Identifying the Patient for Advanced Heart Failure Therapy

Duke Heart Failure Symposium
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Disclosures

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What is Advanced Heart Failure?

European Society of Cardiology Committee on Heart Failure

- NYHA class III-IV symptoms
- Clinical signs of fluid retention and/or peripheral hypoperfusion
- Objective evidence of severe LV dysfunction
  - LVEF ≤ 0.30
  - Pseudonormal or restrictive mitral inflow pattern by Doppler
  - High left and/or right-sided filling pressures
  - Elevated b-type natriuretic peptide
- Severe reduction in exercise capacity
  - 6 minute walk distance < 300 meters
  - Peak VO2 < 12-14 ml/kg/min
- > 1 hospitalization in the past 6 months
- Presence of above despite optimal medical management

Eur J Heart Failure 2007; 9:684-94

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The Stage D Heart Failure Patient

- 5% of the heart failure population
- Intolerable symptoms
- Frequent hospitalizations
- Limited therapeutic options

Heart Failure Risk Stratification
General Concepts and Caveats

- Patients with more symptom burden have a worse prognosis
  - NYHA class is insufficient to accurately predict risk
  - Frequent and prolonged HF hospitalization predict a poor prognosis
  - Exercise testing is critical
- Be mindful of the way medications are being used
  - Need for high dose diuretics to maintain volume status is associated with poor prognosis
  - Having to reduce doses or stop drugs is a red flag
  - Need for inotropes=need to consider advanced heart failure therapies
- Where the kidneys go, so goes the patient
- It is not all about the LV. RV dysfunction plays a critical role in determining the best treatment option
- Electrical instability is a harbinger of impending death
- Physiologic age and frailty are more important than chronological age
Prognostic Importance of Symptoms

Cumulative Survival (%)

Months

Class II and III

Class IV

Circulation 1987;75(suppl IV):IV11-IV19
NYHA Functional Class is Insensitive to Mortality
Sub-stratification using Seattle HF Score

Levy W: Can the Seattle Heart Failure Model Be Used to Risk Stratify Heart Failure Patients for Potential LVAD Therapy? J Heart Lung Transplant 2009
The Impact of Heart Failure Hospitalization on Mortality Risk

A retrospective analysis of the CHARM Trial

Circulation 2007; 116: 1482-7
The Prognostic Significance of Persistent Congestion and Its Treatment

Am Heart J. 2000;140:840–847

Heart Failure Risk Stratification: Cardiac Structure and Function

Mortality vs EF in CHARM

- Hazard ratio
- All-cause mortality

Subgroup Analysis from SAVE

- Percent Mortality (%)
- Diastole (n=499)
  - Quartile I: 16.7%
  - Quartile II: 16.7%
  - Quartile III: 45.5%
  - Quartile IV: 45.5%

- Systole (n=499)
  - Quartile I: 13.3%
  - Quartile II: 16.7%
  - Quartile III: 18.9%
  - Quartile IV: 51.1%

Left Ventricular Size at Baseline in Quartiles

Eur Heart J 2006;27:65-75

Circulation 1994;89:68-75

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Heart Failure Risk Stratification
Circulatory-Renal Limitations to Therapy

J Am Coll Cardiol 2003;41:2029-35

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Prognosis on Chronic Dobutamine or Milrinone Infusions

The Prognostic Value of Functional Limitations

\[ VO_2^{\text{max}} = (A_o - V_o) \times CO \]

- \( VO_2^{\text{max}} > 14 \text{ ml/Kg/min} \)
- \( VO_2 \leq 14 \text{ ml/Kg/min (listed)} \)
- \( VO_2 \leq 14 \text{ ml/Kg/min (not listed)} \)

* \( p < 0.005 \) for \( VO_2 \leq 14 \) vs > 14

Duration of Follow-up (Mo)

Circulation 1991;83:778-786  Duke Heart Center
Common Biomarkers Useful in Risk Stratification

- Natriuretic peptides
- serum sodium
- BUN
- creatinine
- Hemoglobin
- RDW
- albumin
Heart Failure Risk Stratification: Biomarkers

Circulation 2003;107:1278-83

Am J Med 2003;114:112-119
Diagnostic Value of Glomerular Filtration Rate in Patients With Heart Failure

N=196
GFR_{c} = glomerular filtration rate estimated from serum creatinine, LVEF = left ventricular ejection fraction

Impact of Central Venous Pressure on Renal Function

Effect of CVP on GFR in dogs with constant systemic BP

Raised Venous Pressure: A direct cause of renal sodium retention

Firth et al Lancet 5/7/88
Issues of Nutrition

Markers of Poor Nutrition
- BMI < 20 kg/m²
- Pre-albumin < 15 mg/dl
- Transferrin > 250 mg/dl
- Total Cholesterol < 130 mg/dl
- Lymphocyte Count < 100

Strategies
- PO supplements
- Enteral nutrition
- TPN (last resort)

Obesity not a contraindication
- Devices can provide adequate support
- Has not impacted outcomes
- May be contraindication for transplant
- Patients not losing weight on VAD support

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The Importance of Frailty Patient Selection for Advanced Heart Failure Therapy

Circ Heart Fail 2012;5:286-93
Heart Failure Risk Stratification: Multivariable Models

Seattle Heart Failure Model

Baseline Characteristics

Clinical
- Age: 63
- Gender: Male
- NYHA Class: 3B
- Weight (kg): 92
- EF: 20
- Syst BP: 104
- Ischemic

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

Diuretics
- Furosemide: 180
- Bumetanide: 0
- Torsemide: 0
- Metolazone: 0
- HCTZ: 0

Lab Data
- Hgb: 11.5
- Lymphocyte%: 15
- Uric Acid: 9.8
- Total Chol: 166
- Sodium: 132
- QRS >120 msec

Devices
- None
- BIV Pacer
- ICD
- BIV ICD

Levy, Seattle Heart Failure Model

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Is Physician Gestalt Important?

- ESCAPE Registry included 439 patients not randomized in trial but received a PAC
- No difference in hemodynamics except higher SVO2 and CI in Trial patients

<table>
<thead>
<tr>
<th></th>
<th>Trial (n=433)</th>
<th>Registry (n=439)</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>LOS, days</td>
<td>6 (3-8)</td>
<td>13 (7-26)</td>
<td>&lt;0.001</td>
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<tr>
<td>6-Month Mortality (%)</td>
<td>19.7</td>
<td>33.5</td>
<td>&lt;0.001</td>
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LOS given as median (interquartile range). ESCAPE, Evaluation Study of Congestive Heart Failure and Pulmonary Artery Catheterization Effectiveness; LOS, length of stay for index hospitalization; PAC, pulmonary artery catheter.

J Cardiac Failure 2008;14:661-9

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Summary and Conclusions

- Recent outcomes of patients treated with LVADs demonstrate the evolution of a viable therapy to prolong life and improve quality.
- Selecting patients for mechanically assisted circulation should be based upon integrating multiple clinical data elements that predict poor survival with heart failure and a reasonable likelihood of improvement with VAD.
  - *Aged and frail* patients may not do as well with VAD as the younger population.
  - The impact of *right heart failure* on post-implant outcomes is difficult to assess but its presence limits the effectiveness of LVAD therapy and increases post-implant mortality.
  - Most programs find *ESRD* a contraindication to LVAD therapy.
  - *Ventricular tachycardia* is not cured by LVAD but may be better tolerated and allows adjustment of ICD parameters to limit shocks.
Advanced Heart Failure Decision Making

Advanced HF Symptoms
Severe LV Dysfunction
Standard Therapies Utilized

Pt wishes to proceed Viable candidate

Yes
Management of Co-morbidities
Tailored Medical Therapy/PAC

 Suitable improvement

Yes
Continue

No

Palliative Care Hospice

Yes
Continuous infusion inotropes

No
LVAD

Transplant

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