

ADVANCED HEART FAILURE & CARDIAC TRANSPLANT SERVICE

PhD Scholarship Proposal:

The clinical, physiological and psychosocial effects of optimised exercise rehabilitation in patients with ventricular assist devices (VADs).

Candidate Prerequisites

The scholarship, which is consistent with the current Australian Postgraduate Award, will be awarded to a high calibre PhD candidate to undertake the proposed study in patients with advanced heart failure. The successful candidate will be selected for the scholarship based on academic merit and interview and will work closely with existing medical, nursing and allied health staff in conducting the project. They will be able to demonstrate research experience (minimum level Honours or Masters degree) and be eligible for accreditation as an Exercise Physiologist or equivalent.

Research Proposal

Background

Advanced heart failure is characterised by a reduction in the heart's capacity to pump blood around the body. This can result in high blood pressure in the lungs and damage to organs such as the liver and kidneys. Blood flow to the muscles is also decreased, which leads to a deterioration in the structure and function of the muscle resulting in profound reductions in fitness. Ventricular assist devices (VADs) are implanted in people with advanced heart failure to improve the heart's output and address the complications of heart failure.

A key objective of a VAD is to improve the functional abilities of the patient and to facilitate their return to routine daily activities. Exercise rehabilitation plays an important role in this and is an essential component of the patient's overall management. However, very little is known about the mechanisms of *how* patients with VADs respond to exercise rehabilitation (compared with heart failure patients without VADs) and there are currently no evidence-based guidelines for exercise rehabilitation in VAD patients.

Study Synopsis

The aims of this study are to:

1. Perform a comprehensive evaluation of the physiological and psychosocial effects of exercise rehabilitation in the setting of VAD implantation.
2. Refine exercise training protocols to optimise rehabilitation following VAD implantation.
3. Track the longer term impact on physical capabilities of exercise rehabilitation in the setting of VADs implantation.

Participants:

People with advanced heart failure (New York Heart Association Class III and IV) will be recruited to the study. Participants will be allocated to one of two groups; i) patients who receive a VAD as part of their clinical management, ii) patients who are managed by standard medical therapy but do not receive a VAD will act as a control group (nonVAD).

Assessments:

All participants will undergo a series of assessments following their enrolment into the study, with the nonVAD group followed up 12 weeks later and the VAD group followed up 12 weeks post VAD implantation. Further follow-up of the VAD group will occur at 6 and 12 months post implantation to evaluate medium and long term effects of VAD implantation in patients who still have a VAD *in situ*. Tests to measure the following outcomes will be conducted:

Aerobic (heart and lung) fitness - This test measures the maximal amount of oxygen (known as VO_2 max) the body can use during an exercise test and is the gold standard for measuring heart and lung fitness. It is a commonly used clinical test to identify people with advanced heart failure who need to receive a VAD or be listed for a cardiac transplant. Changes in VO_2 max over time reflect an improvement in fitness and are associated with a better prognosis.

Muscle mass and strength - Advanced heart failure is also associated with muscle wasting and deterioration in muscular strength. Muscle mass will be determined by a low level x-ray which measures muscle as well as bone. Muscle strength will be measured by a special machine called a dynamometer which allows muscle strength to be measured at various joint angles and through varying ranges of movement.

Heart function – Echocardiography (ultrasound) will be used to measure the size and pumping ability of the heart's chambers. Novel indicators of intrinsic heart muscle function will be recorded to provide additional information about the impact of the VAD on the heart.

Activity levels – Participants will be asked to wear a device, called an accelerometer, for one week to measure how much physical activity they undertake in going about their day to day activities.

Psychological well being - Quality of life and physical self efficacy (the confidence for performing activity) will be measured using validated questionnaires.

Exercise Rehabilitation Program:

Both groups will receive a personalised rehabilitation program tailored to their individual level of fitness and clinical status. The exercise program will involve a combination of aerobic (walking and cycling) and resistance exercise (weights) and will be performed 3 times a week, under supervision at the Royal Perth Hospital Cardiac Gymnasium. The exercise program will be reviewed at least every fortnight during the course of the study to adapt the exercise prescription as fitness changes.

One of the objectives of the study will be to develop and optimised exercise prescription for patients with VADs (Study Aim 2), as VAD patient specific guidelines are not currently available. This will be achieved by progressively increasing the intensity and duration of exercise throughout the 12 week follow up period to a maximum rating of “Hard” as reported by the patient, according to a standardised perceived exertion scale. The patient will be closely monitored during this process.

Significance of the Study

This study will build on RPH’s international reputation as a centre-of-excellence for the management of advanced heart failure, VAD therapy and cardiac transplantation.

The study will provide benefits to both staff and patients. Assessments performed specifically for the study will complement routine clinical assessment by enhancing an understanding of the physiological and psychosocial impact of VADs. This will help guide the future medical management of these devices. All participants involved in the study will benefit directly through the provision of an optimised exercise program. The close supervision and regular reviews that occur during the study will lead to an improved understanding of the levels of exercise that can be achieved by patients with VADs and contribute to the development of formal exercise recommendations.