

# Managing End-Stage Heart Failure in Singapore

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## INTRODUCTION

The incidence of heart failure is on the rise. Despite the success of advances in medical, interventional and surgical therapy in treating patients with coronary artery and other cardiac-related diseases, alleviating morbidity and reducing mortality, a significant proportion of patients go on to develop advanced (Stage D) heart failure with debilitating symptoms.

Patients often require repeated hospitalisations and frequent outpatient clinic visits, resulting in significant health-care burden. Annual mortality remains in excess of 50% in this group of patients, unless advanced heart failure therapeutics is implemented.

## HEART TRANSPLANT

Orthotopic heart transplantation remains the gold standard therapy for patients with advanced heart failure. For this, a patient's ailing heart is removed and replaced by a healthy donor heart. Post-operatively, the recipient requires daily immunosuppressants to prevent immune rejection of the transplanted heart.

However, in spite of the amendment to the Human Organ Transplant Act in 2004 mandating the compulsory donation of the heart, liver, kidneys and cornea in patients in whom brain death has been certified, suitable donor hearts for transplant have been few and far between. On average, only two to four heart transplants are performed each year in Singapore at the National Heart Centre Singapore (NHCS).

The increased incidence of cardiovascular risk factors like hypertension, hyperlipidaemia, diabetes and cigarette smoking amongst the general population has rendered many potential donor hearts unsuitable for transplantation due to the presence of coronary artery disease in these patients.

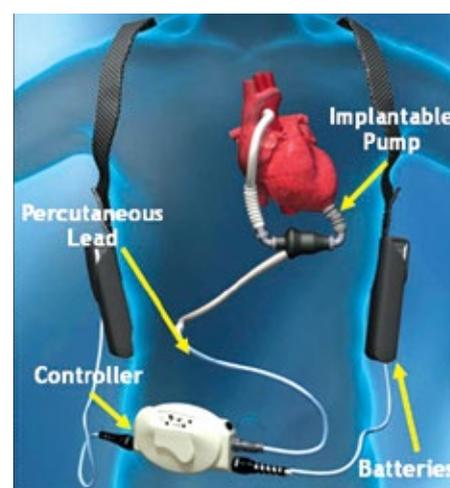
Despite these odds, patients who undergo successful heart transplantation go on to enjoy a good quality of life. The average survival of heart transplant recipients in Singapore is 57.4% at 10 years.

## VENTRICULAR ASSIST DEVICES

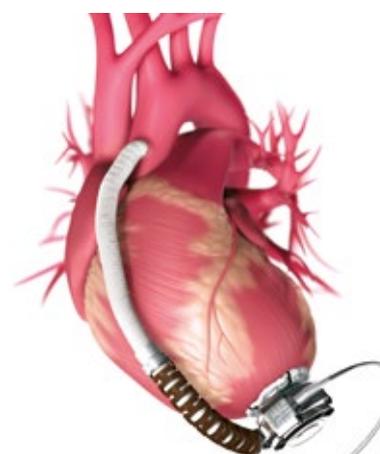
Fortunately in 2009, with the advancement in technology in mechanical circulatory support devices, continuous flow left ventricular assist devices (LVAD) became available to heart failure patients in Singapore.

Unlike its predecessor the pulsatile flow devices, the smaller profile of continuous circulatory flow devices allows them to be implanted even in small-sized Asian patients like ours. Compared to older pumps, these newer generation pumps are associated with improved quality of life, reduced complications and better survival. Since then, NHCS has implanted 62 second- and third-generation left ventricular assist devices in advanced heart failure (Figures 1 and 2).

Essentially, an inflow cannula is implanted into the left ventricular apex, and blood is drawn out of the heart through a rotating impeller and then pumped into the ascending aorta. The LVAD is connected to a controller external to the body via a driveline. Pump settings that determine the amount of cardiac output supported by the pump are



**Figure 1** Thoratec HeartMate II Left Ventricular Assist Device.  
(Reprinted with the permission of Thoratec Corporation.)



**Figure 2** HeartWare HVAD Ventricular Assist Device.  
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altered via the controller. Each controller and LVAD is powered by two external power sources (in the form of either batteries or AC power supply).

Patients who are candidates for these pumps are often in a state of cardiogenic shock or in New York Heart Association (NYHA) functional class III or IV requiring frequent hospital admissions with poor quality of life. The majority of patients return to NYHA class I and II functional capacity after LVAD implantation. Hospital readmission for heart failure is also greatly reduced. The survival rate of patients on LVAD support in Singapore is 87% at five years.

While most of the patients have the pumps implanted as a bridge to cardiac transplantation, some patients are implanted as a destination therapy (non-heart transplant candidates) or as a bridge to recovery. Common complications associated with LVAD implantation include pump thrombosis, driveline infections and gastrointestinal bleeding. Patients are required to take anticoagulation (Warfarin) and an antiplatelet agent (Aspirin or Clopidogrel) to reduce the risk of pump thrombosis.

### PALLIATIVE CARE AND ADVANCED CARE PLANNING

One of the greatest challenges of a physician is in knowing when further, more intrusive therapy is unlikely to lead to a good outcome for our patients. The wishes of the patient must also be respected and taken into consideration when deciding the extent of care in the patient with advanced heart failure.

In recent years, there is an increased acceptance of palliative care in Singapore. Quality of palliative care in heart failure patients has also improved in parallel with increased palliative and hospice care expertise in heart failure patients. The establishment of the Agency of Integrated Care (AIC) in providing care for these patients in their homes has helped to reduce the need for them returning to the hospitals.

Advance Care Planning (ACP) is also gaining ground in NHCS with specially trained coordinators and medical social workers approaching heart failure patients early to identify their wishes and goals of therapy, which in turn serves to guide their choice of therapy and the extent of end-of-life care.

### FUTURE OF ADVANCED HEART FAILURE CARE

Looking forward, there are promising developments in heart transplant centres in Australia and Europe investigating the long-term outcome of heart transplants from donors after circulatory death has been certified. If successful, this could potentially increase the pool of heart transplant donors in the future.

On the LVAD front, there is also much ongoing research in developing smaller and more reliable pumps with fewer complications. Research into the fully implantable pump is also likely to eventually bear fruit.

### CONCLUSION

Technological, medical and surgical advancements over the past ten years have certainly enhanced our capability in the management of advanced heart failure. We are set for another decade of rapid progress and development ahead, hopefully bringing about even greater improvement in the overall quality of life and survival for these patients.



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Dr Lim graduated with his Bachelor of Medicine and Surgery from the National University of Singapore in 2003 and obtained the Membership of the Royal College of Physicians (UK) and Masters of Medicine (Internal Medicine) in 2008.

He completed his clinical fellowship in Heart Failure at the St Vincent's Hospital, Sydney, Australia in 2013. During the fellowship, he acquired competency in managing patients with advanced heart failure, heart transplantation and mechanical circulatory devices. His other interest is in echocardiography. Dr Lim received his accreditation in adult transthoracic and transesophageal echocardiography by the European Association of Cardiovascular Imaging in 2013.



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