Diastolic Heart Failure
Easy to diagnose, hard to manage

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Highlights of this Lecture

Heart Failure with Preserved Ejection Fraction

- Epidemiology
- Risk Factors
- Pathophysiology
- Diagnosis
- Management
Terminology:

- DHF = HFpEF = HFnEF
- SHF = HFrEF
DHF definition

- Symptoms of HF
- EF > 50 %
- Diastolic dysfunction on Echo and/or abnormal invasive hemodynamic data
Echocardiography-Doppler Criteria for Assessment of Diastolic Function E indicates early peak mitral inflow velocity; A, late peak mitral inflow velocity, DT, deceleration time of the E-wave; e’, velocity of annulus early diastolic motion.

Bursi, F. et al. JAMA 2006;296:2209-2216
EPIDEMIOLOGY
Community Based Population

- 556 residents of Olmsted county Minnesota, 2003-2005
- Presented with clinical HF
- Underwent prospective assessment of (EF, diastolic parameters) by Echo
- DHF defined as EF ≥ 50 %
- Mortality was assessed at 6 months
### Characteristics of Patients With Heart Failure

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Overall (n = 556)</th>
<th>Ejection Fraction &gt;50% (n = 308)</th>
<th>Ejection Fraction &lt;50% (n = 248)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD), y</td>
<td>75.6 (13.3)</td>
<td>77.4 (12.5)</td>
<td>73.4 (14.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Men</td>
<td>276 (50)</td>
<td>132 (43)</td>
<td>144 (58)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cardiovascular risk factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>467 (84)</td>
<td>266 (86)</td>
<td>201 (81)</td>
<td>.09</td>
</tr>
<tr>
<td>Smoking (current or former)</td>
<td>342 (62)</td>
<td>177 (58)</td>
<td>165 (67)</td>
<td>.03</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>206 (37)</td>
<td>111 (36)</td>
<td>95 (38)</td>
<td>.56</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>437 (79)</td>
<td>238 (77)</td>
<td>199 (80)</td>
<td>.40</td>
</tr>
<tr>
<td>BMI, mean (SD)</td>
<td>29.4 (7.5)</td>
<td>29.6 (7.5)</td>
<td>29.1 (7.8)</td>
<td>.32</td>
</tr>
<tr>
<td>Comorbidity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior MI</td>
<td>237 (43)</td>
<td>112 (36)</td>
<td>125 (50)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>COPD</td>
<td>192 (35)</td>
<td>117 (38)</td>
<td>75 (30)</td>
<td>.06</td>
</tr>
<tr>
<td>Creatinine clearance, mean (SD), mL/min</td>
<td>54.4 (20.1)</td>
<td>54.2 (19.7)</td>
<td>54.7 (20.5)</td>
<td>.99</td>
</tr>
<tr>
<td>Severe reduced renal function</td>
<td>57 (10)</td>
<td>35 (11)</td>
<td>22 (9)</td>
<td>.34</td>
</tr>
<tr>
<td>Anemia</td>
<td>285 (51)</td>
<td>163 (53)</td>
<td>122 (49)</td>
<td>.38</td>
</tr>
<tr>
<td>Atrial fibrillation/flutter</td>
<td>173 (31)</td>
<td>95 (31)</td>
<td>78 (32)</td>
<td>.85</td>
</tr>
<tr>
<td>Mitral valve disease</td>
<td>97 (17)</td>
<td>53 (17)</td>
<td>44 (18)</td>
<td>.87</td>
</tr>
<tr>
<td>Charison index ≥3</td>
<td>358 (69)</td>
<td>216 (70)</td>
<td>168 (68)</td>
<td>.59</td>
</tr>
<tr>
<td>NYHA class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>52 (9)</td>
<td>36 (12)</td>
<td>16 (6)</td>
<td>.006</td>
</tr>
<tr>
<td>II or III</td>
<td>246 (44)</td>
<td>143 (46)</td>
<td>103 (42)</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>258 (46)</td>
<td>129 (42)</td>
<td>129 (42)</td>
<td></td>
</tr>
<tr>
<td>Echocardiographic variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left ventricular mass index, mean (SD), g/m²</td>
<td>117.8 (36.7)</td>
<td>106.9 (32.1)</td>
<td>131.1 (37.5)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Left ventricular end-diastolic diameter, mean (SD), mm</td>
<td>52.1 (9.2)</td>
<td>47.9 (6.3)</td>
<td>57.3 (9.6)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Medications before the echocardiographic study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACE inhibitors or angiotensin II receptor blockers</td>
<td>102 (18)</td>
<td>52 (17)</td>
<td>50 (20)</td>
<td>.32</td>
</tr>
<tr>
<td>β-Blockers</td>
<td>109 (20)</td>
<td>65 (21)</td>
<td>44 (18)</td>
<td>.32</td>
</tr>
<tr>
<td>Diuretics</td>
<td>126 (23)</td>
<td>73 (24)</td>
<td>53 (21)</td>
<td>.51</td>
</tr>
<tr>
<td>Medications after the echocardiographic study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACE inhibitors or angiotensin II receptor blockers</td>
<td>348 (63)</td>
<td>157 (51)</td>
<td>191 (77)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>β-Blockers</td>
<td>387 (70)</td>
<td>193 (63)</td>
<td>194 (78)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Diuretics</td>
<td>406 (73)</td>
<td>218 (71)</td>
<td>188 (76)</td>
<td>.18</td>
</tr>
</tbody>
</table>

**Abbreviations:** ACE, angiotensin-converting enzyme; BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); COPD, chronic obstructive pulmonary disease; MI, myocardial infarction; NYHA, New York Heart Association.

SI conversion factor: to convert mL/min to mL/s for creatinine clearance, multiply by 0.0167.

*Data are presented as No. (%) unless otherwise specified.*

Bursi, F. et al. JAMA 2006;296:2209-2216
Expected and Observed Survival by Ejection Fraction Category.

Bursi, F. et al. JAMA 2006;296:2209-2216
Summary

✓ Preserved EF (≥50%) was present in 308 (55%) and was associated with older age, female sex, and no history of myocardial infarction (all $P < .001$).

✓ At 6 months, mortality was 16% for both preserved and reduced EF (age- and sex-adjusted hazard ratio, 0.85; 95% CI, 0.61-1.19; $P = .33$ for preserved vs reduced EF).
### Table 2. Distribution of Ejection Fraction and Diastolic Dysfunction Among Patients With Heart Failure*

<table>
<thead>
<tr>
<th></th>
<th>Normal Diastolic Function</th>
<th>Indeterminate Diastolic Function</th>
<th>Mild Diastolic Dysfunction</th>
<th>Moderate Diastolic Dysfunction</th>
<th>Severe Diastolic Dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>All cases (N = 556)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ejection fraction ≥50%</td>
<td>31 (10)</td>
<td>35 (11)</td>
<td>22 (7)†</td>
<td>194 (63)†</td>
<td>26 (8)†</td>
</tr>
<tr>
<td>Ejection fraction &lt;50%</td>
<td>13 (5)</td>
<td>31 (13)</td>
<td>10 (4)</td>
<td>138 (56)</td>
<td>56 (23)</td>
</tr>
<tr>
<td>Total</td>
<td>44 (8)</td>
<td>66 (12)</td>
<td>32 (6)</td>
<td>332 (60)</td>
<td>82 (15)</td>
</tr>
<tr>
<td>Incident cases (n = 295)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ejection fraction ≥50%</td>
<td>18 (11)</td>
<td>10 (6)</td>
<td>16 (9)†</td>
<td>114 (67)†</td>
<td>12 (7)†</td>
</tr>
<tr>
<td>Ejection fraction &lt;50%</td>
<td>3 (2)</td>
<td>16 (13)</td>
<td>4 (3)</td>
<td>72 (58)</td>
<td>30 (24)</td>
</tr>
<tr>
<td>Total</td>
<td>21 (7)</td>
<td>26 (9)</td>
<td>20 (7)</td>
<td>186 (63)</td>
<td>42 (14)</td>
</tr>
<tr>
<td>Outpatient cases (n = 122)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ejection fraction ≥50%</td>
<td>7 (10)</td>
<td>4 (5)</td>
<td>6 (8)†</td>
<td>50 (68)†</td>
<td>6 (8)†</td>
</tr>
<tr>
<td>Ejection fraction &lt;50%</td>
<td>3 (6)</td>
<td>4 (8)</td>
<td>3 (6)</td>
<td>25 (51)</td>
<td>14 (29)</td>
</tr>
<tr>
<td>Total</td>
<td>10 (8)</td>
<td>8 (7)</td>
<td>9 (7)</td>
<td>75 (61)</td>
<td>20 (16)</td>
</tr>
</tbody>
</table>

*Indicates patients with isolated diastolic dysfunction.

*Mild diastolic dysfunction represents impaired relaxation mitral inflow patterns with normal filling pressures; moderate diastolic dysfunction represents impaired relaxation mitral inflow patterns with elevated filling pressures or a pseudo-normal mitral inflow pattern with elevation of filling pressures; and severe diastolic dysfunction represents restrictive mitral inflow patterns.

Bursi, F. et al. JAMA 2006;296:2209-2216
Post HF-Hospitalization Population

- Mayo Observation Study (1987-2001)

- A total of 6076 patients with heart failure were discharged over the 15-year period

- Patients were classified as having either preserved (EF ≥ 50%) or reduced ejection fraction (<50%)
Prevalence of DHF
Secular Trend 1987-2011

Owan TE et al, *NEJM*. 2006
Secular Trend in Survival DHF Vs. SHF

Owan TE et al, *NEJM*. 2006
Survival SHF Vs. DHS

Owan TE et al, NEJM. 2006
Summary

☐ 53% had a reduced ejection fraction and 47% had a preserved ejection fraction.

☐ Preserved ejection fraction increased over time.

☐ Survival was slightly better among patients with preserved ejection.

☐ Survival improved over time for those with reduced ejection fraction but **NOT** for those with preserved ejection fraction.
Diastolic Heart Failure
Epidemiology

↑prevalence:
♥ ? true increase (more effective MI, HTN treatment).
♥ Aging population
♥ ↑ Recognition

♥ Varies with:
♥ Practice type
♥ Ethnicity
♥ Regional factor
### Outcome in Clinical Trials

<table>
<thead>
<tr>
<th></th>
<th>Dig-DHF</th>
<th>Dig-SHF</th>
<th>CHARM-DHF</th>
<th>CHARM-SHF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>67</td>
<td>63</td>
<td>67</td>
<td>64</td>
</tr>
<tr>
<td>% HTN</td>
<td>58</td>
<td>45</td>
<td>64</td>
<td>49</td>
</tr>
<tr>
<td>% MI</td>
<td>49</td>
<td>65</td>
<td>44</td>
<td>55</td>
</tr>
<tr>
<td>F/U, yrs</td>
<td>3.2</td>
<td>3</td>
<td>3</td>
<td>3.4</td>
</tr>
<tr>
<td>Mortality</td>
<td>23%</td>
<td>35%</td>
<td>16%</td>
<td>32%</td>
</tr>
<tr>
<td>HF admit</td>
<td>22%</td>
<td>35%</td>
<td>18%</td>
<td>28%</td>
</tr>
</tbody>
</table>
Death Due to Non-CV Causes

Olmsted county Minnesota, 1979-2002
1063 patients, 5 Y mortality: 55 %
SHF=DHF

RISK FACTORS
Risk Factors Summary

- **DHF>SHF**
  - Age
  - Female
  - Hypertension
  - Obesity

- **DHF=SHF**
  - Diabetes

- **SHF>DHF**
  - Coronary artery disease?
  - Underdiagnosed in women
PATHOPHYSIOLOGY

- Impaired relaxation
- Increased diastolic stiffness
Relaxation

\[ \tau = \text{time constant of isovolemic relaxation. Exponential pressure decay.} \]

Normal \( \tau < 40 \) ms
Relaxation & Heart Rate

Heart rate: 60 BPM

Hay et al, AJP.2005

Heart rate: 120 BPM
PATHOPHYSIOLOGY

- Impaired relaxation
- Increased diastolic stiffness
Diastolic Stiffness Assessment
pressure volume loops
(multiple beats, different preload)

$P_{es} = E_{es} (V_{es} - V_0)$

$P_{ed} = \alpha e^{\beta V_{ed}}$

Constant stiffness : $\beta$ rate of change of EDP with change in EDV
Stiffness Constant
↑ change in P with filling

Comparing diastolic stiffness in patients with DHF Vs. Normal

Pre-clinical

Impaired vasodilatory reserve

Impaired systolic reserve

Chronotropic incompetence

Exertion

Impaired ventricular vascular coupling reserve

Neurohormonal activation

Renal dysfunction

Resting contractile dysfunction

Resting systemic and pulmonary vascular dysfunction

Rest

Clinical Heart Failure
PRESENTATION & DIAGNOSIS
# How DHF Present?

<table>
<thead>
<tr>
<th>Acute setting/Hospital</th>
<th>Chronic setting/Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>♥ Symptoms of HF</td>
<td>♥ Dyspnea in the elderly</td>
</tr>
<tr>
<td>♥ Pulmonary edema</td>
<td></td>
</tr>
<tr>
<td>♥ Co-morbidities (HTN, a-fib, etc !)</td>
<td></td>
</tr>
<tr>
<td>♥ ECHO c/w normal EF</td>
<td></td>
</tr>
</tbody>
</table>

Easy | Tough
Acute DHF
Precipitating Factors

1) Hypertension: 50 %
   ♥ Difficult to control HTN
   ♥ Diet non-compliance
   ♥ Medication non-compliance
   ♥ Renal artery stenosis
   ♥ NSAIDs use

2) Atrial fibrillation: 30%

3) Ischemia

4) Other settings (anemia, GI bleed, sepsis, preoperative, etc.)

Chen et al, JCF. 2002
Diagnosis

- Clinical history
- Physical exam
- CXR
- ECG

× Unreliable

✓ ECHO
Echo Findings

- Normal ejection fraction
- Normal LV size
- LVH
- LAE
- Diastolic dysfunction

May be completely normal
## Diagnostic Guidelines for DHF

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HF signs and symptoms</strong></td>
<td><strong>Present</strong></td>
<td><strong>Present</strong></td>
<td><strong>Present</strong></td>
<td><strong>Present</strong></td>
</tr>
<tr>
<td><strong>(other criteria)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Normal LV systolic function</strong></td>
<td>LVEF &gt; 45%</td>
<td>LVEF &gt; 50%</td>
<td>LVEF &gt; 50%</td>
<td>LVEF &gt; 50%</td>
</tr>
<tr>
<td></td>
<td>LVEDVI &lt; 102 ml/m²</td>
<td>within 72h HF episode</td>
<td>LVEDVI &lt; 97 ml/m²</td>
<td>LVEDVI &lt; 97 ml/m²</td>
</tr>
<tr>
<td><strong>LV diastolic dysfunction</strong></td>
<td>LVEDP &gt; 16 mm Hg</td>
<td>LVEDP &gt; 16 mm Hg</td>
<td>LVEDP &gt; 16 mm Hg</td>
<td>LVEDP &gt; 16 mm Hg</td>
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<tr>
<td></td>
<td>PCW &gt; 12 mm Hg</td>
<td>PCW &gt; 12 mm Hg</td>
<td>PCW &gt; 12 mm Hg</td>
<td>PCW &gt; 12 mm Hg</td>
</tr>
<tr>
<td></td>
<td>E/A &lt; 0.5</td>
<td>E/A &lt; 0.5</td>
<td>E/A &lt; 0.5</td>
<td>E/A &lt; 0.5</td>
</tr>
<tr>
<td></td>
<td>DT &gt; 280 ms</td>
<td>DT &gt; 280 ms</td>
<td>DT &gt; 280 ms</td>
<td>DT &gt; 280 ms</td>
</tr>
<tr>
<td></td>
<td>IVRT &gt; 105 ms</td>
<td>IVRT &gt; 105 ms</td>
<td>IVRT &gt; 105 ms</td>
<td>IVRT &gt; 105 ms</td>
</tr>
<tr>
<td></td>
<td>PW &gt; 0.35 m/s</td>
<td>PW &gt; 0.35 m/s</td>
<td>PW &gt; 0.35 m/s</td>
<td>PW &gt; 0.35 m/s</td>
</tr>
<tr>
<td></td>
<td>Arv-Ad &gt; 20 ms</td>
<td>Arv-Ad &gt; 20 ms</td>
<td>Arv-Ad &gt; 20 ms</td>
<td>Arv-Ad &gt; 20 ms</td>
</tr>
</tbody>
</table>

- **E/A**: Ratio of early (E) to late (A) filling velocities
- **DT**: Deceleration time
- **IVRT**: Isovolumic relaxation time
- **PW**: P-wave duration in the electrocardiogram
- **Arv-Ad**: Atrial-ventricular difference
- **LVEF**: Left ventricular ejection fraction
- **LVEDVI**: Left ventricular end-diastolic volume index
- **LVEDP**: Left ventricular end-diastolic pressure
- **PCW**: Pulmonary capillary wedge pressure
Differential Diagnosis in Patient with HF and Normal LVEF with Symptoms

- Incorrect diagnosis of HF
- Inaccurate measurement of LVEF
- Primary valvular disease
- Restrictive (infiltrative) cardiomyopathies
- Amyloidosis, sarcoidosis, hemochromatosis
- Pericardial constriction
- Episodic or reversible LV systolic dysfunction
- Severe hypertension, myocardial ischemia
- HF associated with high metabolic demand (high-output states)
- Anemia, thyrotoxicosis, arteriovenous fistulae
- Chronic pulmonary disease with right HF
- Pulmonary hypertension associated with pulmonary vascular disorders
- Atrial myxoma
- Diastolic dysfunction of uncertain origin
- Obesity
71 YO female with hx of HTN referred to you for progressive DOE X 2 years. Symptoms worsened in the last few months and now happening with less than ordinary physical activities. 2 years ago, she had coronary angiography for atypical CP and was told “no blockages”. Echo last month was normal except, mild TR with RVSP: 45 mm Hg. ECG : NL. PFTs reported are all “normal” in recent study. No hx of DM, HLP and tobacco abuse. Medications include HCTZ 25 mg po qd and Norvasc 10 mg. No family hx of CM. BP: 133/78, HR: 67. BMI: 29. Exam is unremarkable.

The best next step is:

a) Repeat coronary angiography
b) RHC
c) Repeat ECHO and Cardiac MRI
d) Tell her she is “deconditioned” and refer for rehab program
e) Add furosemide 40 mg daily and follow up in 6 months
56% of elderly patients with unexplained dyspnea and Echo evidence of PH, had elevated PCWP (pulmonary venous congestion).

Shapiro BP et al, Chest. 2007
Systematic Approach to Unexplained Dyspnea

- Symptoms
  - HF Dx unclear
- Echo Doppler
- EF < 40% or Valve Disease
- PH + Normal EF
  - DHF Likely
  - DHF Uncertain
  - Exclude Other Causes of PH
    - RHC
  - DHF Unlikely
    - Exclude Other Causes of PH
    - RHC
Case 1, cont.

♥ RHC performed
♥ RA: 8, RV: 37/5, PA: 37/14, mean 22, PCWP: 12.

**Next step:**
- a. Exercise hemodynamic
- b. Nipride challenge
- c. NO challenge

TPG = mPA - PWP
BNP in DHF
Breathing Not Properly Trial

Maisel et al, JACC. 2003
MANAGEMENT
# Enrollment Criteria & Outcomes for Large DHF Trials

<table>
<thead>
<tr>
<th></th>
<th>V-HeFT/HHeFT/Enelapril</th>
<th>DIG</th>
<th>CHARM-P</th>
<th>SENIORS</th>
<th>PEP-CHF</th>
<th>I-PRESERVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolment criteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HF signs and symptoms (other criteria)</td>
<td>Present ( (V_0 \downarrow) )</td>
<td>Present</td>
<td>Present</td>
<td>Present ( (3/9 \text{ criteria including prior MI}) )</td>
<td>Present</td>
<td></td>
</tr>
<tr>
<td>Normal LV systolic function</td>
<td>LVEF ( \geq 35% ) ( \text{CTR} \geq 0.55 ) ( \text{LVEDD} \geq 2.7 \text{ cm/m}^2 )</td>
<td>LVEF ( \geq 45% )</td>
<td>LVEF ( \geq 40% )</td>
<td>LVEF ( \geq 35% )</td>
<td>LVEF ( &gt;40% ) ( \text{WMI} &gt;1.4 )</td>
<td>LVEF ( &gt;45% )</td>
</tr>
<tr>
<td>LV diastolic dysfunction</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>WT ( &gt;13 \text{ mm} ) ( \text{IVRT} &lt;105 \text{ ms} ) ( \text{E/A} &lt;0.5 ) ( \text{DT} &gt;280 \text{ ms} ) ( \text{LA diameter} &gt;25 \text{ mm/m}^2 )</td>
<td>LAE ( \text{LVH} ) ( \text{LA diameter} &gt;25 \text{ mm/m}^2 )</td>
</tr>
<tr>
<td>Positive outcomes</td>
<td>Mortality ( -40% )</td>
<td>Hospitals</td>
<td>Hospitals</td>
<td>Mortality + hospitalizations ( -14% )</td>
<td>Hospitals and symptoms at 1 yr follow-up</td>
<td>—</td>
</tr>
</tbody>
</table>

CTR = cardiothoracic ratio; DT = deceleration time; LVEDD = left ventricular end-diastolic dimension index; MI = myocardial infarction; \( V_0 \) = maximal oxygen consumption during exercise; \( \text{WMI} \) = wall motion index; \( \text{WT} \) = wall thickness; other abbreviations as in Table 1.
Why did we fail?

- EF mismatch between guidelines and trials
- Variation in LV remodeling, eccentric in SHF Vs. eccentric in DHF
- I-PRESERVE included LBBB? (sign of eccentric LV remodeling)!
- Iscemic CM was present in 56% of CHARM-preserved and 70% of the DIG trial
- Only 50% of CHARM-Preserved trial had evidence of moderate – severe diastolic dysfunction by Echocardiography
Why did we fail?

We missed the Target
DHF Treatment

♥ ACC/AHA guidelines 2001

♥ ACC/AHA guidelines 2005

♥ ACC/AHA guidelines/focused update 2009
Normal Left Ventricular Ejection Fraction

Physicians should control systolic and diastolic hypertension in patients with HF and normal LVEF, in accordance with published guidelines.  

Physicians should control ventricular rate in patients with HF and normal LVEF and atrial fibrillation.  

Physicians should use diuretics to control pulmonary congestion and peripheral edema in patients with HF and normal LVEF.
Patients With Heart Failure and Normal Left Ventricular Ejection Fraction

Coronary revascularization is reasonable in patients with HF and normal LVEF and coronary artery disease in whom symptomatic or demonstrable myocardial ischemia is judged to be having an adverse effect on cardiac function.

NO CHANGE
Normal Left Ventricular Ejection Fraction

Restoration and maintenance of sinus rhythm in patients with atrial fibrillation and HF and normal LVEF might be useful to improve symptoms.

The use of beta-adrenergic blocking agents, ACEIs, ARBs, or calcium antagonists in patients with HF and normal LVEF and controlled hypertension might be effective to minimize symptoms of HF.

The usefulness of digitalis to minimize symptoms of HF in patients with HF and normal LVEF is not well established.
Thank You