Focus on Quality

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GET WITH THE GUIDELINES
MANAGEMENT OF THE HEART FAILURE PATIENT

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Outline

• Heart failure basics
• Discuss evidence-based medical management of heart failure
• Discuss, in particular, evidence-based beta-blocker therapy for left ventricular systolic dysfunction
• Review ACCF/AHA guidelines on care transition
HEART FAILURE BASICS
What is heart failure (HF)?

- HF is a complex clinical syndrome (collection of symptoms) that results from any structural or functional impairment of ventricular filling or ejection of blood
  - When the heart is not able to maintain adequate cardiac output to perfuse organ systems adequately and meet the metabolic needs of the body
  - Symptoms caused by systemic and/or pulmonary congestion due to low output
    - Symptoms include: dyspnea, fatigue, poor exercise tolerance, orthopnea, PND, abdominal fullness, cough, frothy sputum, nocturia
    - Physical exam findings: peripheral edema, ascites, lung rales/crackles, elevated JVP, S3 gallop, tachypnea, hepatomegaly, abdominal distention, etc.
  - Lab work and imaging: elevated BNP, NT pro-BNP, congestion on CXR
What is cardiomyopathy?

- **Cardiomyopathy** = “disease of heart muscle”
  - “A heterogeneous group of diseases of the myocardium associated with mechanical and/or electrical dysfunction that usually (but not invariably) exhibit inappropriate ventricular hypertrophy or dilatation and are due to a variety of causes that frequently are genetic. Cardiomyopathies either are confined to the heart or are a part of generalized systemic disorders, often leading to cardiovascular death or progressive heart failure-related disability.”

- **Ischemic cardiomyopathy**
  - Most common cause of heart failure
  - Heart muscle damage from prior infarct (scar) or ischemia

- **Non-ischemic cardiomyopathy**
  - Hypertensive, due to valve disease, lung disease (right sided), arrhythmia (tachycardia-induced), toxic (ETOH, cocaine), viral, HIV, sarcoid, due to congenital anomaly, idiopathic dilated, myocarditis, chemotherapy-induced, restrictive, hypertrophic, stress-induced (i.e. Takotsubo), pregnancy/post-partum
Types of heart failure

- Systolic heart failure
  - Signs of clinical heart failure + left ventricular ejection fraction (LVEF) less than 40%
- Diastolic heart failure
  - Signs of clinical heart failure + LVEF is greater than 40%
- Right heart failure
  - Isolated right-sided dysfunction, left heart systolic function normal

…Different types of heart failure are treated differently!
<table>
<thead>
<tr>
<th>Definition</th>
<th>HFrEF</th>
<th>HFpEF</th>
<th>Borderline HFpEF</th>
<th>Improved HFpEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV systolic dysfunction</td>
<td>LV systolic function preserved, a filling problem</td>
<td>Characteristics, treatment patterns, &amp; outcomes appear similar to those of patients with HFpEF</td>
<td>Patients who previously had EF &lt;40%</td>
<td></td>
</tr>
<tr>
<td>LVEF</td>
<td>≤40%</td>
<td>≥50%</td>
<td>41-49%</td>
<td>&gt;40%</td>
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<tr>
<td>Therapies</td>
<td>BB + ACEi/ARB + aldosterone antagonist if EF is less than 35%</td>
<td>BP, HR control, treat symptoms with diuresis</td>
<td>BP, HR control, treat symptoms with diuresis</td>
<td>Typically remain on BB and ACEi/ARB</td>
</tr>
</tbody>
</table>
MEDICAL MANAGEMENT OF HEART FAILURE
2013 ACCF/AHA Guideline for the Management of Heart Failure

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American College of Chest Physicians, Heart Rhythm Society and International Society for Heart and Lung Transplantation

Endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation

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## Classification of Recommendation and Level of Evidence

### Table: Classification of Recommendation and Level of Evidence

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Benefit &gt;&gt; Risk</td>
<td>Procedure/Treatment SHOULDN'T be performed/administered</td>
</tr>
<tr>
<td>Class IIa</td>
<td>Benefit &gt;&gt; Risk</td>
<td>Additional studies with focused objectives needed; it is reasonable to perform procedure/administer treatment</td>
</tr>
<tr>
<td>Class IIb</td>
<td>Benefit ≥ Risk</td>
<td>Additional studies with broad objectives needed; additional registry data would be helpful; procedure/treatment may be considered</td>
</tr>
<tr>
<td>Class III</td>
<td>No Benefit or Class III Harm</td>
<td>Procedure/Treatment should</td>
</tr>
</tbody>
</table>

### Detailed Explanations:

**Class I:** Recommendations are based on a high level of evidence.
- **Level A:** Multiple populations evaluated.
- **Level B:** Limited populations evaluated.
- **Level C:** Very limited populations evaluated.

**Class IIa:** Recommendations are based on moderate level of evidence.
- **Level A:** Recommendation that procedure or treatment is useful/effective.
- **Level B:** Recommendation that procedure or treatment is useful/effective.
- **Level C:** Recommendation that procedure or treatment is likely useful.

**Class IIb:** Recommendations are based on low level of evidence.
- **Level A:** Recommendation in favor of treatment or procedure being useful/effective.
- **Level B:** Recommendation in favor of treatment or procedure being useful/effective.
- **Level C:** Recommendation in favor of treatment or procedure being useful.

**Class III:** Recommendations are based on very low level of evidence.
- **Level A:** Recommendation of usefulness/effectiveness.
- **Level B:** Recommendation of usefulness/effectiveness.
- **Level C:** Recommendation of usefulness.

### Comparative Effectiveness Phrases:

- Treatment/strategy A should be recommended/indicated in preference to treatment B.
- Treatment/strategy A is probably recommended/indicated in preference to treatment B.

### Notes:

- A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Although randomized trials are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.
- *Data available from clinical trials or registries about the usefulness/efficacy in different subpopulations, such as sex, age, history of diabetes, history of prior myocardial infarction, history of heart failure, and prior aspirin use.
- For comparative effectiveness recommendations (Class I and IIa; Level of Evidence A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.
MANAGEMENT OF SYSTOLIC HEART FAILURE
Systolic heart failure

- Also referred to as “HF with reduced ejection fraction” (HFrEF)
- Clinical diagnosis of heart failure + LVEF less than or equal to 40%
- Commonly due to coronary artery disease, often with history of prior MI
- Other common causes
  - Toxic cardiomyopathy 2/2 ETOH use, cocaine, chemo
  - Viral/myocarditis -> dilated cardiomyopathy
  - Stress cardiomyopathy (physical or emotional stressor)
  - Tachycardia-induced cardiomyopathy

- Only in HFrEF patients have medical therapies been proven to be efficacious
Treatment of systolic heart failure

- Evidence-based beta-blocker
  - Class I: Use of 1 of the 3 beta blockers proven to reduce mortality (e.g., bisoprolol, carvedilol, and sustained-release metoprolol succinate) is recommended for all patients with current or prior symptoms of HFrEF, unless contraindicated, to reduce morbidity and mortality (Level of Evidence: A)

- ACE inhibitor or angiotensin receptor blocker
  - Class I: ACE inhibitors are recommended in patients with HFrEF and current or prior symptoms, unless contraindicated, to reduce morbidity and mortality (Level of Evidence: A)
  - Class I: ARBs are recommended in patients with HFrEF with current or prior symptoms who are ACE inhibitor intolerant, unless contraindicated, to reduce morbidity and mortality (Level of Evidence: A)
Treatment of systolic heart failure

- **Aldosterone antagonist for LVEF ≤35%**
  - Class I: Aldosterone receptor antagonists (or mineralocorticoid receptor antagonists) are recommended in patients with NYHA class II–IV HF and who have LVEF of 35% or less, unless contraindicated, to reduce morbidity and mortality. Patients with NYHA class II HF should have a history of prior cardiovascular hospitalization or elevated plasma natriuretic peptide levels to be considered for aldosterone receptor antagonists.
  - Creatinine should be 2.5 mg/dL or less in men or 2.0 mg/dL or less in women (or estimated GFR >30), and potassium should be less than 5.0 mEq/L. Careful monitoring of potassium, renal function, and diuretic dosing should be performed at initiation and closely followed thereafter to minimize risk of hyperkalemia and renal insufficiency (Level of Evidence: A)
  - Class I: Aldosterone receptor antagonists are recommended to reduce morbidity and mortality following an acute MI in patients who have LVEF of 40% or less who develop symptoms of HF or who have a history of diabetes mellitus, unless contraindicated (Level of Evidence: B)
HFrEF Stage C
NYHA Class I – IV
Treatment:

Class I, LOE A
ACEI or ARB AND
Beta Blocker

For all volume overload, NYHA class II-IV patients
Add
Class I, LOE C
Loop Diuretics

For persistently symptomatic African Americans, NYHA class III-IV
Add
Class I, LOE A
Hydral-Nitrates

For NYHA class II-IV patients. Provided estimated creatinine >30 mL/min and K+ <5.0 mEq/dL.
Add
Class I, LOE A
Aldosterone Antagonist
Why these medications?

- Signaling for Hypertrophic growth and Remodeling
  - (-)
  - AT1 receptor antagonists
  - ACE inhibitors
  - Beta blockers

- Hypertension
- Viral Infection
- Myocardial Ischemia

- Left ventricular dysfunction

- Inotropes

- Perceived reduction in circulating volume and pressure

- (-) Coronary perfusion
  - (-) Coronary mass
  - (-) Arterial pressure

- Vasoconstriction
  - Salt and water retention
  - (-)

- ACE inhibitors
  - AT1 antagonists
  - Diuretics

- (+) Sympathetic tone
  - (+) renin-angiotensin-aldosterone
  - (+) Arginine vasopressin

- (-) Left ventricular function

- AT1 receptor antagonists
  - ACE inhibitors
  - Beta blockers
BETA-BLOCKERS IN SYSTOLIC HEART FAILURE
# Evidence-based beta-blockers

<table>
<thead>
<tr>
<th></th>
<th>Initial daily dose</th>
<th>Max dose</th>
<th>Mean dose achieved in clinical trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bisoprolol</td>
<td>1.25 mg daily</td>
<td>10 mg daily</td>
<td>8.6 mg/day</td>
</tr>
<tr>
<td>Carvedilol (Coreg)</td>
<td>3.125 mg BID</td>
<td>50 mg BID</td>
<td>37 mg/day</td>
</tr>
<tr>
<td>Carvedilol CR</td>
<td>10 mg daily</td>
<td>80 mg daily</td>
<td>n/a</td>
</tr>
<tr>
<td>Metoprolol succinate (Toprol XL)</td>
<td>12.5 mg-25 mg daily</td>
<td>200 mg daily</td>
<td>159 mg/day</td>
</tr>
</tbody>
</table>

What’s missing…..?

Metoprolol *tartrate* (Lopressor)!
Which is the BID version of metoprolol
Why Toprol XL but not Lopressor?

• MERIT-HF trial (1999)
  • Purpose was “to determine if metoprolol succinate decreases mortality in patients with symptomatic HF with reduced ejection fraction”
  • Study demonstrated a 34% reduction in all cause mortality with treatment with metoprolol succinate (versus placebo) and led to its approval by the FDA – metoprolol tartrate was NOT approval
  • Mortality benefit consistent with that seen with carvedilol in CAPRICORN and bisoprolol in CIBIS-II
Why Toprol XL but not Lopressor?

• COMET trial (2003)
  • Purpose was “to compare the effects of carvedilol and metoprolol tartrate on morbidity and mortality in patients with mild to severe chronic heat failure and reduced LV ejection fraction”
  • The only major direct comparison study of beta-blockers and demonstrated a 17% reduced in relative risk of death with treatment with carvedilol over metoprolol tartrate (short acting metoprolol) in patients with NYHA class II-IV and LVEF ≤35%
  • Comment: metoprolol succinate (long acting, i.e. Toprol XL) was not commercially available when this trial started
Additional comments about beta-blockers...

- Metoprolol tartrate is dosed BID but duration is variable and dose related
  - 50% reduction in maximum heart rate after single doses of 20, 50, and 100 mg occurred at 3.3, 5, and 6.4 hours, respectively

But...

- No head-to-head comparison has been done between carvedilol and metoprolol succinate but...
- MADIT-CRT (2009)
  - Study on benefit from cardiac resynchronization therapy
  - Recent retrospective analysis demonstrated a 30% reduction in hospitalized for heart failure or death in patients treated with carvedilol over metoprolol
MANAGEMENT OF DIASTOLIC HEART FAILURE
Diastolic heart failure

• Also referred to as “HF with preserved ejection fraction” (HFpEF)
• Clinical diagnosis of heart failure + LVEF greater than or equal to 50%
• Commonly due to hypertension
• Patients often are older and female
• **High** prevalence of obesity, diabetes, atrial fibrillation
Treatment of diastolic heart failure

- We don’t know!
- Blood pressure control
  - Class I: Systolic and diastolic blood pressure should be controlled in patients with HFpEF in accordance with published clinical practice guidelines to prevent morbidity (Level of Evidence: B)
- Treat the symptoms with diuresis
  - Class I: Diuretics should be used for relief of symptoms due to volume overload in patients with HFpEF. (Level of Evidence: C)
CARE TRANSITION FOR THE HEART FAILURE PATIENT
Care transition for the HF patient

• “For patients with HF, the transition from inpatient to outpatient care can be an especially vulnerable period because of the progressive nature of the disease state, complex medical regimens, the large number of comorbid conditions, and the multiple clinicians who may be involved” (ACCF/AHA, 2013)

• “Early post-discharge follow-up may help minimize gaps in understanding of changes to the care plan or knowledge of test results and has been associated with a lower risk of subsequent re-hospitalization” (ACCF/AHA, 2013)
Cost of heart failure admissions

- HF is the primary diagnosis in >1 million hospitalizations annually
- Patients hospitalized for HF are at high risk for all-cause re-hospitalization, with a 1-month readmission rate of 25%
- In 2013, physician office visits for HF cost $1.8 billion
- The total cost of HF care in the United States exceeds $30 billion annually, with over half of these costs spent on hospitalizations
- The mean cost of HF-related hospitalizations was $23,077 per patient and was higher when HF was a secondary rather than the primary diagnosis
ACCF/AHA Recommendation

• Class I Recommendations

  1. The use of performance improvement systems and/or evidence-based systems of care is recommended in the hospital and early post-discharge outpatient setting to identify appropriate HF patients for GDMT, provide clinicians with useful reminders to advance GDMT, and assess the clinical response (Level of Evidence: B)

  2. Throughout the hospitalization as appropriate, before hospital discharge, at the first post-discharge visit, and in subsequent follow-up visits, the following should be addressed (Level of Evidence: B)

     • initiation of GDMT if not previously established and not contraindicated
     • precipitant causes of HF, barriers to optimal care transitions, and limitations in post-discharge support
     • assessment of volume status and supine/upright hypotension with adjustment of HF therapy as appropriate
     • titration and optimization of chronic oral HF therapy
     • assessment of renal function and electrolytes where appropriate
     • assessment and management of comorbid conditions
     • reinforcement of HF education, self-care, emergency plans, and need for adherence
     • consideration for palliative care or hospice care in selected patients
ACCF/AHA Recommendation

• Class IIa
  • 1. Scheduling an early follow-up visit (within 7 to 14 days) and early telephone follow-up (within 3 days) of hospital discharge are reasonable (Level of Evidence: B)
  • 2. Use of clinical risk-prediction tools and/or biomarkers to identify patients at higher risk for post-discharge clinical events are reasonable (Level of Evidence: B)
Goals of follow-up appointment

• Medication reconciliation
• Initiation of guideline derived medical therapy if indicated
• Follow-up lab work if needed
• Physical exam/volume assessment
• Review hospital stay with patient and provider
• Re-educate, re-educate, re-educate
• Prevent re-admission!
Our hospital’s example

• Our Heart Failure Team makes an appointment with primary care provider within 7 days of hospital discharge
  • Important to acknowledge day and time preferences of the patient/family
• If no PCP, we make appointment with a family medicine resident to establish care
• When cardiology is consulted, attempt is made to follow-up with cardiology within 7 days of hospital discharge
• Appointment date and time is communicated to patient personally and added to discharge instructions
• At this time, we do not have an outpatient heart failure clinic which is a major limitation for us
THANK YOU!

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