Heart Failure Management: Continuum of Care

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Important Info

• I, Robin Harris, do not have any financial disclosures.

• I, Robin Harris, will not discuss any off-label or investigational devices in my presentation.
Objectives

• Discuss guidelines for care of the patient with heart failure.

• Discuss strategies to prevent acute CHF illness exacerbation.

• Identify treatments for management of advanced heart failure.
Heart Failure - Definition

• “A condition in which the heart fails to discharge its contents adequately” (Thomas Lewis, 1933)

• A pathophysiological state in which an abnormality of cardiac function is responsible for the failure of the heart to pump blood at a rate commensurate with the requirements of the metabolising tissues” (E Braunwald, 1980)

• “A clinical syndrome caused by an abnormality of the heart and recognised by a characteristic pattern of haemodynamic, renal, neural and hormonal responses” (Philip Poole-Wilson, 1985)

• A syndrome in which cardiac dysfunction is associated with reduced exercise tolerance, a high incidence of ventricular arrhythmias and shortened life expectancy” (Jay Cohn, 1988)
• **A brief history of heart failure care**

  • **1628** - William Harvey describes the circulation
  • **1785** - William Withering publishes an account of medical use of digitalis
  • **1819** - René Laennec invents the stethoscope
  • **1895** - Wilhelm Röntgen discovers x rays
  • **1920** - Organomercurial diuretics are first used
  • **1954** - Inge Edler and Hellmuth Hertz use ultrasound to image cardiac structures
  • **1958** - Thiazide diuretics are introduced
  • **1967** - Christiaan Barnard performs first human heart transplant
  • **1987** - CONSENSUS-I study shows unequivocal survival benefit of angiotensin converting enzyme inhibitors in severe heart failure
  • **1995** - European Society of Cardiology publishes guidelines for diagnosing heart failure
  • **1997** – COMET – Carvedilol first beta blocker with FDA approval for mild—moderate heart failure
  • **2015** – PARADIGM HF – Entresto approved;
  • **2015** – Corlanor approved
Famous People with Heart Failure

- Elizabeth Taylor
- Ginger Rogers
- Helen Hayes
- Barbara Stanwyck
- Donald O’Connor
- Danny Thomas
- Randy Travis
- Karen Carpenter
- Dick Cheney
- James Monroe
- Harry Truman
Where we are today...

• 5 million people diagnosed with heart failure
• Most common diagnosis for hospital admission for patients > 65
• Only cardiovascular diagnosis on the increase
• 555,000 new cases diagnosed each year
• Incidence – 10 out of every 1000 people over age 65
Figure 6. Changing management of heart failure over the past 40 years.
ACC/AHA Staging of CHF

**At Risk for Heart Failure**

**STAGE A**
At high risk for HF but without structural heart disease or symptoms of HF.

- e.g., Patients with:
  - hypertension
  - atherosclerotic disease
  - diabetes
  - obesity
  - metabolic syndrome

**STAGE B**
Structural heart disease but without signs or symptoms of HF.

- e.g., Patients with:
  - previous MI
  - LV remodeling including LVH and low EF
  - asymptomatic valvular disease

**STAGE C**
Structural heart disease with prior or current symptoms of HF.

- e.g., Patients with:
  - known structural heart disease
  - shortness of breath and fatigue, reduced exercise tolerance

**Heart Failure**

**STAGE D**
Refractory HF requiring specialized interventions.

- e.g., Patients who have marked symptoms at rest despite maximal medical therapy (e.g., those who are recurrently hospitalized or cannot be safely discharged from the hospital without specialized interventions)

**Therapy Goals**

**STAGE A**
- Treat hypertension
- Encourage smoking cessation
- Treat lipid disorders
- Encourage regular exercise
- Discourage alcohol intake, illicit drug use
- Control metabolic syndrome

**STAGE B**
- All measures under Stage A

**STAGE C**
- All measures under Stages A and B
- Dietary salt restriction

**Therapy Goals**

**Therapy Goals**

**Drugs**

- ACEI or ARB in appropriate patients (see text)
- Beta-blockers in appropriate patients (see text)

**Devices in Selected Patients**

- Implantable defibrillators

**Drugs for Routine Use**

- Diuretics for fluid retention
- ACEI
- Beta-blockers

**Drugs in Selected Patients**

- Aldosterone antagonist
- ARBs
- Digitalis
- Hydralazine/nitrates

**Devices in Selected Patients**

- Biventricular pacing
- Implantable defibrillators

**Options**

- Compassionate end-of-life care/hospice
- Extraordinary measures
- Heart transplant
- Chronic inotropes
- Permanent mechanical support
- Experimental surgery or drugs
Prognostic Significance of Heart Failure Stages
ACC Stages of Heart Failure

At risk for development of heart failure

Stage A – High risk for developing heart failure
Stage B – Asymptomatic LV dysfunction

Heart Failure

Stage C – History of heart failure/current sx.
Stage D – End stage heart failure
Stage A Heart Failure Management

- Treat known risk factors
- Evaluation for S/S heart failure
- Rhythm control
- Echocardiogram to assess LV control
- Treat Lipid disorders
- Control diabetes
- Lifestyle modifications
- Medications: ACE Inhibitors, ARBs
Mortality Findings in Large Placebo-Controlled ACEI Trials

<table>
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<tr>
<th>TRIAL</th>
<th>AMI</th>
<th>AMI with LVD</th>
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<td>ISIS IV</td>
<td>GISSI 3</td>
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<td>AIRE</td>
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<td>DAILY†</td>
<td>capto</td>
<td>lisino</td>
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RR  5% CI

- 0.93* .87-.99
- 0.88* .79-.99
- 0.81 .68-.97
- 0.73 .60-.89
- 0.73 .67-.91
- 0.78 .56-95
- 0.73 .74-.95
- 0.84 .74-.91
- 0.83 .74-.94

*odds ratio  †maximum daily dose
**Patients With Reduced Left Ventricular Ejection Fraction**

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<thead>
<tr>
<th>A</th>
<th>Ar</th>
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<td>Angiotensin II receptor blockers are recommended in-patient with current or prior symptoms of HF and reduced LVEF who are ACE-inhibitor intolerant (see full text guidelines).</td>
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J Am Coll Cardiol 2009, 53: 1343-82
Val-HeFT: Valsartan in Heart Failure

Probability of Event-free Survival (%)

Months since Randomization

P = 0.009
CHARM-Alternative: Candesartan in Place of ACEI

CHARM-Alternative Trial

CV Mortality or CHF hospitalization
HR 0.77
p=0.0004

CV Mortality
HR 0.84
p=0.02

%  
60  
50  
40  
30  
20  
10  
0  

Candesartan | Placebo

33.0 | 21.6
40.0 | 24.8

Lancet 2003; 362: 772-76
The addition of an ARB may be considered in persistently symptomatic patients with reduced LVEF who are already being treated with conventional therapy.

Routine combined use of an ACE inhibitor, ARB, and aldosterone antagonist is not recommended for patients with current or prior symptoms of HF and reduced LVEF.

Calcium channel blocking drugs are routine treatment for HF in patient...
Stage B Heart Failure Management

- Same general measures as Stage A
- Medications: ACE Inhibitors, ARBs, Beta blockers
- Implantable Cardioverter Defibrillator – EF < 35% on optimal medical therapy
- Treat structural disorder: CABG, PTCA/PCI, valve repair/replacement
- Avoid use of calcium channel blockers with negative inotropic effects
Mortality Benefit of Beta-Blockers in Congestive Heart Failure

- **CIBIS II** (Bisoprolol)
  - Relative Reduction: 34%
  - p Value: <0.0001
- **MERIT II** (Metoprolol)
  - Relative Reduction: 35%
  - p Value: 0.0009
- **COPERNICUS** (Carvedilol)
  - Relative Reduction: 35%
  - p Value: 0.0014
- **BEST** (Bucindolol)
  - Relative Reduction: 10%
  - p Value: 0.10
## Stage C Heart Failure Management

- Same general measures as Stage A and B
- Medications: ACE Inhibitors, ARBS, Beta blockers, Diuretics
- Other Medication that may be indicated: Aldosterone Antagonists, Digitalis, Hydralazine/nitrates
- Implantatable Cardioverter Defibrillator
- Cardiac Resynchronization (biventricular PM)
Addition of an aldosterone antagonist is recommended in selected patients with moderately severe to severe symptoms of HF and reduced LVEF who can be carefully monitored for preserved renal function and normal potassium concentration. Creatinine 2.5 mg/dL or less in men or 2.0 mg/dL or less in women and potassium should be less than 5.0 mEq/L. Under circumstances where monitoring for hyperkalemia or renal dysfunction is not anticipated to be feasible, the risks may outweigh the benefits of aldosterone antagonists.
RALES: Spironolactone Plus Usual Therapy

No. at Risk

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<th>723</th>
<th>678</th>
<th>628</th>
<th>592</th>
<th>565</th>
<th>483</th>
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Months

Probability of Survival vs. Months
The combination of hydralazine and nitrates is recommended to improve outcomes for patients self-described as African-Americans, with moderate-severe symptoms on optimal therapy with ACE inhibitors, beta blockers, and diuretics.
Patients With Reduced Left Ventricular Ejection Fraction

Hydralazine and Nitrate Combination

A combination of hydralazine and a nitrate might be reasonable in patients with current or prior symptoms of HF and reduced LVEF who cannot be given an ACE inhibitor or ARB because of drug intolerance, hypotension, or renal insufficiency.

J Am Coll Cardiol 2009, 53: 1343-82
A-HeFT: Isosorbide Dinitrate Plus Hydralazine in Black Patients

**Figure 1.** Kaplan–Meier Estimates of Overall Survival.
Patients With Reduced Left Ventricular Ejection Fraction

Recommendations for Atrial Fibrillation and Heart Failure

It is reasonable to treat patients with atrial fibrillation and HF with a strategy to maintain sinus rhythm or with a strategy to control ventricular rate alone.

J Am Coll Cardiol 2009, 53: 1343-82
Patients With Reduced Left Ventricular Ejection Fraction

The Benefits of Digitalis

Digitalis can be beneficial in patients with current or prior symptoms of HF and reduced LVEF to decrease hospitalizations for HF.

J Am Coll Cardiol 2009, 53: 1343-82
DIG Trial: Digoxin in Heart Failure

Death or Hospitalization Due to Worsening Heart Failure (%)

- Placebo
- Digoxin

P < 0.001

NO. OF PATIENTS AT RISK

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<tr>
<th></th>
<th>Placebo</th>
<th>Digoxin</th>
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Stage D Heart Failure Management

• Control/Prevent fluid retention
• Heart Failure Clinic Program/Specialist
• Discuss end-of-life care
• Discuss deactivation of defibrillator
• Cardiac transplant/LVAD Evaluation
• Drug Therapy – continuous inotrope infusion
Heart Failure Management: Goals

- Increase access to heart failure care
- Improve outcomes
  - Reduce mortality
  - Reduce rehospitalization rates
- Improve quality of life
- Provide quality, evidence-based patient care
- Individualized patient care
- Improve patient adherence to treatment regimen
- Minimize acute heart failure exacerbations and reduce hospitalizations
Heart Failure Management: Continuum of Care

• Inpatient Care
  ◦ Management of Acute Illness
    • Fluid Volume Reduction
      ◦ Diuretics
      ◦ Symptom Management
    • Hemodynamic Support
    • Evaluation and Treatment of HF Etiology

• Outpatient Care
  ◦ Pharmacologic Management
    • Evidence-Based Guidelines
  ◦ Nonpharmacologic Management
Heart Failure Management: Continuum of Care - Barriers

- Decentralized health care delivery
- Cost, complexity, and standards for HF care
- Management of complex drug regimens
- Identification of treatment side effects
- Mostly elderly population
- Patients with multiple comorbidities
Disease Management Models

- **Telephone Nurse Follow-up**
  - Nurse calls patient at designated intervals
  - Review of treatment plan, goals
- **Telemonitoring System**
  - Daily weights, vital signs transmitted to remote site
  - Information shared with providers
- **Home Health Nurse follow-up**
  - CHF programs
  - IV Lasix protocols, home infusion therapy
- **Outpatient Follow-up**
  - Team approach to heart failure care
  - Optimize medical therapy
  - Regular/frequent follow-up
  - Patient/caregiver education
  - Rapid response to clinical change
  - Coordination of care
HF Treatment Protocols

- Evidence-based Protocols
- Heart Failure Management
  - Pharmacologic
    - Medication uptitration
      - Beta blockers
      - ACE I/ARB
      - Aldosterone agonists
    - Diuretics
  - Nonpharmacologic
    - Diet
    - Fluid restriction
    - Daily weights
    - Lifestyle changes
  - Etiology of Heart Failure
    - Laboratory and diagnostic testing as indicated
  - Advanced Heart Failure Care
    - EP referral
      - CRT, ICD
      - Fluid volume monitoring
      - Referral for LVAD, cardiac transplant evaluation
  - Advanced Directives, Palliative Care
Advanced Heart Failure Management

- **Fluid Management**
  - Decompensated heart failure
  - Fluid management strategies
- **New Therapies** –
  - valsartan-sacubitril (LCZ696, *Entresto*; Novartis)
    - an angiotensin-receptor/neprilysin inhibitor (ARNI), showed as sharp an edge against the ACE-inhibitor comparator for the CV death/heart-failure hospitalization primary end point regardless of baseline LV ejection fraction or whether the target dosage was achieved.
  - Corlanor® (ivabradine)
    - indicated to reduce the risk of hospitalization for worsening heart failure in patients with stable, symptomatic chronic heart failure with left ventricular ejection fraction ≤ 35%, who are in sinus rhythm with resting heart rate ≥ 70 beats per minute and either are on maximally tolerated doses of beta-blockers or have a contraindication to beta-blocker use.
- **Referral for LVAD evaluation/Cardiac transplant evaluation**
Referral for Advanced Heart Failure Care

- LVAD
- Cardiac Transplant
Left Ventricular Assist Device

How the pump works
The HeartMate II Left Ventricular Assist System helps the heart’s left ventricle — the main pumping chamber of the heart — deliver blood to the rest of the body. It does not replace the natural function of the heart. Rather, it connects to the patient’s weakened left ventricle and helps it provide additional blood flow.

Thoratec’s HeartMate II
The newest heart pump, the Heartmate II is a quarter of the size of the formerly approved pump from Thoratec.

First generation HeartMate pump
Shape of flattened softball.

Sources: Dr. Randall C. Starling, Cleveland Clinic Heart Center; Dr. Michael Givertz, Brigham and Women’s Hospital; ThoraTec; Heartware; World Heart Technologies, Bloomberg
Left Ventricular Assist Device
The LVAD Shared Care program includes:

- Patient management protocols with partnering LVAD implanting center
- Extensive in-person and online training/certification on HeartMate II patient management
- Equipment to interrogate the HeartMate II LVAD for local follow-up in coordination with LVAD center
LVAD Shared Care Center

- Work in collaboration with implant centers
- Coordinate patient visits for follow-up and device interrogation with implant centers
Heart Failure: Quality of Life

- **Open Heart Surgery**
  - Percutaneous Valvuloplasty
  - Closure Devices

- **Congenital Heart Disease**
  - *Prevalence in 2001: 1 Million*

- **Valve Heart Disease**

- **Risk Factors**
  - Genetics, Diabetes Mellitus, Hypertension, Dyslipidemia, tobacco, obesity

- **Coronary Artery Disease (CAD)**
  - *Prevalence in 2001: 13.2 Million*
  - 2004 Cost estimate of CAD (USA): 133.2 Billion dollars

- **Arrhythmia**

- **Congestive Heart Failure**
  - *Prevalence in 2001: 5 Million*
  - 2004 Cost estimate: 28.8 Billion dollars

- **Stroke**
  - *Prevalence in 2001: 4.8 Million*

- **Drug therapy, surgical cardiomyoplasty, heart transplant, ICD, Biventricular Pacing, LV assist device, Angiogenesis & Myogenesis**

**Population Age (years)**

- 0
- 30
- 60

*->1 Million Angioplasties annually
->500,000 Bypass Surgeries annually*
When to refer to Palliative Care...

- Discussion of patient wishes should occur early in treatment
- Discussion between patient and primary physicians
Heart Failure: Cost of care

<table>
<thead>
<tr>
<th>Year</th>
<th>Prevalence of HF (%)</th>
<th>Direct costs of HF ($ billions)</th>
<th>Indirect costs of HF ($ billions)</th>
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<td>2010</td>
<td>2.8</td>
<td>24.7</td>
<td>9.7</td>
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<td>2015</td>
<td>3.0</td>
<td>32.4</td>
<td>11.3</td>
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<td>2020</td>
<td>3.1</td>
<td>42.9</td>
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<td>2025</td>
<td>3.3</td>
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<td>2030</td>
<td>3.5</td>
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<tr>
<td>Overall change (%)</td>
<td>25.0</td>
<td>215</td>
<td>80</td>
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Heart Failure: Readmissions

Readmissions Grow as Length of Stay Declines

- Length of Stay
- 30 Day Readmission Rate

1993: Length of Stay = 9, 30 Day Readmission Rate = 15%
2006: Length of Stay = 6, 30 Day Readmission Rate = 21%
High-risk for heart failure readmission

- Patients recently hospitalized for heart failure
- High-risk for readmission
  - Renal insufficiency
  - Diabetes
  - COPD
- Chronic NYHA FC III or IV symptoms
- Frequent hospitalizations of any cause
- Elderly patients or other patients with multiple comorbidities
- History of nonadherence to medical therapy
- Inadequate social support system
Why all the focus on heart failure?

• The Patient Protection and Affordable Care Act (PPACA) established the Hospital Readmissions and Reduction Program.

• October 1, 2012: hospitals penalties in effect
• Initial penalties for AMI, CHF, and Pneumonia
• Focus is on all-cause readmissions within 30 days
• In 2015, at least four more conditions will be added (likely COPD, coronary artery bypass graft, percutaneous coronary interventions, vascular procedures, and orthopedic procedures.)
## Timeline for Readmissions Reduction Program

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<th>FY08</th>
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<td><strong>Year 1:</strong> 1% Penalty Maximum</td>
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*We are HERE*
Heart Failure Readmissions

- Evidence-based therapies improve patient outcomes
- 25% of patients admitted for heart failure are readmitted within 30 days; 50% of patients are readmitted within 6 months
- CMS changes in reimbursement/penalties for hospitals effective October 1, 2012
- An estimated 40% of readmissions are avoidable
- Discharge teaching/patient education has been shown to reduce readmission rates
Heart Failure Management: Reducing Readmissions

- Early post-discharge follow-up within 7 days
- Patient and Caregiver Education:
  - Disease Process and Progression
  - Pharmacologic Management:
    - Indications, Dosage, side effects
  - Nonpharmacologic management
    - Monitor weight daily
    - Dietary Sodium Restriction
    - Fluid Restriction
    - Exercise
    - Symptom recognition
Question 1

Which of the following conditions increase risk of readmission for heart failure?

1. recent admission for heart failure
2. history of COPD
3. lives alone/poor social support
4. all of the above
Question 2

Which beta blockers have FDA indication for heart failure?

1. Carvedilol, Atenolol, Metoprolol tartrate
2. Carvedilol, Metoprolol tartrate, Bisoprolol
3. Carvedilol, Metoprolol tartrate, Metoprolol succinate
4. Carvedilol, Metoprolol succinate, Bisoprolol
Questions?