Emerging Challenges in Primary Care: 2017

Outpatient Management of Heart Failure (HF)…and HF prevention
Faculty

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Director, UCLA Barbra Streisand Women’s Heart Health Program
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Disclosures

- Karol E. Watson, MD, PhD serves as a consultant for Amarin and Amgen. Dr. Watson also serves as a consultant/speakers bureau member for Boehringer Ingleheim.
Learning Objectives

- Recognize the epidemiology and pathophysiology of HF
- Discuss the classification of HF
- Understand the role of biomarkers in diagnosing and monitoring HF
- Discuss current strategies in the management of chronic HF
Outline

- Epidemiology / Pathophysiology
- Classification
- Diagnosis
- Management
HF is increasing in prevalence

Hospital discharges for HF by gender (USA: 1979-2006)
The burden of heart failure

21 MILLION adults worldwide are living with heart failure. This number is expected to rise.\textsuperscript{1,2}

ECONOMIC BURDEN
In 2012, the overall worldwide cost of heart failure was nearly $108 BILLION.\textsuperscript{3}

MORTALITY
50% of heart failure patients die within 5 years from diagnosis.\textsuperscript{4}

\textsuperscript{1} Mozaffarian D et al. Circulation. 2015;131(4):e29-e322.
\textsuperscript{2} Mosterd A et al. Heart. 2007;93(9):1137-1146.
Pathological Progression of Heart Failure

- Neurohormonal activation
- Endothelial dysfunction
- Myocardial toxicity
- Vasoconstriction
- Renal sodium retention

Symptoms:
- Dyspnea
- Fatigue
- Edema

Chronic heart failure

Arrhythmia

Low ejection fraction

Pump

Death

Left ventricular injury

Pathologic remodeling

CAD

CM

HTN

Valvular Dz

Chemo

Endothelial Dysfunction


Prognosis

Chronic heart failure
- CHF: 5 M in US; 10 M in Europe

Normal heart

Initial myocardial injury

First episode of ADHF:
- pulmonary edema
- ER admission

ADHF: 1 M/y in US; 1.7 M/y in Europe

Need of rescue therapy & ICU admission

Initial phase

Last year

Death

Sources:
- Acute Heart Failure Syndromes Gheorghiade & Mebazaa, Am J Cardiology 2005;96(suppl 6A)
Causes of death in heart failure

NYHA II
- Pump failure: 12%
- Other: 24%
- Sudden death: 64%

NYHA III
- Pump failure: 26%
- Other: 15%
- Sudden death: 59%

NYHA IV
- Pump failure: 33%
- Other: 11%
- Sudden death: 56%

Heart Failure (HF) Definition

A complex clinical syndrome in which the heart is incapable of maintaining a cardiac output adequate to accommodate metabolic requirements and the venous return.
The Donkey Analogy

Ventricular dysfunction limits a patient's ability to perform the routine activities of daily living…
Outline

- Epidemiology / Pathophysiology
- Classification
- Diagnosis
- Management
## Classification of HF

<table>
<thead>
<tr>
<th>NYHA Functional Class</th>
<th>ACC/AHA HF Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>A At high risk for heart failure but no structural heart disease or symptoms (e.g., patients with HTN or CAD)</td>
</tr>
<tr>
<td>I Asymptomatic</td>
<td>B Structural heart disease but no symptoms of heart failure</td>
</tr>
<tr>
<td>II Symptomatic with moderate exertion</td>
<td>C Structural heart disease with prior or current symptoms of heart failure</td>
</tr>
<tr>
<td>III Symptomatic with minimal exertion</td>
<td>D Refractory heart failure requiring specialized interventions</td>
</tr>
<tr>
<td>IV Symptomatic at rest</td>
<td></td>
</tr>
</tbody>
</table>

Heart failure subtypes

- Heart Failure with reduced Ejection Fraction
  - HFrEF
  - Formerly termed “systolic heart failure”
  - EF ≤ 40%

- Heart Failure with preserved Ejection Fraction
  - HFpEF
  - Formerly termed “diastolic heart failure”
  - EF ≥ 50%
Outline

- Epidemiology / Pathophysiology
- Classification
- Diagnosis
- Management
Suspected Heart Failure because of SIGNS and/or SYMPTOMS

Assess presence of CARDIAC DISEASE by ECG, CxR and BNP

Tests abnormal

VENTRICULAR FUNCTION
Imaging by ECHO-Doppler, Nuclear angiography or MRI if available

Tests abnormal

HF-rEF
Identify etiology, evaluate severity, choose therapy

NORMAL No Heart Failure

NORMAL No Heart Failure OR HF-PEF

ESC HF guidelines 2001
B-type Natriuretic Peptide (BNP)

- 32-aa polypeptide
- Produced in response to ventricular stretch
- Results in vasodilation, natriuresis, diuresis, and reduced preload
- Increases with worsening heart failure
BNP in heart failure

BNP in lung disease

**BNP Levels**

Mean BNP Concentration (pg/ml)

- **Asymptomatic LV Dysfunction (n=14)**
  - 38 ± 4

- **No CHF (n=139)**
  - 0

- **CHF (n=97)**
  - 1076 ± 138


**BNP Levels**

- **Mean BNP Concentration (pg/ml)**
  - Asymptomatic LV Dysfunction (n=14): 38 ± 4
  - No CHF (n=139): 141 ± 31
  - CHF (n=97): 1076 ± 138

Significant Decompensated Heart Failure

Mild Ventricle Stretch: HF, PE, CM, ACS, Pulm HTN

No Heart Failure, No Ventricle Stretch
CLINICAL PEARL

With intermediate BNP levels (100-400) consider other causes of ventricular stretch (such as PE, HTN, ACS, Pulmonary HTN, etc.)
Outline

- Epidemiology
- Classification
- Diagnosis
- Management
All patients with Heart Failure should purchase a scale
The vascular bed can hold 10 pounds of fluid before it starts to seep out into the tissues.

2 pounds = 1 quart of water extra in the circulation.

Usual recommendation:
  - Report a 2- to 3-pound weight gain overnight or a 5-pound gain in 1 week.
Heart Failure Teaching

- Monitor Daily weights
  - Same time
  - Same place
  - Same scale
  - 2 lb. increase in 24 hours or 5 lb. increase in 1 week is significant
  - Patients can be taught to adjust their diuretic dose / K based on changes in weight
- Dietary sodium restriction (2-3 gm/d)*
- Routine fluid restriction is NOT necessary
- Don’t forget to address weight reduction
CLINICAL PEARL

Self management measures are essential to HF control
Heart Failure with Reduced Ejection Fraction

(HFrEF, formerly called Systolic Heart Failure)
Heart Failure (HFrEF) Management

Medications used in virtually all heart failure patients
- ACE inhibitors (or ARBs)
- ß blockers
- diuretics (most patients will need these)

Medications used in select heart failure patients
- Aldosterone antagonists
- Hydralazine / Isosorbide
- Digoxin
- Ivabradine
- sacubitril/valsartan
Diuretics

- Accepted Clinical Benefit: Diuretics relieve symptoms of dyspnea and edema

- BUT
  - No good randomized trials
  - Activate RAAS and SNS
  - Electrolyte abnormalities
  - Can worsen Renal Failure
  - High Doses correlate with poorer prognosis

Aim for minimum effective dose to control symptoms
Diuretics

Reduce the number of sacks on the wagon
ACE Inhibitors

- ~ 7000 patients evaluated in controlled clinical trials

- Improvement in cardiac function, symptoms, and clinical status; equivocal effects on exercise tolerance

- Decrease in all-cause mortality by 20%-25% (P<.001) and decrease in combined risk of death and hospitalization by 30%-35% (P<.001)

# ACE Inhibitors

<table>
<thead>
<tr>
<th>ACEI</th>
<th>Initial Dose</th>
<th>Maximum Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captopril</td>
<td>6.25 mg tid</td>
<td>50 mg tid</td>
</tr>
<tr>
<td>Enalapril</td>
<td>2.5 mg bid</td>
<td>10-20 mg bid</td>
</tr>
<tr>
<td>Fosinopril</td>
<td>5-10 mg daily</td>
<td>40 mg daily</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>2.5-5 mg daily</td>
<td>20-40 mg daily</td>
</tr>
<tr>
<td>Quinapril</td>
<td>5 mg bid</td>
<td>20 mg bid</td>
</tr>
<tr>
<td>Ramipril</td>
<td>1.25-2.5 mg daily</td>
<td>10 mg daily</td>
</tr>
<tr>
<td>Trandolapril</td>
<td>1 mg daily</td>
<td>4 mg daily</td>
</tr>
</tbody>
</table>

ACC/AHA Guidelines for the Evaluation and Management of Chronic Heart Failure in the Adult

[http://www.acc.org/clinical/guidelines/failure/hf_index.htm](http://www.acc.org/clinical/guidelines/failure/hf_index.htm)
ARBs

- Recommendations
  - **ARBs** are recommended in patients with HF and reduced LVEF who are ACEI intolerant
  
  - **DO NOT USE ACE-I and ARBs TOGETHER**

ACC/AHA Guidelines for the Evaluation and Management of Chronic Heart Failure in the Adult

http://www.acc.org/clinical/guidelines/failure/hf_index.htm
## ARBs

<table>
<thead>
<tr>
<th>ARB</th>
<th>Initial Dose</th>
<th>Maximum Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candesartan</td>
<td>4-8 mg daily</td>
<td>32 mg daily</td>
</tr>
<tr>
<td>Losartan</td>
<td>25-50 mg day</td>
<td>50-100 mg day</td>
</tr>
<tr>
<td>Valsartan</td>
<td>20-40 mg bid</td>
<td>160 mg bid</td>
</tr>
</tbody>
</table>

Not FDA approved

ACC/AHA Guidelines for the Evaluation and Management of Chronic Heart Failure in the Adult

http://www.acc.org/clinical/guidelines/failure/hf_index.htm
ACE-I and ARBs (and all vasodilators)

Reducing the steepness of the hill
**β-Blockers**

- Over 10,000 patients evaluated in long-term placebo-controlled clinical trials (carvedilol, bisoprolol, metoprolol)

- Decrease in all-cause mortality by 30%-35% \((P<.0001)\)

- Decrease in combined risk of death and hospitalization by 35%-40% \((P<.001)\); effect shown in 6 individual trials

- Effect shown in patients *already receiving ACE-I*
Patients receiving diuretics, ACE inhibitors, ± digoxin; follow-up 6 months; placebo (n=84), carvedilol (n=261).

Results from the Multicenter Oral Carvedilol Heart Failure Assessment (MOCHA) trial (n=345).

\( P < .005 \) vs placebo.

\( P < .0001 \) vs placebo.

### β-Blockers

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Initial Daily Dose</th>
<th>Target Dose</th>
<th>Mean Dose in Clinical Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bisoprolol</td>
<td>1.25 mg qd</td>
<td>10 mg qd</td>
<td>8.6 mg/day</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>3.125 mg bid</td>
<td>25 mg bid</td>
<td>37 mg/day</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>10 mg qd</td>
<td>80 mg qd</td>
<td></td>
</tr>
<tr>
<td>Metoprolol CR/XL</td>
<td>12.5-25 mg qd</td>
<td>200 mg qd</td>
<td>159 mg/day</td>
</tr>
</tbody>
</table>
β-Blockers

Limit the donkey’s speed, thus saving energy
Heart Failure Management

- Medications used in virtually all heart failure patients
  - ACE inhibitors (or ARBs)
  - ß blockers
  - diuretics (most patients will need these)

- Medications used in select heart failure patients
  - Aldosterone antagonists
  - Hydralazine / Isosorbide
  - Digoxin
  - Ivabradine
  - sacubitril/valsartan
Aldosterone Antagonists
Mortality Benefit in HFrEF

RALES\(^1\) NYHA FC3/4

Spironolactone
Placebo

EPHESUS-HF\(^2\)

Probability of Death/Hospitalization (%)

Morbidity / Mortality \(\downarrow\) 30%

### Aldosterone Antagonists

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Initial Daily Dose</th>
<th>Target Dose</th>
<th>Mean Dose in Clinical Trials</th>
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</thead>
<tbody>
<tr>
<td>Spironolactone</td>
<td>12.5-25 mg qd</td>
<td>25 mg qd</td>
<td>26 mg/day</td>
</tr>
<tr>
<td>Eplerenone</td>
<td>25 mg qd</td>
<td>50 mg qd</td>
<td>42.6 mg/day</td>
</tr>
</tbody>
</table>

**Indications:**
Class III and IV heart failure; LVEF < 35%

**Contra-indications:**
severe renal dysfunction or brittle hyperkalemia

**Cautions:**
Serum creatinine <2.5 mg/dL; Serum potassium <5 mmol/L

**Troublesome interactions:**
K+ supplements
AHeFt Trial

- 1,050 Self-identified African Americans
- Stable NYHA Class III-IV
- On standard HF treatment (BB and ACE)
- Randomized to Fixed-dose HYD/ISDN or Placebo
- Fixed-dose HYD/ISDN = 20 mg ISDN + 37.5 mg HYD titrated up to 2 tablets tid

## Hydralazine-Isosorbide

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Initial Daily Dose</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed dose hydralazine/ isosorbide dinitrate</td>
<td>37.5 mg hydralazine/ 20 mg isosorbide dinitrate tid</td>
<td>75 mg hydralazine/ 40 mg isosorbide dinitrate tid</td>
</tr>
<tr>
<td>Hydralazine</td>
<td>37.5 mg tid</td>
<td>75 mg tid</td>
</tr>
<tr>
<td>Isosorbide dinitrate</td>
<td>20 mg tid</td>
<td>40 mg tid</td>
</tr>
</tbody>
</table>

### Indications:
African American patients with Class III/IV (II) heart failure; **may be considered** in non-African American patients who remain symptomatic despite optimal HF therapy.

### Contra-indications:
allergy to organic nitrates.

### Cautions:
Caution in patients with CAD or tachycardia; hydralazine may cause a lupus-like reaction

Hydralazine-Nitrates: Precautions

- **Hydralazine**
  - Lupus
  - Hypotension
  - Tachycardia
  - Peripheral neuritis

- **Nitrates**
  - Hypotension
  - Headaches
  - Tolerance – separate dosing by 10-12 hours
    - Example: Dose at 9 am, 3 pm, 9 pm
  - Drug interactions with PDE-5 inhibitors
Digitalis

An Account of the Foxglove and Some of its Medical Uses

William Withering

1785
Digoxin does not decrease mortality (The DIG Trial)

HR = 0.99;
95% CI = 0.91–1.07;
P = 0.80

Figure 1. Mortality in the Digoxin and Placebo Groups. The number of patients at risk at each four-month interval is shown below the figure.
Digoxin Reduces 30-day All-cause Hospital Admission in Older Patients with Chronic Systolic Heart Failure

Robert C. Bourge, MD, a Jerome L. Fleg, MD, b Gregg C. Fonarow, MD, c John G. F. Cleland, MD, d John J. V. McMurray, MD, e Dirk J. van Veldhuisen, MD, PhD, f Mihai Gheorghiade, MD, g Kanan Patel, MBBS, MPH, a Inmaculada B. Aban, PhD, a Richard M. Allman, MD, h,a Connie White-Williams, RN, PhD, a Michel White, MD, j Gerasimos S. Filippatos, MD, PhD, j Stefan D. Anker, MD, PhD, k Ali Ahmed, MD, MPH a,h

aUniversity of Alabama at Birmingham, Birmingham; bNational Heart, Lung, and Blood Institute, Bethesda, Md; cUniversity of California, Los Angeles; dHull York Medical School, Kingston-Upon-Hull, United Kingdom; eUniversity of Glasgow, Glasgow, United Kingdom; fUniversity Medical Centre, Groningen, The Netherlands; gNorthwestern University, Chicago, Ill; hVeterans Affairs Medical Center, Birmingham, Ala; iMontreal Heart Institute, Montreal, Canada; jAttikon University Hospital, Athens, Greece; kCenter for Clinical and Basic Research, IRCCS San Raffaele, Rome, Italy.
Digoxin
Association of Outcomes and Concentration

![Graph showing the association between serum digoxin concentration and mortality rate.](image)

- **Digoxin Group**
  - Crude Mortality Rate
  - Risk-Adjusted Mortality Rate
- **Placebo Group**
  - Mortality Rate

*JAMA 2003; 289:871*
Digitalis Compounds

Like the carrot placed in front of the donkey
Or the whip used to make him go faster
CLINICAL PEARL

If using Digoxin, stick to lower doses.
Neprilysin Inhibition Preserves Endogenous vasodilatory peptides

Endogenous vasoactive peptides

These Peptides Counter Maladaptive Mechanisms in Heart Failure, so preserving them is beneficial

Neprilysin

Inactive metabolites

Neprilysin inhibition

- Neurohormonal activation
- Vascular tone
- Cardiac fibrosis, hypertrophy
- Sodium retention
Angiotensin–Neprilysin Inhibition versus Enalapril in Heart Failure

John J.V. McMurray, M.D., Milton Packer, M.D., Akshay S. Desai, M.D., M.P.H., Jianjian Gong, Ph.D., Martin P. Lefkowitz, M.D., Adel R. Rizkala, Pharm.D., Jean L. Rouleau, M.D., Victor C. Shi, M.D., Scott D. Solomon, M.D., Karl Swedberg, M.D., Ph.D., and Michael R. Zile, M.D., for the PARADIGM-HF Investigators and Committees*

8,399 patients on standard HF medications randomized to LCZ696 (Neprilysin) or Enalapril. Median FU 27 months.
Sacubitril/Valsartan

- Tablet comes in 3 doses
  - 24mg/26mg
  - 49mg/51mg
  - 97mg/103mg

- Indicated to reduce the risk of cardiovascular death and hospitalization for heart failure (HF) in patients with chronic heart failure (CHF) (NYHA class II-IV) and reduced ejection fraction

- Recommended starting dose: 49 mg/51 mg BID
- Target dose: 97 mg/103 mg BID
Systolic Heart failure treatment with the $I_f$ inhibitor, ivabradine Trial

Aim: To assess the effect of ivabradine on outcomes in heart failure patients on recommended background therapies with heart rates $\geq$75 bpm

Ivabradine reduces heart rate via specific inhibition of the funny channel, which is highly expressed in the sinoatrial node.

Effect of ivabradine on primary outcome: CV death or hospitalization for HF

Hazard ratio = 0.76

$P < 0.0001$


www.shift-study.com
Ivabradine

- Indicated in patients with LVEF ≤35%, who are in sinus rhythm with resting heart rate ≥70 bpm and are on maximally tolerated doses of
- Initial dose: 5 mg BID with meals
- After 2 weeks, assess patient and adjust dose to achieve a resting heart rate of 50-60 bpm
Heart Failure Management

- Medications used in virtually all heart failure patients
  - ACE inhibitors (or ARBs)
  - ß blockers
  - diuretics (most patients will need these)

- Medications used in select heart failure patients
  - Aldosterone antagonists
  - Hydralazine / Isosorbide
  - Digoxin
  - Ivabradine
  - sacubitril/valsartan
Drugs to discontinue

- doxazosin (probably all alpha blockers)
- verapamil
- diltiazem
- nifedipine
- Most antiarrhythmics
- all NSAIDS, including COX-2 agents
- all Alcohol in non-CAD cardiomyopathy
- any drug not helping is probably hurting
When to refer for devices
Cardiac Resynchronization Therapy (CRT)

- Symptomatic heart failure despite OPT
- Wide QRS complex
- LV dysfunction EF < 35%
- NYHA Class III/IV
MADIT-CRT: CRT in Patients with Mild Heart Failure

1820 pts, mostly NYHA II, CRT+ICD vs ICD alone
40% reduction in HF events in CRT-ICD group

Moss et al, NEJM 2009
Reverse Remodeling in HF

10/10/03

8/13/07
Cardiac Resynchronization Therapy

Increase the donkey’s (heart) efficiency
Implanted Cardioverter Defibrillator (ICD)

Post MI patients with LVEF ≤ 35% who are in Class II or III HF or LVEF ≤ 30%, and Class I HF.

Patients with nonischemic cardiomyopathy who have LVEF ≤ 35% and Class II or III HF.
Assist Devices: Bridge to Transplant
Treatment: Who needs What?

**WARM AND DRY**
- Compensated
- Optimize oral therapy
- *Outpatient*

**COLD AND DRY**
- Low Flow State
- Inotropes, vasodilators, ?IABP
- *ICU*

**WARM AND WET**
- Congested
- Diuretics
- *ED or Inpatient*

**COLD AND WET**
- Decompensated
- Diuretics, vasodilators, inotropes
- *ICU*

Adapted from Nohria, J Cardiac Failure 2000;6:64
## Has care evolved?

<table>
<thead>
<tr>
<th></th>
<th>1950</th>
<th>1974</th>
<th>2012</th>
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<tbody>
<tr>
<td>Morphine</td>
<td>Morphine</td>
<td>Morphine?</td>
<td></td>
</tr>
<tr>
<td>Sedation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen</td>
<td>Oxygen?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary sodium restriction</td>
<td>Dietary sodium restriction</td>
<td>Dietary sodium restriction?</td>
<td></td>
</tr>
<tr>
<td>Strict bed rest</td>
<td></td>
<td>Early mobilization</td>
<td></td>
</tr>
<tr>
<td>Digitalis</td>
<td>Inotropes</td>
<td>Avoid inotropes</td>
<td></td>
</tr>
<tr>
<td>Mercurial diuretics</td>
<td>Diuretics</td>
<td>?Diuretics</td>
<td></td>
</tr>
<tr>
<td>Venesection</td>
<td>Vasodilators</td>
<td>?Vasodilators</td>
<td></td>
</tr>
</tbody>
</table>

Heart Failure with Preserved Ejection Fraction

(HFpEF, formerly called Diastolic Heart Failure)
HFpEF & HFrEF: Similarly high mortality

- Survival rate among patients with a discharge diagnosis of HF in the USA was slightly higher among patients with HFpEF than those with HFrEF between 1987–2001
- Respective mortality rates were 29% and 32% at 1 year and 65% and 68% at 5 years
- HFpEF is associated with significant morbidity and mortality, despite having a slightly higher survival rate compared with HFrEF

Survival rates for HFpEF (LVEF ≥50%) and HFrEF (LVEF <50%) are shown with a p-value of 0.03.

References:
The diagnosis of Heart failure with Preserved Ejection Fraction is based on the clinical finding of congestive heart failure with the echocardiography findings of preserved left ventricular ejection fraction and the absence of valvular abnormalities.

(ACC/AHA guidelines)
## Characteristics of Patients with Reduced and Preserved LVEF

<table>
<thead>
<tr>
<th>Baseline Variables</th>
<th>Reduced EF (&lt;40%, n=1570)</th>
<th>Preserved EF (&gt;50%, n = 880)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean LVEF %</td>
<td>25.9</td>
<td>62.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age-years</td>
<td>71.8 ± 12</td>
<td>75.4 ± 11.51</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Female (%)</td>
<td>37.4</td>
<td>65.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Coronary artery disease (%)</td>
<td>48.7</td>
<td>35.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Angina (%)</td>
<td>28.0</td>
<td>22.8</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Prior myocardial infarction (%)</td>
<td>39</td>
<td>16.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Prior CABG (%)</td>
<td>12.9</td>
<td>5.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypertension (%)</td>
<td>84</td>
<td>91</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diabetes (%)</td>
<td>38.9</td>
<td>31.7</td>
<td>&lt;0.001</td>
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<tr>
<td>Atrial Fibrillation (%)</td>
<td>23.6</td>
<td>31.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>COPD (%)</td>
<td>13.2</td>
<td>17.7</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Hemoglobin &lt;10 g/dl (%)</td>
<td>9.9</td>
<td>21.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Systolic blood pressure-mm Hg</td>
<td>146</td>
<td>156</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Bhatia et al. NEJM 2006;355:251-9
CLINICAL PEARL

Older women with long-standing hypertension are most likely to develop HFpEF
## Treatment of HFpEF

<table>
<thead>
<tr>
<th>HFpEF Characteristic</th>
<th>Treatment Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume overload symptoms</td>
<td>Diuretic</td>
</tr>
<tr>
<td>Hypertension</td>
<td>ACE inhibitor, ARB, β-blocker</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>β-blocker, non-DHP CCB, digoxin, amiodarone</td>
</tr>
<tr>
<td>Diabetes/CKD</td>
<td>ACE inhibitor, ARB</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>ACE inhibitor or ARB + β-blocker</td>
</tr>
</tbody>
</table>
HFpEF Management

1. Manage volume: Daily weights
2. Avoid overdiuresis
3. Avoid harmful medications. Avoid all NSAIDS!
4. Treat underlying hypertension, tachycardia, diabetes, CKD, CAD
5. Teach self management
Presence of risk factors increases Heart Failure incidence

- Investigators evaluated the association of hypertension, obesity and diabetes with development of heart failure

- 4 large cohort studies were included; 516,537 person-years of follow-up; 1,677 incident heart failure events

- Individuals with all 3 risk factors, had 73% - 85% higher risks of developing heart failure and HF developed 34.7 years earlier

- Results: Heart failure can be preventable by avoidance of hypertension, obesity and diabetes

Faraz S. Ahmad et al. JCHF 2016;4:911-919
Why we need to PREVENT heart failure

If we keep on doing what we've always done...we'll keep on getting what we've always gotten...