Review of the State of Heart Failure

Failure is not an option
November 8, 2015

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Disclosure:

Mariell Jessup MD

- **Speakers Bureau:**
- **Advisory Board:** NONE
- **Honorarium:**
*HF incidence ~ 10/1000 population>65 years of age.
*75% of HF cases have antecedent hypertension.
*At 40, the lifetime risk of developing HF is 1 in 5.

Go et al. Heart Disease and Stroke Statistics—2014 Update
A Report From the American Heart Association
Survival after HF diagnosis has improved over time, as shown by data from the Framingham Heart Study and the Olmsted County Study.

However, the death rate remains high: ≈50% of people diagnosed with HF will die within 5 years.

Go et al. Heart Disease and Stroke Statistics—2014 Update
A Report From the American Heart Association
Heart Failure is increasing in prevalence, costly and deadly.

Heidenreich et al. *Circulation HF* 2013; 6:606

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**Table 2. Projections of Total Cost of Care ($ Billions) for HF for Different Age Groups of the US Population**

<table>
<thead>
<tr>
<th>Year</th>
<th>All</th>
<th>18–44 y</th>
<th>45–64 y</th>
<th>65–79 y</th>
<th>≥80 y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>20.9</td>
<td>0.33</td>
<td>3.67</td>
<td>8.46</td>
<td>8.42</td>
</tr>
<tr>
<td>Indirect: Morbidity</td>
<td>5.42</td>
<td>0.52</td>
<td>1.92</td>
<td>2.05</td>
<td>0.93</td>
</tr>
<tr>
<td>Indirect: Mortality</td>
<td>4.35</td>
<td>0.66</td>
<td>2.53</td>
<td>0.98</td>
<td>0.18</td>
</tr>
<tr>
<td>Total</td>
<td><strong>30.7</strong></td>
<td>1.51</td>
<td><strong>8.12</strong></td>
<td>11.5</td>
<td>9.53</td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>31.1</td>
<td>0.43</td>
<td>4.58</td>
<td>14.2</td>
<td>11.8</td>
</tr>
<tr>
<td>Indirect: Morbidity</td>
<td>7.09</td>
<td>0.66</td>
<td>2.20</td>
<td>3.11</td>
<td>1.12</td>
</tr>
<tr>
<td>Indirect: Mortality</td>
<td>5.39</td>
<td>0.79</td>
<td>2.89</td>
<td>1.49</td>
<td>0.22</td>
</tr>
<tr>
<td>Total</td>
<td><strong>43.6</strong></td>
<td>1.88</td>
<td><strong>9.67</strong></td>
<td>18.8</td>
<td>13.2</td>
</tr>
<tr>
<td>2030</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>53.1</td>
<td>0.59</td>
<td>5.86</td>
<td>23.3</td>
<td>23.4</td>
</tr>
<tr>
<td>Indirect: Morbidity</td>
<td>9.80</td>
<td>0.91</td>
<td>2.54</td>
<td>4.48</td>
<td>1.87</td>
</tr>
<tr>
<td>Indirect: Mortality</td>
<td>6.84</td>
<td>0.98</td>
<td>3.32</td>
<td>2.16</td>
<td>0.37</td>
</tr>
<tr>
<td>Total</td>
<td><strong>69.7</strong></td>
<td>2.48</td>
<td><strong>11.7</strong></td>
<td>29.9</td>
<td>25.6</td>
</tr>
</tbody>
</table>
MEDICAL PROGRESS

MECHANISMS OF CONTRACTION OF THE NORMAL AND FAILING HEART*

Eugene Braunwald, M.D.,† John Ross, Jr., M.D.,‡ and Edmund H. Sonnenblick, M.D.§
Exploring the determinants of muscle mechanics...

and the resultant hemodynamic findings

Braunwald, Ross, Sonnenblick. NEJM 1967; 277: 910

Braunwald, Ross, Sonnenblick. NEJM 1967; 277: 1012
Renin-Angiotensin-Aldosterone system
Understanding the compensatory response of the sympathetic nervous system in HF....

and how to gently block the adverse effects.

Norepinephrine levels increase during exercise in patients with HF.
Adrenergic signaling pathways

Adding ACEI

SOLVD (1991)

15.6

CIBIS II
MERIT-HF (1999)

12.4

11.9

adding beta-blocker

adding ACEI

diuretic
digoxin

ACE-I

diuretic
digoxin

ACE-I

diuretic
digoxin

ACE-I

beta-blocker

Pharmacologic Treatment for Stage C HFrEF

**HFrEF Stage C NYHA Class I – IV**

*Treatment*

*Class I, LOE A*
- ACEI or ARB AND Beta Blocker

For persistently symptomatic African Americans, NYHA class III-IV

*Add*

*Class I, LOE A*
- Loop Diuretics

For NYHA class II-IV patients. Provided estimated creatinine >30 mL/min and K+ <5.0 mEq/dL

*Add*

*Class I, LOE A*
- Hydral-Nitrates

For all volume overload, NYHA class II-IV patients

*Add*

*Class I, LOE A*
- Aldosterone Antagonist

**ACC/AHA 2013 HF Guidelines**
Hospital to hospital variation in HF quality measurements

Fonarow et al. *Archives of Internal Medicine* 2005; 165: 1469
Remodeling
diastolic HF becomes HFpEF
Systolic HF becomes HFrEF
And now, HF mid-range

The unmet need of patients with heart failure and preserved ejection fraction, HFpEF.

Co-morbidities in HFpEF

Senni et al. European Heart Journal 2014; 35:2797

Underlying Causes for Mortality

ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

- Hypertensive AHF
- Acutely Decompensated Chronic HF
- Pulmonary Oedema
- ACS and HF
- Cardiogenic shock
- Right HF

Acute heart failure in all its manifestations and etiologies
risk predictors
and
risk stratification

Fonarow et al. JAMA 2005; 293:572
Biomarkers for diagnosis, triage, and guiding management

Ahmad et al. Nature Reviews Cardiology 2012; 9:347
1. Team Care
2. Patient-centered care

Pursuing Funding from the Patient-Centered Outcomes Research Institute (PCORI)
Supporting the transition from hospital to home for older people across Scotland.

Readmissions and transitions are a focus throughout the world!
Models of HF Care

CURRENT
- HOME
- TRADITIONAL HF CLINIC
  - ORAL MEDICATION TITRATION
  - NURSE/PHARMACIST DIRECTED EDUCATION

RE-DESIGNED
- INTEGRATED HEART FAILURE TREATMENT CENTER
  - HOME CARE LOOP
    - REMOTE MONITORING
    - SELF-TREATMENT
  - MULTIDISCIPLINARY HF CLINIC
    - ORAL MEDICATION TITRATION
    - NURSE/PHARMACIST DIRECTED EDUCATION
    - SOCIAL WORK SUPPORT
    - ADVANCED CARE PLANNING
  - ACUTE THERAPY
    - EVALUATION, ACTIVE INTERVENTION, REASSESSMENT

CHRONIC MANAGEMENT

ACUTE MANAGEMENT
- ED
- HOSPITAL

Desai and Stevenson. Circulation 2012; 126:501
Model illustrating that symptom monitoring and treatment adherence are a function of self-care maintenance.

Self-Care of Heart Failure Model

- Self-Care Maintenance
- Self-Care Management

- Symptom monitoring and treatment adherence
- Symptom recognition
- Symptom evaluation
- Treatment implementation
- Treatment evaluation

Self-Care Confidence

The NEAT-HFpEF accelerometer device.
A new drug class, capitalizing on an alternative pathway, combining the salutary effects of angiotensin inhibition and vasoactive peptide promotion.
Normal conditions

endothelial

eNOS → eNOS uncoupling → eNOS

ADMA

NO → ONOO⁻ → NADPH oxidase → Xanthine oxidase

O₂⁻

sGC stimulation → sGC

Relaxation, anti-proliferation, anti-inflammation, anti-remodeling

sGC activation

Apo-sGC

Proteasomal degradation

cGMP↑

vascular smooth muscle cell
Cardiac myocyte substrate utilization in heart failure

Margulies et al. Circulation Heart Failure 2014; 7:673
Alterations in substrate metabolism and mitochondria during the development of heart failure.

Doenst et al. Circulation Research 2013; 113:709
Abnormal genes in myocardial disorders

Hershberger et al. Nature Reviews Cardiology 2013
BEAT and NEAT and FIGHT and....SOCRATES
“Success consists of going from failure to failure without loss of enthusiasm.”

Winston Churchill