Survival and Likelihood of Timely Hospital Discharge With Ventricular Assist Device Versus Predicted Risk With Medical Management Using the Seattle Heart Failure Model

Heart Failure Background

- Heart failure incidence is increasing
- In 2006: 53,000 deaths; 550,000 new cases; 5,000,000 Americans affected
- Incidence of 1:100 by age 65
- More Medicare expenditure ($28B) on HF than any other diagnosis
- Staging: ACC/AHA criteria, NYHA criteria
LVADs Background
LVADs Background

- Left ventricular assist devices: surgically implanted devices to support forward flow in patients with the most severe forms of medically refractory heart failure
- In the works for several decades
- Destination therapy vs. Bridge to transplant vs. Bridge to revascularization
- UW: the most critically ill heart failure patients in a five state catchment area
- ACC/AHA criteria for placement of an LVAD
Predicting Heart Failure Survival

- Several models over the years (ie: Heart Failure Survival Score) have used a variety of invasive and non-invasive data
- Our predictor: Seattle Heart Failure Model
- Relatively easy to gather data: labs, ejection fraction, vitals signs, medications
- Well validated
- Allow prediction or survival and adjustment of meds to show impact on survival
Seattle Heart Failure Model

Survival
- Baseline
  - 1 year: 25%
  - 2 year: 6%
  - 5 year: 0%

Mortality
- 1 year: 75%
- 2 year: 94%
- 5 year: 99%

Mean life expectancy
- 0.7 years
- 1.4 years

Baseline Characteristics
- Age: 68
- Gender: Male
- NYHA Class: 4
- Weight (kg): 80
- EF: 17
- Syst BP: 103
- Ischemic

Medications
- ACE-I
- Beta-blocker
- ARB
- Statin
- Allopurinol
- Aldosterone blocker

Diuretics
- Lasix
- Bumex
- Demadex
- Metolazone
- HCTZ

Lab Data
- Hgb: 11.7
- Lymphocytes: 15
- Uric Acid: 11
- Total Chol: 160
- Sodium: 135
- QRS >120 msec

Interventions
- ACE-I
- ARB
- Beta-blocker
- Statin
- Aldosterone Blocker

Devices
- None
- BiV Pacer
- BiV ICD
- ICD
- LVAD

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Seattle Heart Failure Model
Prognostic Predictors

- Clinical Adverse Risk
  - Age Older
  - Gender Male
  - Etiology Ischemic
  - SBP Low “HTN-stronger pump”
  - LVEF Low
  - NYHA Class High

- Laboratory
  - Sodium Low RAAS, NE
  - Cholesterol Low Cytokines
  - % lymphocytes Low Cytokines, LPS
  - Hemoglobin Low or High Cytokines/Lungs
  - Uric acid High Cytokines/FMD/Diabetes

WC Levy et. al. Circulation 2006;113:1424
Study Design

- Patients at a single academic medical center receiving an LVAD between 1997 and 2007 were prospectively recorded.
- Labs and clinical data were extracted from medical records and used to calculate a risk score and predicted survival using the SHFM.
- Predicted survival vs. actual survival.
- A subgroup analysis assessed SHFM risk score and likelihood of discharge within 60 days of LVAD implantation.
Baseline characteristics

- Inclusion criteria: 30 days of refractory heart failure before LVAD placement
- 88 patients identified
- All NYHA Stage IV
- Average age: 53 years; 88% male
- Average ejection fraction was 17±8%
- 82% were dependent on a balloon pump
- 88% required inotropic or phosphodiesterase inhibitor support.
Results: Survival

- Predicted: One month 54±34%; Six month: 19±24%
- 7% of patients >50% one year survival with medical management
- Actual LVAD survival: 83% at six months
- 6 month ROC area: .70
- Hazard ratio for LVAD therapy was 0.11 at six months (p<.01) and 0.31 at one year (p<.01)
Results: Survival

![Survival Curve]

- **6 Month**: HR 0.11, p<0.0001
- **1 Year**: HR 0.30, p=0.005
Results: Hospital discharge

- Multiple types of LVADs: earlier models not capable of outpatient management
- A sub-group analysis was done for LVADs capable of outpatient management
- 62 patients:
  - One year survival of > 4% (n=22) had 82% rate of hospital discharge
  - One year survival of <4% (n=40) had 55% rate of timely d/c (p=.03)
Conclusions

- Patients are meeting ACC/AHA guidelines in terms of criticality of illness
- Use of predictive model (SHFM) in determining optimal timing of LVAD placement
- Improved survival and higher likelihood of timely discharge in (relatively) healthier patients
- Increasing role for LVAD as DT
- Optimal timing of LVAD placement?
- Too sick or not sick enough?