Inpatient Congestive Heart Failure Evaluation and Management

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Faculty Disclosure

Relevant financial relationship(s) with industry
  None

Off Label Usage
  None
CHF

HFrEF (EF ≤40%)

HFpEF (EF ≥50%)

6076 hospital discharges for heart failure, 1987 – 2001

Survival

Male Female

Preserved EF

Reduced EF

P=0.03

Key features

History

- SOB
- Orthopnoea
- PND
- Chest pain
- Palpitations
- Toxins

Examination

- JVP
- Crackles
- Ascities
- Peripheral edema
- Murmurs
- Rate / Rhythm
118 patients undergoing right heart cath

- Physical exam from staff cardiologist predicted right heart pressures with 82% accuracy.

- Right and left heart pressures by cath correlated in 80% of cases.

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0                      5                      10                      15                      20                      25                      30

0                      5                      10                      15                      20                      25                      30

Right heart filling pressures (mm Hg)
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Left = 9.2 + 0.75*right
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0.62, P<0.0001
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Left heart filling pressures (mm Hg)
```

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Right heart filling pressures (mm Hg)
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<table>
<thead>
<tr>
<th>Normal Right Heart Pressures</th>
<th>Normal Left Heart Pressures</th>
<th>Abnormal Left Heart Pressures</th>
</tr>
</thead>
<tbody>
<tr>
<td>70* (33%)</td>
<td>38 (17%)</td>
<td>101* (47%)</td>
</tr>
<tr>
<td>Abnormal Right Heart Pressures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 (3%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Non-pharmacologic

• Daily weighs and monitor fluid balance
• Daily electrolytes and renal function
• Sodium restriction
  • \( \leq 1.5 \) grams/day
• Fluid restriction
  • \( \leq 1.5 \) to 2 liters/day
• DVT prophylaxis
• Discuss goals of care and resuscitation status

Pharmacological therapy

<table>
<thead>
<tr>
<th>Drugs that ↓ mortality</th>
<th>Drugs that ↓ symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitors / ARBs</td>
<td>Diuretics</td>
</tr>
<tr>
<td>β-blockers</td>
<td>Digoxin</td>
</tr>
<tr>
<td>Aldosterone antagonists</td>
<td>Inotropes (dobutamine, milrinone)</td>
</tr>
<tr>
<td>Hydralazine &amp; nitrates (in African Americans)</td>
<td>Vasodilators (nitroglycerin, nitroprusside)</td>
</tr>
</tbody>
</table>
Management of Acute Heart Failure

<table>
<thead>
<tr>
<th>Perfusion at rest?</th>
<th>Congestion at rest?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Warm &amp; dry</td>
</tr>
<tr>
<td>Low</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Warm &amp; wet</td>
</tr>
<tr>
<td></td>
<td>Cool &amp; dry</td>
</tr>
<tr>
<td></td>
<td>Cool &amp; wet</td>
</tr>
</tbody>
</table>

Diuretics

• Start IV loop-diuretic at ≥ usual oral dose
• Either boluses or continuous infusion
• Aim weight loss 1-2 kg/day
• If inadequate diuresis:
  • Increase IV loop diuretic dose
  • Add second diuretic (e.g., thiazide)
  • Consider adding spironolactone as K⁺ sparing diuretic
• Potential roles for low-dose dobutamine and ultrafiltration

**Carefully assess fluid status**
Creatinine improves with initial diuresis
Creatinine only gets worse with overdiuresis
Chronic heart failure
Pharmacological therapy

Stage A
At risk

ACE-I’s / ARB’s → Class 1
Start with ACE-I
ARB if ACE-I contraindicated
OK if CCB
Avoid ACE-I + ARB combo
Control weight
ACE-I / ARB in select patients

Stage B
Asymptomatic

If volume overloaded
Add diuretics

ACE-I / ARB and β-blocker
Contraindicated in NYHA III – IV symptoms
Add hydralazine / nitrates
Dimazem, verapamil

Stage C
Symptomatic

African American patients
NYHA III – IV symptoms
Add hydralazine / nitrates

Stage D
Refractory

Heart transplant
Mechanical circulatory support
Palliative care

NYHA II – IV
K+ <5 mEq/L
eGFR >30
Add aldosterone antagonist

**Beta-blockers**

<table>
<thead>
<tr>
<th></th>
<th>Initial dose</th>
<th>Goal dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carvedilol</td>
<td>3.125 mg BID</td>
<td>50 mg BID</td>
</tr>
<tr>
<td>Metoprolol succinate</td>
<td>12.5 - 25 mg daily</td>
<td>200 mg daily</td>
</tr>
<tr>
<td>Bisoprolol</td>
<td>1.25 mg daily</td>
<td>10 mg daily</td>
</tr>
</tbody>
</table>

- Carvedilol
  - More vasoactive
  - Preferred when blood pressure not a limitation to titration

- Metoprolol succinate
  - Use in patients with tendency toward hypotension
  - Less likely to provoke bronchospasm

Beta-blockers

- Continue at usual home dose
- Only discontinue in hemodynamically unstable who will require inotropes.
- Initiate after euvolemia restored
- Caution initiating in patients who have required inotropes this admission


- Do not give β-blockers in acute pulm edema
- Initiate β-blockers slowly and gently uptitrating
- Sinus tachycardia is compensatory to maintain stroke volume – do not aggressively β-block for HR control
ACE Inhibitors and ARBs

- Ideally continue home doses at admission
- Consider temporary dose reduction or discontinuation if worsening of renal function until improves.
- Aim to uptitrate during admission as tolerated

- Recheck potassium and creatinine 2 weeks after dose uptitration

Digoxin

• Persistent symptoms despite medical therapy
• Decreases HF hospitalisations
• Goal level $\rightarrow 0.5 – 0.9$ mg/dL
• Additional rate control in AF

Valsartan / Sacubitril (Entresto)

- 8442 patients
- NYHA class II - IV
- LVEF ≤40%
- Enalapril versus ARB + neprilysin inhibitor
- ↓ composite endpoint of CV death or HF hospitalization by 20%

Valsartan / Sacubitril (Entresto)

- HFrEF patients with NYHA class II-III symptoms who tolerate ACEI / ARB
- Do **not** use in those with history of angioedema
- Neprilysin inhibitors cause angioedema when used with ACEI
- Wait 36 hours from last dose of ACEI prior to commencing

Ivabradine

- Selective sinus node blocker

- ↓ HF admissions in HFrEF with NYHA class II-III symptoms

- Sinus rhythm with resting HR > 70 BPM on max tolerated beta-blocker dose

HFpEF

I-PRESERVE\textsuperscript{16}
CHARM-Alternative\textsuperscript{s16}
CHARM-Preserved\textsuperscript{15}
PEP-CHF\textsuperscript{17}
SOLVD\textsuperscript{s17}
DIG-Preserved\textsuperscript{28}
OPTIMIZE-ACE\textsuperscript{9}
OPTIMIZE-ACE\textsuperscript{9}
OPTIMIZE-BB\textsuperscript{20}
OPTIMIZE-BB\textsuperscript{20}

Lots of negative trials!
Paucity of good data in HFpEF!

HFpEF Management

• Treat Hypertension
  • ACE-I / ARB and / or β-blockers
  • Consider aldosterone antagonist
• Use diuretics to achieve euvolemia
• Exclude coronary artery disease
• Control atrial fibrillation
• Manage lifestyle
  • Diet & exercise
Restrictive Cardiomyopathies

- Slow diuresis
- Cautious β-blockers
- Avoid digoxin
- Treat underlying cause
- Consider transplantation
## Chemotherapy-induced Cardiomyopathy

<table>
<thead>
<tr>
<th>Agent</th>
<th>Mechanism</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthracyclines (doxorubicin)</td>
<td>Dose dependent (≥300 mg/m²) Irreversible</td>
<td>Optimize medical therapy Control other risk factors</td>
</tr>
<tr>
<td>Trastuzumab</td>
<td>Not dose dependent Reversible</td>
<td>Ischemia, arrhythmias</td>
</tr>
<tr>
<td>5-fluorouracil</td>
<td>Vasospasm</td>
<td></td>
</tr>
</tbody>
</table>
Tachycardia-induced Cardiomyopathy

Tachycardia-induced Cardiomyopathy

- Look for other causes
- Re-assess LV function
- Optimize meds
- Treat arrhythmia
- PVC’s (≥20,000/day)

Sinus tach does NOT cause cardiomyopathy

Check a TSH!
Essentials at hospital discharge

• Diuretics
  • Ideally ensure stable weight on oral Rx for 24 hrs prior
  • Consider using Torsemide or Bumetanide in RHF
    • Lasix 40mg po = Torsemide 20mg = Bumetanide 1mg
• Daily weighs
  • Needs diuretic dose adjustment if weight ↑ or ↓ by > 2 kg
• Low salt diet (Na⁺ ≤ 1.5 g/day)
• Fluid restrict (≤ 1.5 L per day)
• PCP follow up and HF titration plan
Conclusions

• Daily clinical assessment of volume status essential

• Diuresis improves renal function in volume overload

• Consider Torsemide or Bumetanide in RHF at discharge

• Use admission time to uptitrate HF therapy

• HF medication titration and diuretic plan essential to prevent re-admissions
Questions & Discussion

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