemic cardiomyopathy, and hypertension. He had undergone coronary artery bypass grafting, aortic and tricuspid valve replacements, as well as a femoral endarterectomy, left popliteal-tibial embolectomy, and biventricular defibrillator placement. The LVAD had been implanted in early November 2007 and was intended as a bridge to transplantation. Mr. A. had a prior diagnosis of bipolar disorder with mainly depressive episodes, which had initially manifested in adolescence. He had been in recovery related to alcoholism for approximately 35 years. Mr. A. began drinking rarely to occasionally in 2005 when his health started to seriously fail.

Initially, Mr. A. was admitted to the primary system medical facility because he had stopped taking his prescribed medications and had discontinued caring for his LVAD driveline. These behaviors represented a passive suicide attempt and resulted in a status change. He was removed from the cardiac transplant list and was subsequently considered a destination therapy LVAD patient. Mr. A. was colonized with vancomycin-resistant enterococcus (VRE). On admission to SMVH, his presenting symptoms were low energy, poor appetite, poor sleep, impaired memory, irritability, and anhedonia. He expressed intermittent suicidal ideation, as well as feelings of hopelessness and emptiness. Finally, he reported feeling overwhelmed with moderate, intermittent anxiety.

Mr. A. is a retired engineer who remarried his current wife within the past year after being divorced from her for several years. They have four children together. Although they were experiencing significant difficulties in their relationship prior to his admission to the medical facility, they resided together. Mr. A. describes Mrs. A. as a person with a drinking problem who is consumed by her work. She has visited Mr. A. only on rare occasions. Their children are minimally involved in their lives and provide little emotional support. Mr. A. has no hobbies and few interests. He has no religious affiliation and very few friends.

His Axis V Global Assessment of Functioning (GAF) and Beck Depression Inventory (BDI) scores confirmed the diagnosis of major depression, with a moderate to severely compromised level of function. The GAF (American Psychiatric Association, 2000) is a 100-point rating scale used by clinicians to determine the patient's overall level of functioning on the basis of psychological, social, and occupational functioning. The BDI (Beck, Steer, & Garbin, 1988), which takes approximately 5 minutes to administer, is a simple tool used to detect depression. The nursing plan of care treatment problems included psychological impairment: mood disorder; violence: suicidal ideation; and medical impairments: pain, cardiac function, and infection.

In addition to participation in the nursing plan of care, group and individual therapy, family joint meetings, instruction on and implementation of relaxation techniques, journaling, and thought record construction, Mr. A.'s treatment was also focused on finding the correct type, dosage, and timing of psychotropic medications. He had been on numerous antidepressant medications in the past with varying degrees of symptom control.

While hospitalized at SMVH, Mr. A. experienced an episode of congestive heart failure, which necessitated readmission to the medical facility to aggressively diurese him. On his return to SMVH, measures such as daily weights, intake and output, assessment for pedal edema, pulmonary status monitoring, and encouragement to strictly adhere to a low sodium diet were re instituted, and closer supervision was provided. At bedtime, Mr. A. attached himself to the power base unit, and data from the system monitor screen were recorded by the nursing staff every 4 hours.

Mr. A. was hospitalized at SMVH for a total of 3 weeks. Prior to discharge, he was responding very well to his medical medication regimen and his psychotropic medications, which included lamotrigine (Lamictal®), venlafaxine (Effexor XR®), and aripiprazole (Abilify®). His response to CBT was positive, and he had become proficient in the use of tools, such as thought records and journaling.

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SUMMARY AND IMPLICATIONS

As professional nurses, we are frequently required to increase our skills and knowledge base to provide the best evidence-based care and ensure optimal outcomes for our patients. During the past several years, we have witnessed the advancement of technology and its impact on patient care, as well as on the nursing profession. The individual example in this article highlights not only the value of encouraging nursing cultures that are based on teamwork and support, but also that, as nurses, we are capable of embracing change and stretching our clinical limits in the interest of superior patient care. To advance the profession and place the interests of our patients first, we must not only welcome but embrace challenges. We must also encourage the acquisition of knowledge that prompts positive change.

REFERENCES


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