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Left Ventricular Device Implantation Impacts on Hospitalisation Rates, Length of Stay and Out of Hospital Time

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Background

Widespread application of left ventricular assist devices (LVADs) in advanced heart failure, is limited by costs, and access to technical expertise. Hospitalisation drives both cost and inversely, quality of life – but cross institutional and pre-surgical inpatient length of stay data is missing in the Australian literature. We describe changes in hospitalisation rates, in the year before and after bridge to transplant LVAD therapy and preceding heart transplant (HTX).

Methods

Hospitalisation, Australian refined diagnosis group (ArDRG), and clinical data were assessed for 77/100 consecutive patients listed for heart transplant between July of 2009 and June of 2012. Twenty-five of the patients required ventricular assist device (VAD) therapy whilst waitlisted. Hospitalisation was defined as the proportion of “days at risk” that were spent in hospital and included all public and private admissions identified in the year before and after VAD implant, or before HTX, in a linked administrative dataset of admissions across New South Wales.

Results

Patients requiring VADs were clinically more unstable and spent proportionally more time in hospital than pre-HTX patients, (13% (IQR 10-20%) vs 4% (IQR1-10%), $p < 0.01$). During the index admission, they spent 22 days (IQR 10-33) in hospital before implantation, including 13 days in non-transplant centres (IQR 7-20). Following implantation, median inpatient stay was 31(IQR 26-70) – including rehabilitation in 8 of the 25 patients.

The number of admissions per patient reduced in the year after VAD-implant to two (IQR1-3), from five pre-implant (IQR 3-7) $p = 0.002$. This was similar to the pre-HTX group's three admissions (IQR1-6), $p = 0.33$. Overall hospitalisation decreased in VAD patients beyond the first year – from 14% (IQR 10-20%) *at one-year* to 0.5% (IQR 0-10%) *at two-years* ($p = 0.002$). A high percentage of hospitalisation prior to VAD (41%) and HTX (66%) occurred outside the transplant centre.

Conclusions

A high proportion of activity in the pre-implant and transplant year occurs outside the implanting hospital with higher pre-implant hospitalisation in VAD patients reflecting clinical severity. Ventricular assist device

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implantation is significantly associated with reduced admissions, and hospitalisation once reconditioning has occurred.

Keywords

Heart failure • Cost effectiveness • Hospitalisation • Left ventricular assist device (LVAD)

Introduction

Heart failure accounts for 1–2% of health budget expenditure in the developed world [1] and affects up to 500,000 Australians [2,3]. Frequent hospitalisation, increasing health care costs and decreasing quality of life, mark the disease's progression [4].

Although heart transplantation remains the gold standard treatment, eligibility and donor availability limit access, and up to one half of transplant listed patients require implantation of a ventricular assist device (VAD) as a bridge to transplantation (BTT). The clinical, ethical, cost and access issues associated with their use have spurred considerable debate [5,6,7–11].

In many countries, including Australia, VADs are publicly funded for a limited number of transplant eligible patients [12], whereas in parts of Europe and the United States indications for VAD therapy have been extended to include destination therapy (DT) where transplant is not possible [13]. It is also increasingly recognised that the distinction between bridge and destination is an artificial one, with significant cross-over between the groups [14]. Recent inclusion of VADs on the federally managed Prosthesis list in Australia [15] increased the funding sources available to include private health insurances and is also likely to broaden eligibility.

Assessing outcomes beyond survival is becoming increasingly important in an era where indications for VAD therapy are expanding, and patients are faced with difficult choices related to the prolongation of life, symptom control, and the risks of facing additional extra-cardiac complications [13].

The frequency and duration of hospitalisation has been identified as a simple and useful metric that has significant implications for both disease burden and cost [4], while the ratio of days out of hospital to total days (%OOH) has been suggested as an indirect measure of health related quality of life for VAD patients and heart failure cohorts [16,17]. However, much of the recent analysis has focussed on single institutional data only [17–20], and on the postoperative periods following VAD and transplant [21,22]. Marasco *et al.* (2016) and Chimanji *et al.* (2016) both examine institutional costs accrued in the first year following VAD implant and heart transplant and demonstrate much higher procurement and index admission costs for the VAD cohort. But for meaningful comparisons to be made with preoperative periods, and potentially comparative medically managed cohorts, linked administrative datasets including admissions to hospitals other than the implanting centre need to be identified and assessed.

We sought to describe and compare data, in the year before heart transplant and VAD implant with the period after VAD

implant, linking institutional demographic and clinical data with New South Wales statewide administrative datasets. This is the first study to incorporate linked administrative datasets in the context of the heart failure management of patients listed for heart transplantation in Australia.

Methods

Patients and Setting

The cohort consisted of 77/100 consecutive patients first waitlisted for heart transplant over three years between July of 2009 and June of 2012 at an Australian quaternary transplant centre (Figure 1). Twenty-five of the patients received a Ventricular Assist Device (all HeartWare HVAD[®], HeartWare[®] Inc., Framingham, and MA) and were part of the

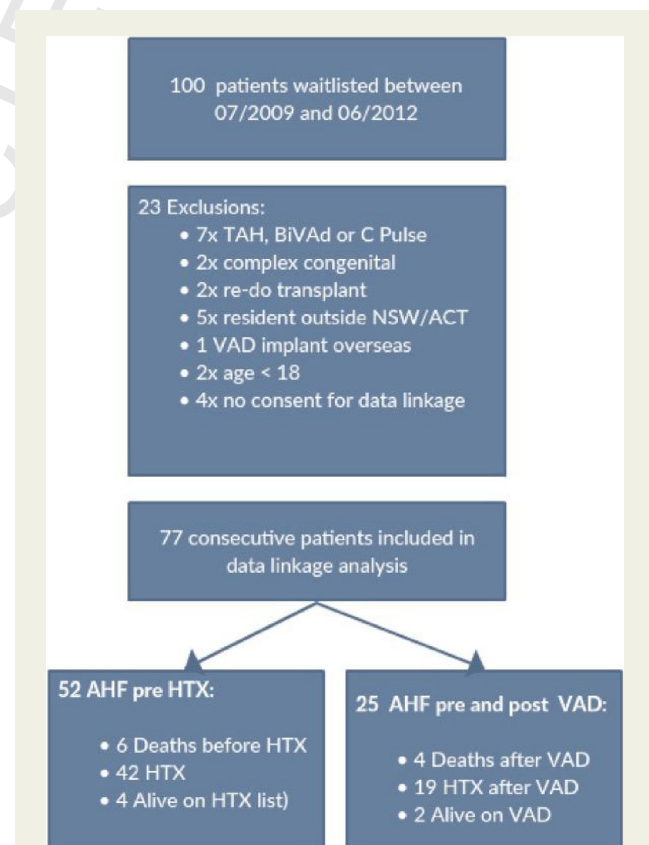


Figure 1 Inclusion and exclusion criteria.

Abbreviations: TAH = Total artificial heart, BiVAD = Biventricular implants, C Pulse = Extra aortic counter pulsation device, HTX = Heart Transplant, AHF = Advanced heart failure, VAD = Left ventricular assist device.

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