Heart Failure in Older Adults:
A focus on Multimorbidity

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FACULTY DISCLOSURE DECLARATION

FINANCIAL OR OTHER RELATIONSHIP(S) DISCLOSURE:

Dr. Chen has indicated that he has not had financial or other relationships with commercial interests, related to this presentation, within the past 12 months.
Objectives

1. Understand that HF is a clinical diagnosis
2. Distinguish (some) differences (etiology, pathophysiology, treatment) between heart failure with a reduced ejection fraction and with a preserved ejection fraction
3. Appreciate the impact of multimorbidity and geriatric syndromes on the diagnosis and management of HF in older adults

Outline

- Background
- Etiology & Pathophysiology
- Multimorbidity
- Diagnostic Challenges
- Management Challenges
Background

- ~ 5.7 million people in the US currently have heart failure (HF), with ~550,000 new diagnoses per year
- Expected to double by year 2030
- #1 admission diagnosis in patients over 65 years of age—diagnosed in 20% of all hospitalizations
- 6.5 million hospital days/year
- 44% Readmission rate in next 6 months
- < 50% five year survival
- HF costs: $10B - $30B/year


Prevalence of Heart Failure by Age and Sex
NHANES: 1999-2002

Median age of HF patients in US = 75 y
85% of HF deaths occur in those ≥ 65 y

Aging of the Population

Aging of the Population

Heart Failure (Chen), NW GWEC Winter 2017
What is Heart Failure?

- HF is a clinical syndrome that can result from any structural or functional cardiac disorder that impairs the ability of the ventricle(s) to fill with or eject blood
- “Heart failure” is not a specific diagnosis!
Two Main Categories of Heart Failure

- HF with reduced Ejection Fraction (HFrEF)
- HF with preserved Ejection Fraction (HFpEF)

What is “Ejection Fraction?”
Pathophysiology
Heart Failure with a Reduced EF

- Most common type of heart failure; <65 y/a (90%)
- Middle aged ♂ w/ CAD
- Well studied, many therapies

Low Cardiac Output
Compensatory Mechanisms

- Developed in “pre-historic times”
- No coronary artery disease, HTN, etc.
- Bleeding from trauma was the main threat
- Beneficial acutely, ultimately deleterious
- Mediated by neurohormonal changes
Neurohormonal Activation

- Sympathetic Nervous System
  - ↑ Norepinephrine levels
  - ↑ Inotropic & Chronotropic activity
  - ↑ Vasoconstriction
- Renin-Angiotensin-Aldosterone System (RAAS)
  - ↑ Angiotensin II
    - Potent vasoconstrictor
    - Growth promoter
  - ↑ Aldosterone
    - Salt & water retention
    - Myocardial fibrosis
- Counter-regulatory
  - ↑ Endothelin, Nitric Oxide, Prostaglandins
  - ↑ Natriuretic peptides (ANP, BNP)

Heart Failure with Preserved Ejection Fraction

- “HF with preserved systolic function,” “Diastolic Heart Failure”
- 50-70% of patients with HF
  - Various populations, various EF cut-offs
- Risk Factors
  - Age. < 10% of patients with HF < 60 y/a have nl EF
  - Gender. 67% of elderly ♀ with CHF had nl EF vs. 42% ♂
  - LV Hypertrophy & HTN. 88% of patients with HF with preserved EF
Pathophysiology of Heart Failure with Preserved Ejection Fraction

- Impaired LV diastolic filling
- Higher than normal filling pressures
- Elevated pulmonary venous pressures
  - Decrease lung compliance, increase WOB
- Impaired cardiac output due to low stroke volume
  - Fatigue
- Neurohormonal activation


Major Effects of Cardiovascular Aging

- Increased systemic vascular impedance, especially in larger arteries
- LVH/↓ relaxation & compliance
- Diminished responsiveness to beta-adrenergic stimulation

**Major Effects of Cardiovascular Aging**

- Impaired mitochondrial energy production in response to stress
- Decline in sinus node function
- Impaired endothelial function, especially endothelium-mediated vasodilation

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**Pathophysiology, cont.**

- The importance of hypertension
  - Nearly 90% of patients with HFpEF have HTN
  - HTN treatment decreases incident HF (by 22-68%)
  - Exacerbations of HFpEF are associated with HTN
### Effect of anti-HTN Treatment on Incident HF in the Elderly

<table>
<thead>
<tr>
<th>Trial</th>
<th>N</th>
<th>Age range (y)</th>
<th>Risk reduction %</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Working Party</td>
<td>840</td>
<td>&gt;60</td>
<td>22</td>
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<tr>
<td>Coope &amp; Warrender</td>
<td>884</td>
<td>60-79</td>
<td>32</td>
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<tr>
<td>Swedish Trial</td>
<td>1627</td>
<td>70-84</td>
<td>51</td>
</tr>
<tr>
<td>SHEP</td>
<td>4736</td>
<td>≥60</td>
<td>55</td>
</tr>
<tr>
<td>Syst-Eur</td>
<td>4695</td>
<td>≥60</td>
<td>36</td>
</tr>
<tr>
<td>STONE</td>
<td>1632</td>
<td>60-79</td>
<td>68</td>
</tr>
<tr>
<td>HYVET</td>
<td>3845</td>
<td>≥80</td>
<td>64</td>
</tr>
</tbody>
</table>


### Other Aggravating Factors

- Hypertension
- Medications
  - New, wrong, missed dose
  - NSAIDs, thiazolidinediones
- Dietary indiscretion
- Myocardial ischemia/infarction
- Arrhythmias
- Obstructive Sleep Apnea
- New/worsened Heart Disease (e.g. Valve)
- Renal Insufficiency
- Anemia
- Thromboembolism
- Hyper/hypothyroidism
- Endocarditis
- Infections
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- Multimorbidity
- Diagnostic Challenges
- Management Challenges

Multimorbidity

- Presence of multiple chronic conditions
  - 90% of adults with HF have ≥ 2
  - ~60% have ≥ 5
- Geriatric syndromes are also common
  - Functional/mobility impairment, cognitive dysfunc.
- Both are related to adverse outcomes (mortality)

Comorbidity among Chronic Conditions for Medicare FFS Beneficiaries: 2010

Medical comorbidities
- Hypertension
- Ischemic heart disease
- Atrial fibrillation
- Stroke
- Diabetes
- Dyslipidemia
- COPD
- CKD
- Anemia
- Osteoarthritis
- Cancer

Geriatric Comorbid conditions
- Cognitive impairment (27%)
- Mobility impairment (39%)
- ADL & IADL impairment
- Incontinence
- Frailty
- Weight loss
- Visual impairment

Common Comorbid Conditions in Older Adults with HF
Overlap of Chronic Medical Conditions and Geriatric Syndromes in Older Adults with HF


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Diagnostic Challenges

- Dyspnea & exercise intolerance, fatigue & weakness
  - CAD, atrial fibrillation, valve disease
  - COPD, PNA, obesity, anemia, infections depression, frailty
- HF is a clinical diagnosis/syndrome
  - HFpEF
    - Symptoms, Echo findings

Congestive Heart Failure Treatment

- Objectives
  - ↑ Survival
  - ↓ Progression of CHF
  - ↓ Symptoms/Morbidity
  - ↑ Exercise capacity
  - ↑ Quality of life
- ↓ Neurohormonal changes
**Treatment of Heart Failure**

<table>
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<tr>
<th>Reduced EF</th>
<th>Preserved EF</th>
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</table>
| - Well-defined treatment strategy  
- Data from large-scale randomized controlled trials  
- Substantial improvements in morbidity & mortality | - Data are limited  
- Theoretic benefits of multiple agents  
- No therapies shown to prolong life  
- Some data for reduction in hospitalizations/symptoms |

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**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, metabolic syndrome or Patients using cardiac drugs with HFx CM

- **Stage B**: Structural heart disease but without 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 and shortness of breath and fatigue, reduced exercise tolerance

- **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)

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**Heart Failure**

- **Therapy Goals**: - All measures under stages A and B, - Dietary salt restriction, - Drugs for Routine Use, - Diuretic for fluid retention, - ACEI, - Beta-blockers, - Drugs in Selected Patients

- **Devices in Selected Patients**: - Implantable defibrillators

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**ACC/AHA HF Guideline. Circ 2013;128:e240.**
### Pharmacologic Treatment of HFrEF

**Hemodynamic & Neurohormonal Modulation**

- Angiotensin converting enzyme inhibitors
- Angiotensin receptor blockers
- Beta Blockers
- Aldosterone Antagonists
- Hydralazine + Isosorbide Mono/Dinitrate
- Digoxin
- Novel agents
  - Sacubitril-Valsartan (Entresto)
  - Ivabradine (Corlandor)
- Diuretics

### HFSA Practice Guideline

**HF with preserved EF**

- Etiology affects diagnosis, look carefully
- Evaluate for ischemic heart disease and active ischemia
- Aggressive BP management*
- Low salt diet
- Diuretics for volume overload (careful titration)
- ARBs or ACE inhibitors should be considered
  - ACEi for cardiovascular disease, diabetes, multiple risk factors
  - ARBs for ACEi intolerant patients

HFSA Practice Guideline

- β-blockers for pts with prior MI, HTN, Afib
- CCB for patients with Afib (β-blockers not enough/CI), angina, HTN
- Consider rhythm control strategy for symptomatic Afib/flutter
- Enrollment in disease management program for hospitalized and high risk patients

Exercise & Heart Failure

- Exercise has been shown to improve diastolic function in the elderly
- Regular physical activity improves exercise performance and is recommended for patients with heart failure
- Supervised exercise has been associated with the greatest improvements

HF-ACTION Trial
- 2331 pt. multicenter randomized trial of supervised exercise vs. usual care in patients with HFrEF
- After adjustment: 11% reduction in the primary endpoint: all-cause mortality or hospitalization (HR 0.89, 95% CI 0.81-0.99, p=0.03)
HF Disease Management

- HF disease management programs
  - HF clinics
  - Care delivered in the home or to patients who are at home
  - Tele-monitoring
- Multidisciplinary teams
  - Nurse coordinator
  - Dietician
  - Social Worker
  - Clinical Pharmacist
  - Home health provider
  - Cardiologist
  - PCP
- Goals
  - Individualize care
  - ↑ self-management skills
  - ↑ compliance (meds/diet/exercise)
- Multiple studies
  - Many older patients with preserved EFs
  - Reduce hospitalizations, ↑ QOL, ↓ Costs


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Management Challenges

Evidence

- Randomized trials exclude multimorbid patients
- 15 year analysis (Gen med/specialties)
  - >90% used MCC to exclude pts
- Analysis of phase 3-4 clinical trials from 5 journals
  - ~1/2 excluded pts with disability, functional limitations, decreased life expectancy, cog impairment, non-independent living, serious illness
  - 20% had max age cut-offs


Management Challenges

Evidence

- TOPCAT
  - Excluded: SBP >160mmHg, afib w/ HR >90bpm, life expectancy <3y
- CHARM-Preserved
  - Excluded: Persistent HTN despite treatment, life expectancy <2y
- I-PRESERVE
  - Excluded: BP >160/95bpm, hb <11g/dL, life expectancy <3y.
  - Only one to have median age >70y (72y)

Management Challenges

- RALES trial (Aldactone in HFrEF) 1999
  - Reduced all-cause mortality, HF hosp, HF symptoms
  - Ave age 65y
- Study in N. America, after publication
  - 5-fold increase in hosp for hyperkalemia in elders
    - Without any benefit
  - Ave age of patients treated in real-world practice 13y higher


Management Recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Tools and Tips</th>
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</table>
| 1. Focus on universal health outcomes | - Identify symptoms including pain, dyspnea, fatigue, lightheadedness  
- Quantify health-related quality of life through validated tools such as the SF12  
- Determine functional status including patient-reported difficulty with ADLs/IADLs and gait speed  
- Aim to reduce all-cause hospitalization rather than HF-only hospitalization  
- Discuss prognosis for survival and perform advance care planning |
| 2. Formally assess cognitive function | - MOCA  
- Mini-Mental Status Examination  
- Mini-Cog |
| 3. Focus on nonpharmacologic treatments | - Exercise  
- If appropriate, pelvic floor training for urinary incontinence, physical countermeasures for orthostasis, and others |
| 4. Minimize treatment burden | - Ask patients what aspects of care are most burdensome  
- Discontinue unnecessary medications  
- Reduce unnecessary medical appointments |
| 5. Enhance care coordination | - Communicate with other clinicians involved in the patient’s care  
- Develop an integrated multidisciplinary plan of care  
- Elicit community resources to provide additional support |

Abbreviations: ADL, activity of daily living; IADL, instrumental activity of daily living; SF12; Short-Form 12

Typical Burden of an Older Patient with HF and Multimorbidity

- Has 4 other chronic conditions in addition to heart failure
- Takes 10 or more medications a day
- Spends about 2 hours per day on health-related activities
- Attends 15 or more outpatient appointments with physicians each year
- Needs assistance with at least one activity of daily living
- Experiences hospitalizations for multiple conditions

All are best estimates based on the available published literature, but burden is likely to vary widely across individual patients.

Questions?

Happy Valentine’s Day!
References