The First International
Conference on Cardiology and Geriatrics
Thong Nhat Hospital, Ho Chi Minh City, 2012

Heart Failure in the Elderly

Ramesh Daggubati, MD FACC

Associate Professor

Director of Interventional Cardiology

East Carolina Heart Institute

Greenville, North Carolina USA

Definition of Heart Failure

- HF is a complex clinical syndrome that can result from any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood.
- Manifests as
  - Dyspnea and fatigue
    - Limits exercise tolerance
  - Fluid retention
    - Pulmonary congestion and peripheral edema

Overview

- Epidemiology: changing demographics
- Heart failure and geriatric syndromes
- Heart failure management
- A program of research to manage heart failure in long-term care
- Concluding thoughts

The scope of the problem

EPIDEMIOLOGY OF HEART FAILURE

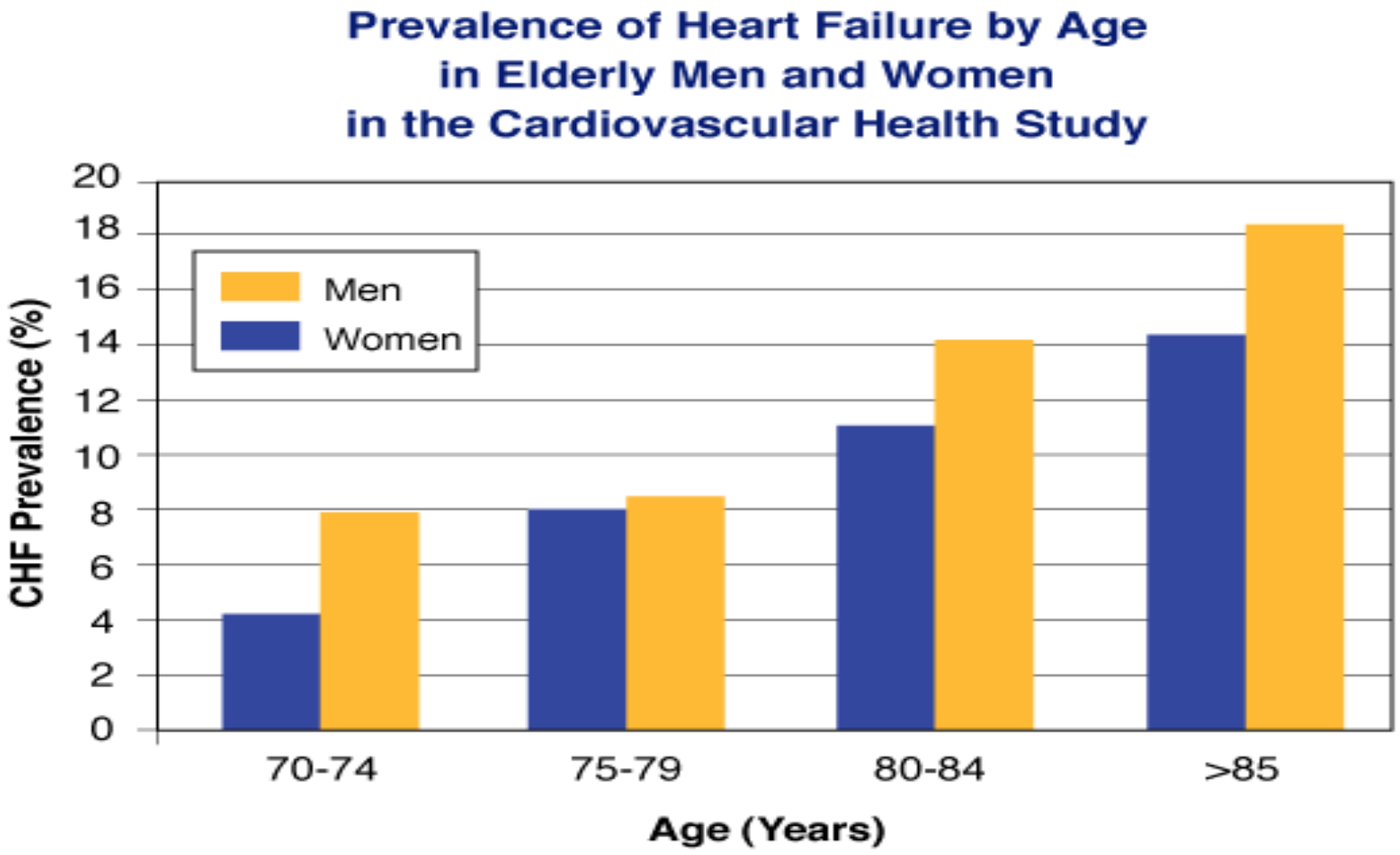
Demographic imperative

Bleumink Eur Heart J 04

- Reduction in CV mortality, *except HF*
  - Better survival, population aging
- Rotterdam study
  - 55-64 yrs 0.9%
  - 65-74 yrs 4%
  - 75-84 yrs 9.7%
  - 85+ yrs 17.4%

Prevalence of Heart Failure by Age and Sex in CHS

HF is predominantly a disorder of the older adult population and of the greater than 5 million adults with HF in the United States, 50% are at least 75 years of age..

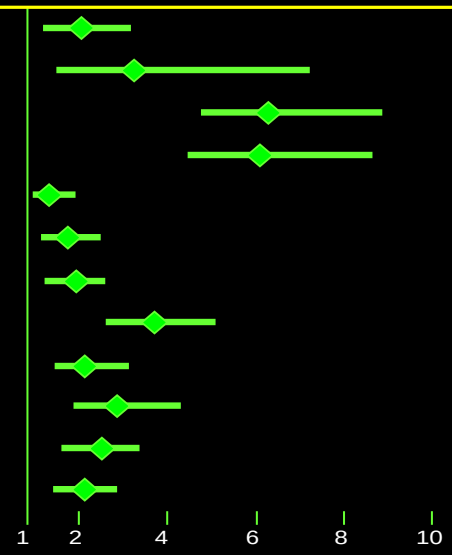


Risk Factors for the Development of HF

Important modifiable risk factors for the development of HF systolic hypertension, ischemic heart disease, diabetes, left ventricular hypertrophy and valvular heart disease among others (obesity, COPD and atrial fibrillation). Among these, systolic hypertension has the greatest population attributable risk, especially among women, for the development of HF, and is the most modifiable

Risk Factors for the Development of HF

Risk Factor	Sex	Age- and Risk-Factor-Adjusted Hazard Ratio (95% CI)	Prevalence (%)	Population-Attributable Risk (%)
Hypertension	M		60	39
	F		62	59
Myocardial infarction	M		10	34
	F		3	13
Angina pectoris	M		11	5
	F		9	5
Diabetes	M		8	6
	F		5	12
Left ventricular hypertrophy	M		4	4
	F		3	5
Valvular heart disease	M		5	7
	F		8	8



Levy D et al. *JAMA*. 1996;275:1557-1562.

Is Heart Failure different in older persons?

HEART FAILURE AND GERIATRIC SYNDROMES

Heart failure mortality

Wang Arch Intern Med 98; Lee Can J Card 04; Jong Arch Int Med 04; Gross Arch Intern Med 88

- most common cause of death in older patients
- one year mortality
  - 33% after first hospitalization
  - over 60% if older, co-morbidities, dementia

Heart failure morbidity

Bowman Postgrad Med J 01; AHA 02; Philips JAMA 04; Lee Can J Card 04; Heckman Can J Card 04; Senni Mayo Clin Proc 97

- most common single cause of hospitalization in > 65 years
- 3 month readmission rates 23% to 50%
- patients over 75 years account for 2/3 of hospital days for HF
- over $30 billion / year in U.S.

HF in Long-Term Care

Butler NZ Med J 99; Porock 05; Wang 98; CIHI 2009

- Common: up to 45% in some homes
- 1-yr mortality over 40%
  - 90% if hospitalized with HF
- 15% of transfers from LTC to acute care
  - 90% admitted via ER
  - Mean length-of-stay 6 days
  - 7.4% spend 8 days awaiting transfer back

Cognition and HF

Vogels Eur J Heart Fail 07; Heckman Clin Interventions Aging 07, Hutt JAMDA 03; Tilvis J Gerontol Med Sci 04; Qiu Arch Intern Med 06

- 60-80% increased risk of cognitive impairment
- in-hospital prevalence may exceed 50%
  - more common in severe HF
  - often delirium
- community: 80% increased risk of decline and of Alzheimer's disease over 5 years

Impact of impaired cognition in HF

Vinson J Am Geriatr Soc 1990; Ekman J Cardiovasc Nurs 2001; Zuccala JNNP 2001; Zuccala Am J Med 2003; McLennan Eur J Heart Fail 2006; Almeida 2001; Antonelli Incalzi 2003; Alves 2005; Trojano 2003; Verhoeghen 2003; Tanne 2005; Lavery 2006; Chriss 04; Jovicic 06; Dickson Am Heart J 07; Woo J Appl Physiol 03; Hutt JAMDA 03

- rehospitalization
  - non-adherence to diet, medications
  - delays in seeking help
- functional decline
- mortality
- *Potentially significant impact on self-care and symptom recognition*

Frailty and HF

Newman J Gerontology: Med Sci 2001

- Cardiovascular Health Study
  - cross-sectional survey, 4735 community adults, mean age 72.7 years
  - ECHO, ECG, ABI, carotid dopplers, risk factors
  - validated frailty instrument: frail if poor performance on 3^{+} of grip strength, weight loss, physical inactivity, poor energy, walking speed
- Prior HF associated with frailty
  - OR 7.51 (4.66, 12.12)

HF and functional decline

Burns J Am Geriatr Soc 1997

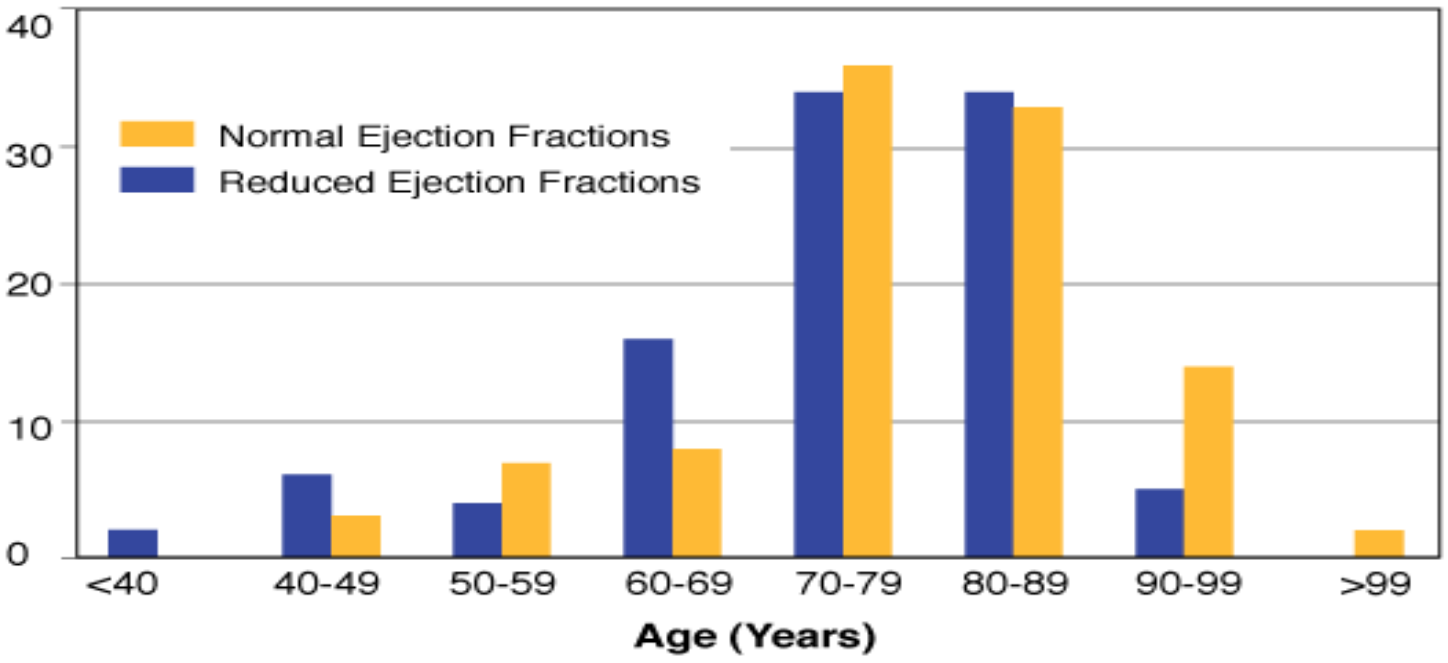
- prospective study 519 patients discharged after HF admission
  - 79+/-8 years, 60.5% women

.

Heart Failure with a Preserved Ejection Fraction (EF) is More Common than Heart Failure with a Reduced EF in Older Adults

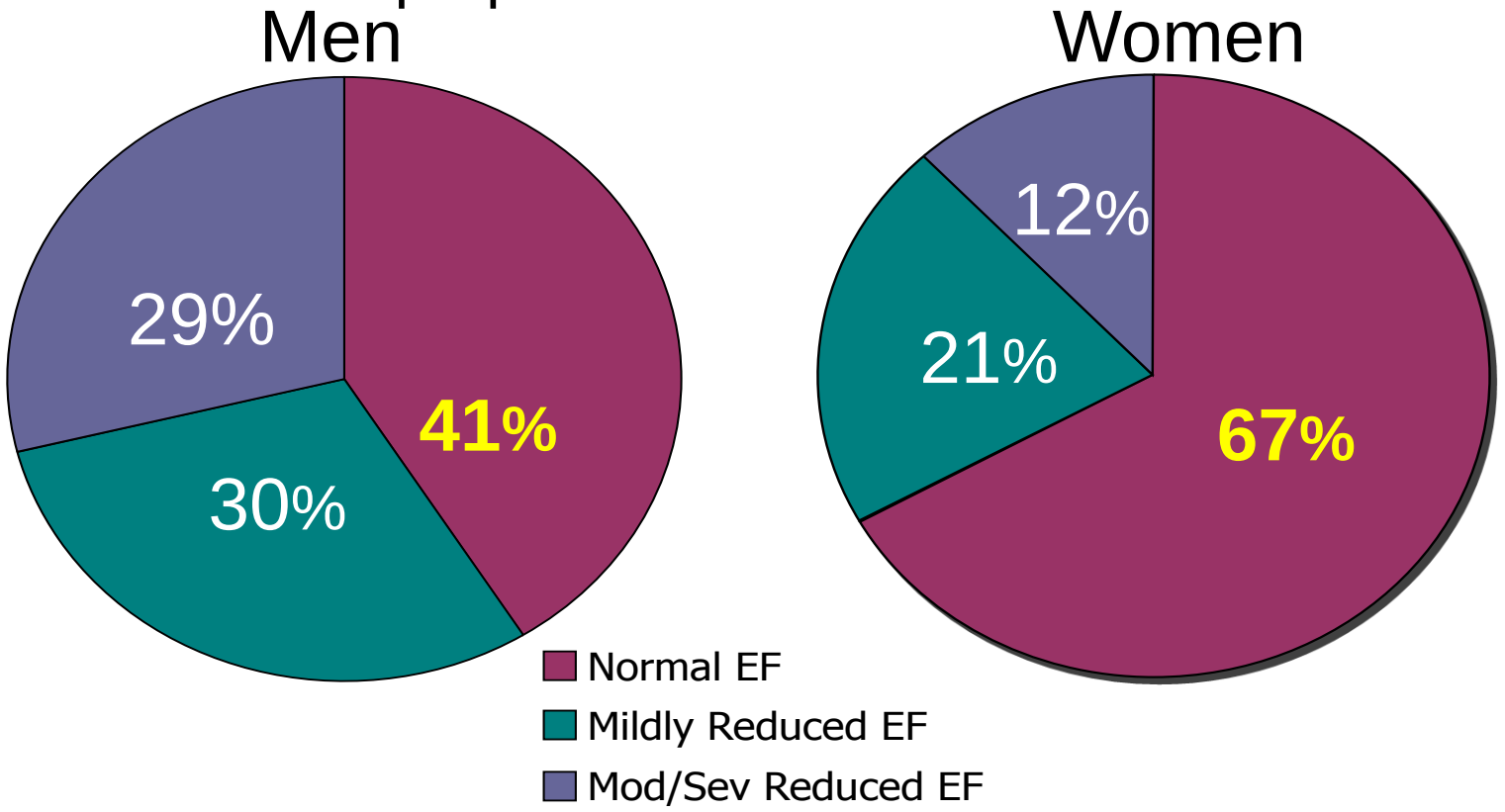
Older patients show a particular propensity for developing HF with preserved LV systolic function (HFNEF) and the proportion with HFNEF increases with advancing age.

Numbers of Patients Hospitalized With Heart Failure in Olmsted County, Minnesota, in 1991 With Normal and Reduced Ejection Fractions



LV Systolic Function in Elderly with HF in CHS

Population-based reports from several studies suggest that 50% or more of elderly HF patients have HFNEF with a female preponderance in HFNEF.



Kitzman DW, Gardin JM, Gottdiener JS, et al. Importance of heart failure with preserved systolic function in patients ≥65 years of age. CHS Research Group. Cardiovascular Health Study. Am J Cardiol 2001;87:413-9

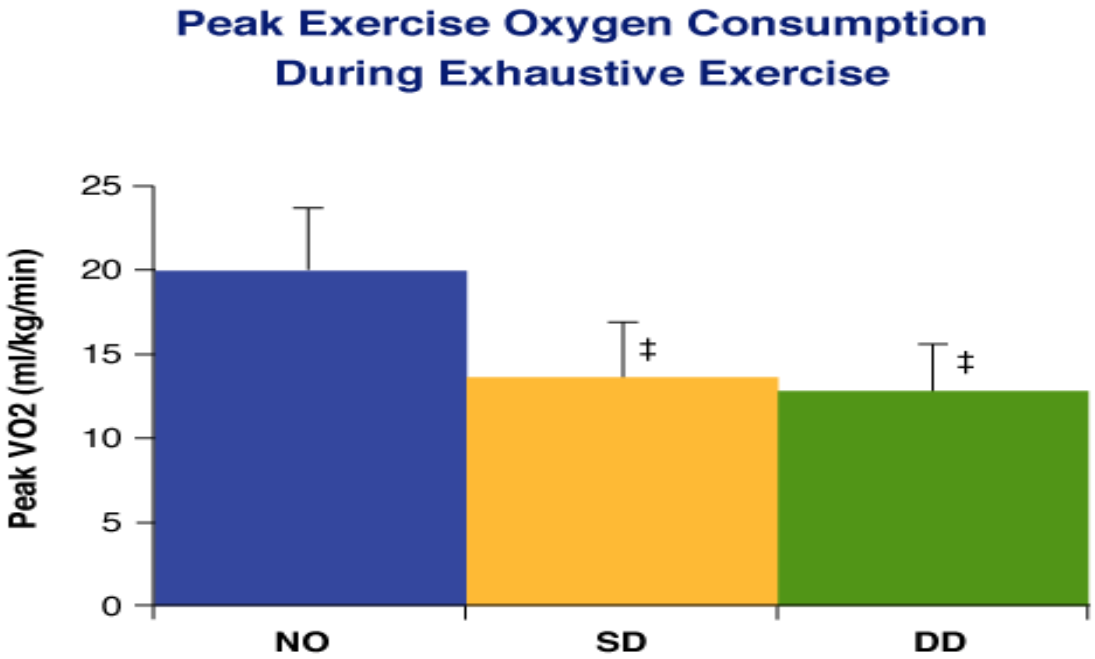
Heart Failure in Older Adults

Compared with younger HF patients, HF is more common in older adults and affected individuals are more likely to be women, and to have antecedent hypertension, less coronary artery disease and multiple comorbid conditions

Characteristic	**Older Adults**	**Middle Aged**
Prevalence	~10%	<1%
Gender	Predominately Women	Predominately Men
Etiology	Hypertension	Coronary Artery Disease
LV Systolic Function	Normal or Preserved	Impaired
Comorbidities	Multiple	Few

Exercise intolerance in Elderly with HF

The primary chronic symptom of HF is exercise intolerance, which can be quantified with cardiopulmonary exercise testing, is related to prognosis, and is similar in severity in older patients with HFNEF compared to those with HFREF

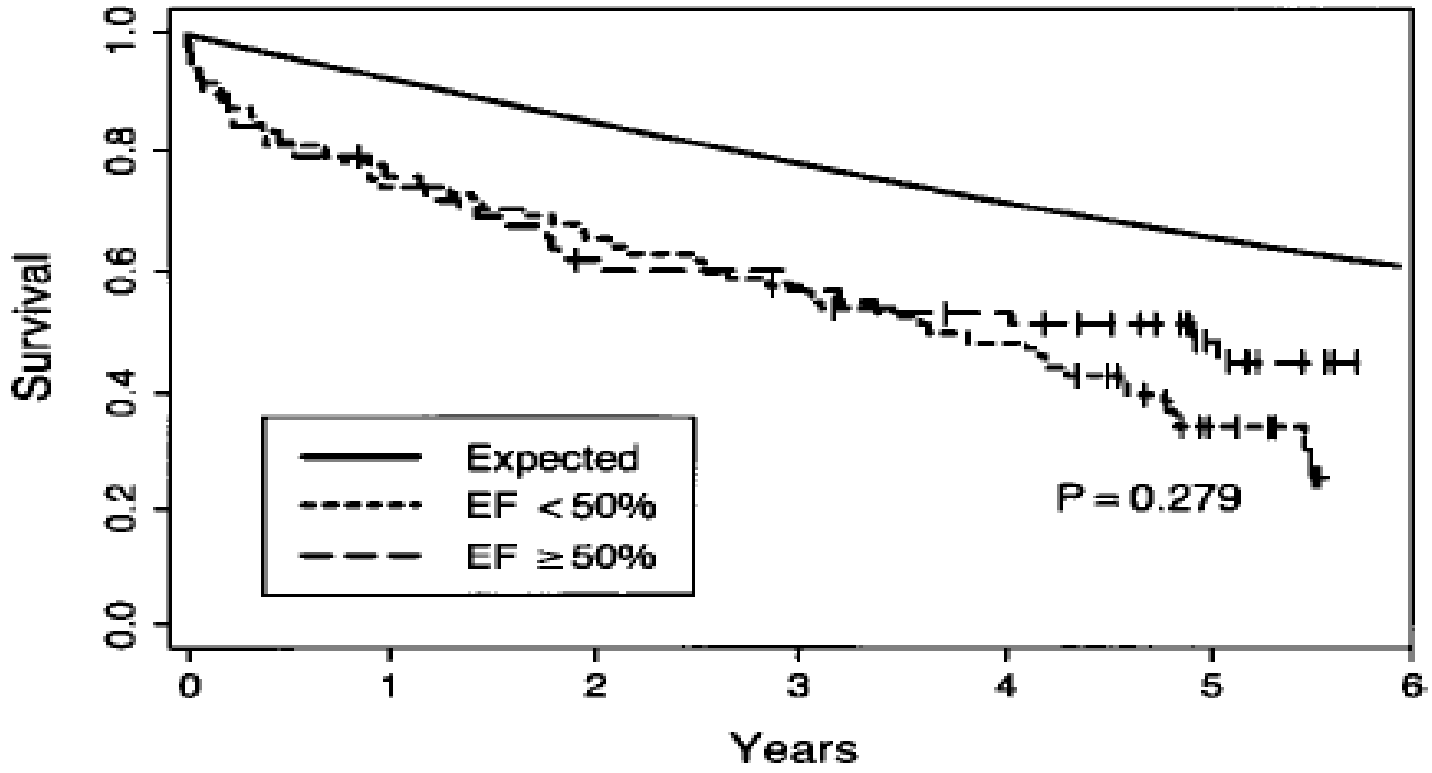


Stratified by Normal (NO), Systolic HF (SD) and HFNEF (DD)

Kitzman et al, JAMA

Mortality with HF Stratified by EF

Elderly HF patients with HFNEF have similar survival to those with HFREF but the modes of death tend to differ with more non-cardiovascular causes among the HFNEF cohort..



EF < 50%	78	58	51	44	36	16
EF ≥ 50%	59	44	35	32	29	15

HEART INSTITUTE

Olmstead County Study Senni et al, Circulation 1998

Associations between Exercise Testing Modalities in Chronic HF

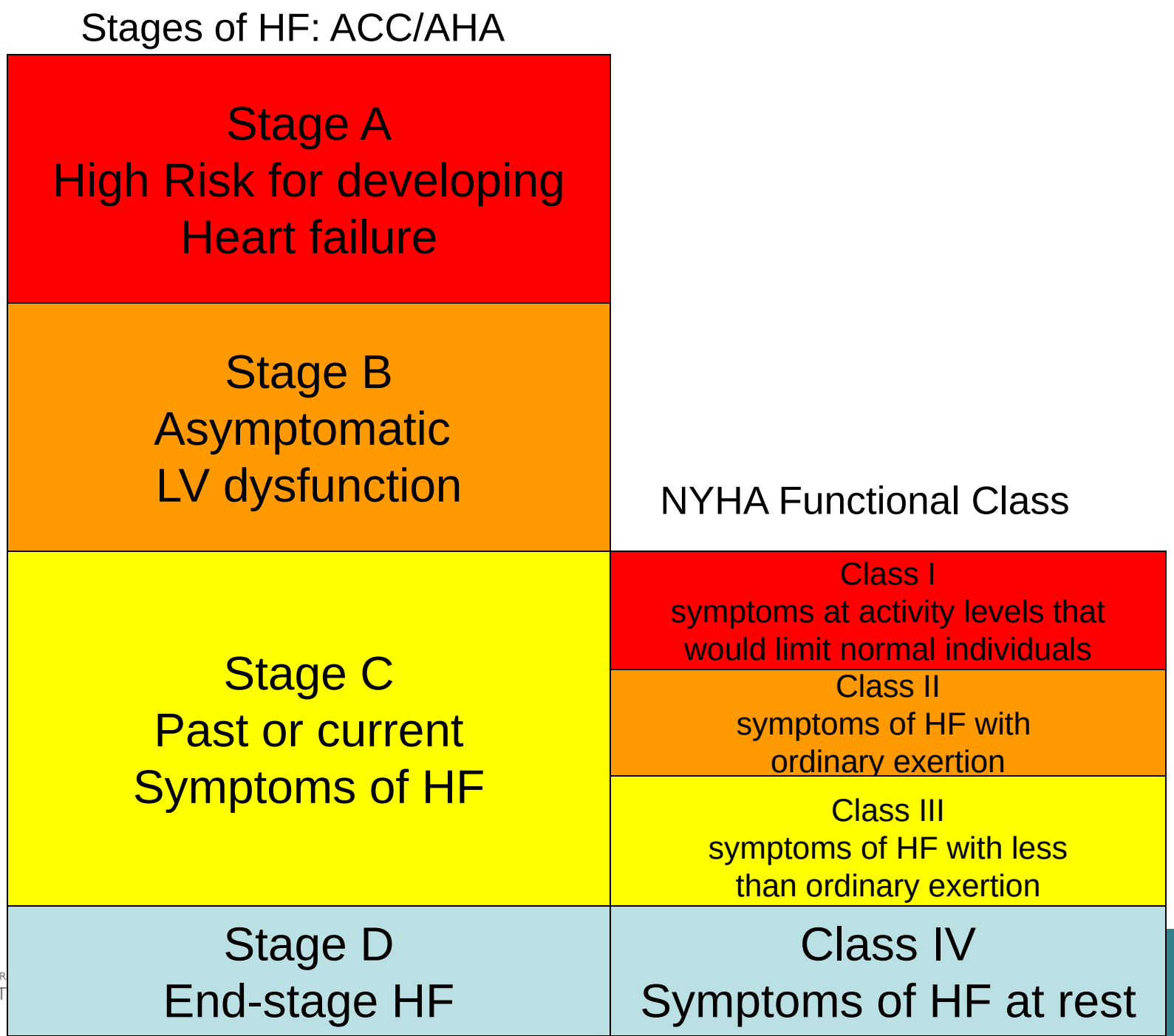
The severity of functional limitation can be evaluated and recorded by metrics, such as NYHA functional class and performance-based measures, including timed and distance walk tests (e.g., the 6-minute walk test) which have prognostic significance and are especially useful for serial follow-up.

NYHA Class	VO_2 Max (ml/kg/min)	MET (MET ~3.5 ml/kg/min)	6-Min Walk (meters)	Duke Activity Index (range 0-60)
I	>20	>6	>450	>37
II	14-20	4-6	300-450	23-37
III	10-14	3-4	150-300	14-23
IV	<10	<3	<150	<14

Challenges in the Clinical History of HF in Older Adults

The diagnosis of HF is challenging in older adults who are more likely to have other conditions that mimic the symptoms and signs of HF.

Atypical Symptoms	Malaise, Confusion, Irritability, Anorexia, Sleep Disturbance, Decreased Activity, Abdominal Complaints
Alternative Explanations for Symptoms	Fluid Retention: Drugs (NSAIDS), Venous Insufficiency Dyspnea: COPD, Anemia, Pneumonia Fatigue: Anemia, Hypothyroidism, Obesity, Deconditioning, Depression
Minimize Symptoms	"I just can't get around, I'm 87"
Fewer Exertional Symptoms	Osteoarthritis, Sarcopenia, Loss of Balance, Poor Vision


Stages of HF: ACC/AHA
Stage A
High Risk for developing
Heart failure
Stage B
Asymptomatic
LV dysfunction
Stage C
Past or current
Symptoms of HF
Stage D
End-stage HF
NYHA Functional Class
Class I
symptoms at activity levels that
would limit normal individuals
Class II
symptoms of HF with
ordinary exertion
Class III
symptoms of HF with less
than ordinary exertion
Class IV
Symptoms of HF at rest

Stages of Heart Failure

COMPLEMENT, DO NOT REPLACE NYHA CLASSES

- **NYHA Classes - shift back/forth in individual patient (in response to Rx and/or progression of disease)**

- **Stages - progress in one direction due to cardiac remodeling**

Diagnosis of HF type by Clinical Signs and Symptoms

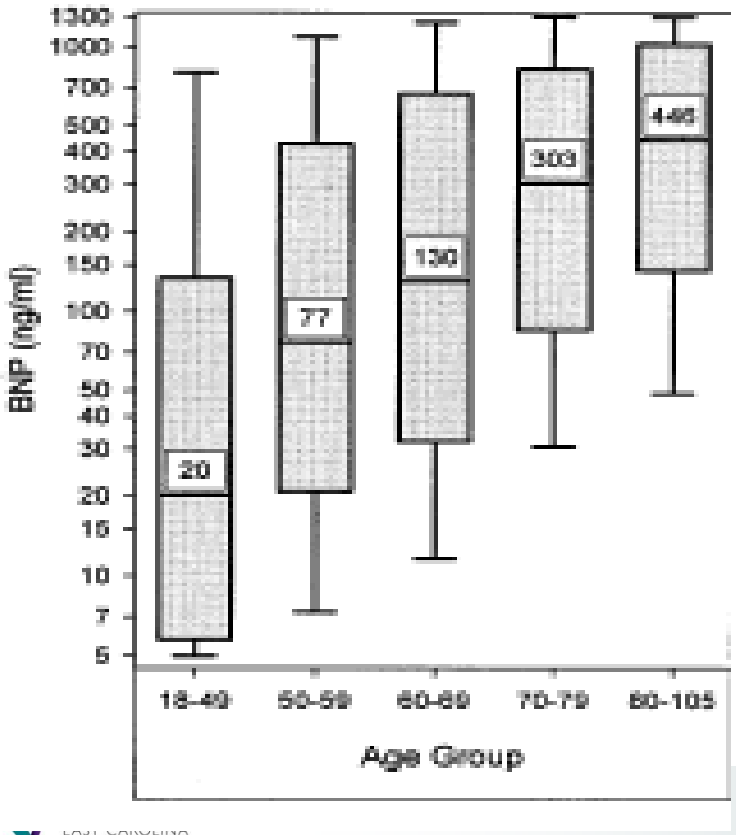
The clinical signs and symptoms of HFREF and HFNEF are similar.

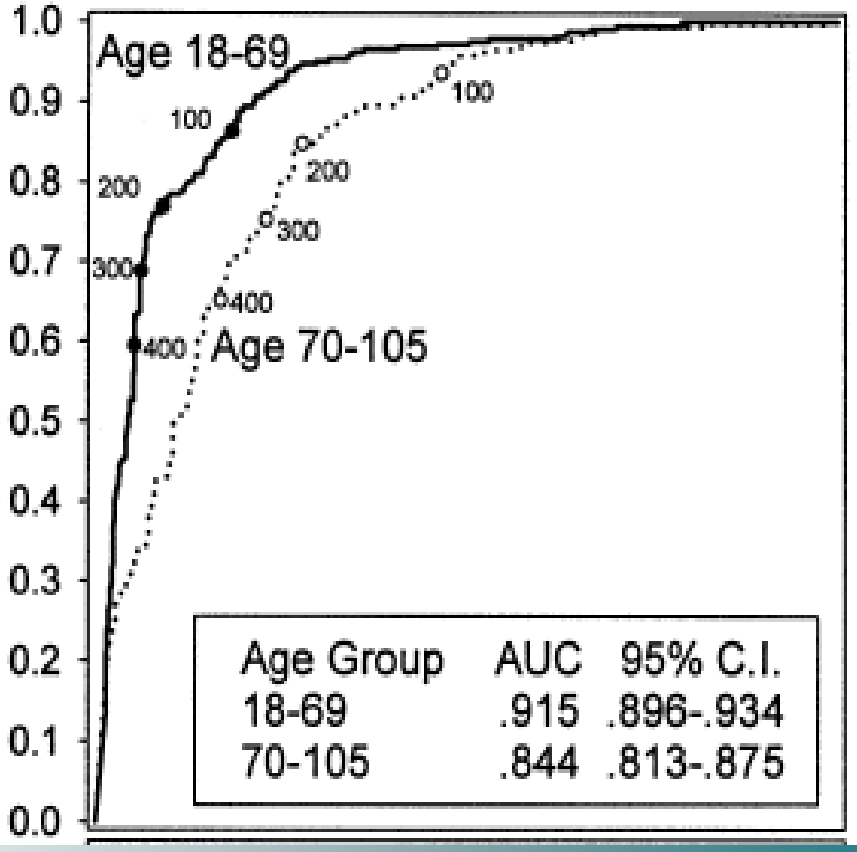
	HFNEF	Systolic HF
Symptoms		
Dyspnea on exertion	85%	96%
PND	55%	50%
Orthopnea	60%	73%
Physical Findings		
Jugular venous distension	35%	46%
Rales	72%	70%
Displaced apical impulse	50%	60%
S3 gallop	45%	65%*
S4 gallop	55%	66%
Edema	30%	40%

Zile MR, Brutsaert DL. *Circulation* 2002; 105: 1389

BNP Test and Age

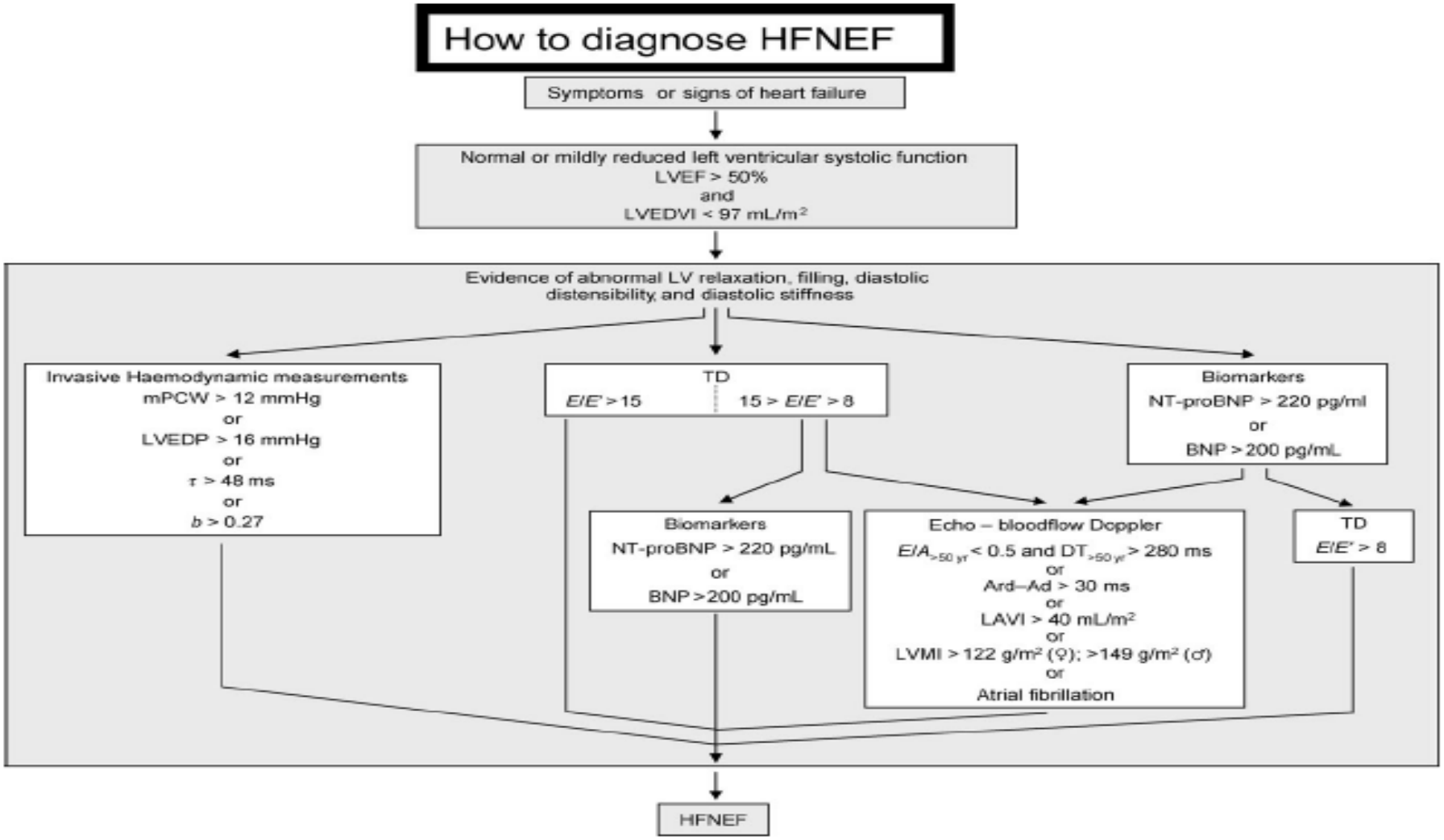
Since natriuretic peptide levels increase mildly with aging, are higher in women than in men, and are affected by renal function and obesity, the specificity of the assays is reduced in older patients, especially in the cohort of older women with HFNEF.





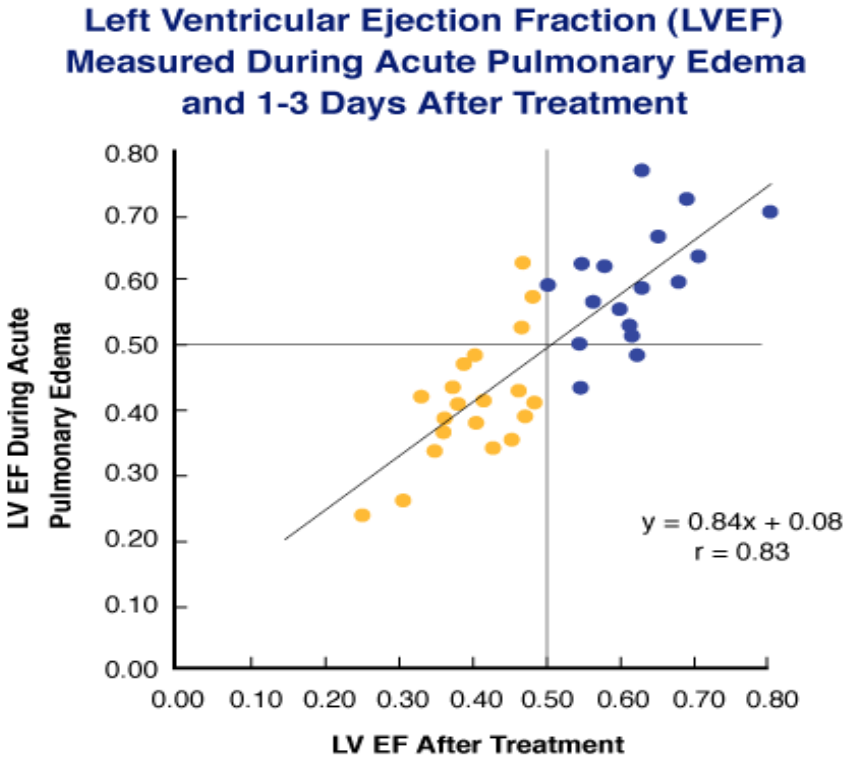
Diagnostic Process for HFNEF

This is a suggested algorithm proposed by the European Society of Cardiology to formalize the diagnosis of HF in the setting of a normal ejection fraction.



EF Measured During Acute Pulmonary Edema Does not Differ From EF after Treatment

Systolic hypertension results in increased afterload and is pivotal in the pathogenesis of acute exacerbations of HFNEF and there is no evidence that transient systolic dysfunction, overt ischemia, or mitral regurgitation played a primary role in the pathogenesis of pulmonary edema.



EAST CAROLINA HEART INSTITUTE

Gandhi SK, Powers JC, Nomeir AM, et al. The pathogenesis of acute pulmonary edema associated with hypertension. N Engl J Med 2001;344:17-22.

Managing Heart Failure

Filling in the evidence gap – a work in progress …

Atypical disease presentation

Jarrett Arch Intern Med 1995

- 193 medical inpatients age 78+/-8 yrs
- frail more likely to present atypically (59% vs. 25%, p<.001)
    - delirium, functional decline, falls, immobility
    - cardiac, infection, metabolic disturbance

Effect of Antihypertensive Therapy on Incident HF in Older Adults

Adequate control of systolic hypertension is the single most effective strategy for management and prevention of HF in older persons.

Effect of Antihypertensive Therapy on Incident Heart Failure			
Trial	**N**	**Age Range (years)**	**Relative Risk Reduction (%)**
European Working Party[1]	840	>60	22%
Coope and Warrender[2]	884	60-79	32%
Swedish Trial[3]	1,627	70-84	51%
SHEP[4]	4,736	≥60	55%
Syst-Eur[5]	4,695	≥60	36%
STONE[6]	1,632	60-79	68%
HYVET[7]	3,845	≥80	64%

(1) Amery A, Birkenhäger W, Brixko P, et al. Mortality and morbidity results from the European Working Party on High Blood Pressure in the Elderly trial. Lancet 1985;1:1349-54.

(2) Coope J, Warrender TS. Randomised trial of treatment of hypertension in elderly patients in primary care. Br Med J (Clin Res Ed) 1986;293:1145-51

(3) Dahlöf B, Hansson L, Lindholm LH, Scherstén B, Ekbom T, Wester PO. Swedish Trial in Old Patients with Hypertension (STOP-Hypertension) analyses performed up to 1992. Clin Exp Hypertens 1993;15:925-39.

(4) Kostis JB, Davis BR, Cutler J, et al. Prevention of heart failure by antihypertensive drug treatment in older persons with isolated systolic hypertension. SHEP Cooperative Research Group. JAMA 1997;278:212-6.

(5) Slovick DI, Amery A, Birkenhager W, et al. SYST-EUR multicentre trial on the treatment of isolated systolic hypertension in the elderly: first interim report. J Hum Hypertens 1993;7:201-3.

(6) Gong L, Zhang W, Zhu Y, et al. Shanghai trial of nifedipine in the elderly (STONE). J Hypertens 1996;14:1237-45.

(7) Beckett NS, Peters R, Fletcher AE, et al., on behalf of the HYVET Study Group. Treatment of hypertension in patients 80 years of age or older. N Engl J Med 2008;358:1887-98.

Co-Morbid Conditions in Older Adults with Heart Failure

Comorbid conditions predispose older patients to the development of HF and also increase symptom severity, worsen prognosis, and complicate management.

Condition	Prevalence in HF	Potential Consequences	Assessment Technique
Renal Dysfunction	16%: GFR ≤30 ml/min 40%: GFR 30 - 59 ml/min	Worsens symptoms, prognosis; exacerbated by diuretics, ACE inhibitors, and ARBs.	Cockroft-Gault Formula MDRD Formula
Chronic Lung Disease	20% to 32%	Worsens symptoms, prognosis; exacerbates right heart function	Pulmonary Function Tests
Dementia/ Delirium	Dementia: 8.5% Delirium: ~50% of hospitalized	Worsens non-adherence	Mini-Mental State Examination Mini-Cog; CAM (Confusion Assessment Methodology)
Diabetes	30-50%	Worsens prognosis; risk of vascular disease, dementia, CKD, and anemia	Blood glucose; Glycosylated hemoglobin
Depression	8%	Worsens prognosis; exacerbates symptoms	Geriatric Depression Scale
Falls, Mobility	30-50%	Exacerbated by diuretics and vasodilators, impairs mobility, and interferes with follow-up	Timed Get up and Go; Tinetti Gait and Balance Scale; Berg Balance Scale
Postural Hypotension	Postural: 10-30% Postprandial: 10-20%	Worsened by diuretics, vasodilators	Orthostatic/postprandial blood pressure measurements;
Anemia	Inpatient: 70% Outpatient: 10-20%	Worsens symptoms, increases risk of hospitalization	Complete blood cell count
Urinary Incontinence	Women 35% > Men 22%	Aggravated by medical therapy (diuretics, ACE cough)	Bladder diary
Sensory Impairments	24%: Ocular disorders	Worsens non-adherence, increases medication errors	Hearing loss screener; Snellen eye chart
Frailty	30-50%	Worsens symptoms, prognosis, quality of life	ADL's; IADL's; Frailty
Fatigue / Anergia	Mild- mod – 70% Severe – 20%	Worsens symptoms, complicates diagnosis	Anergia scale
Nutritional Deficiencies	>30%	Exacerbated by dietary restrictions	Dietary Questionnaires Specific vitamin and nutrient levels
Polypharmacy	-Almost all.	Worsens non-adherence, medication interaction and adverse drug reaction	Greater than 4 medications

Management of HF

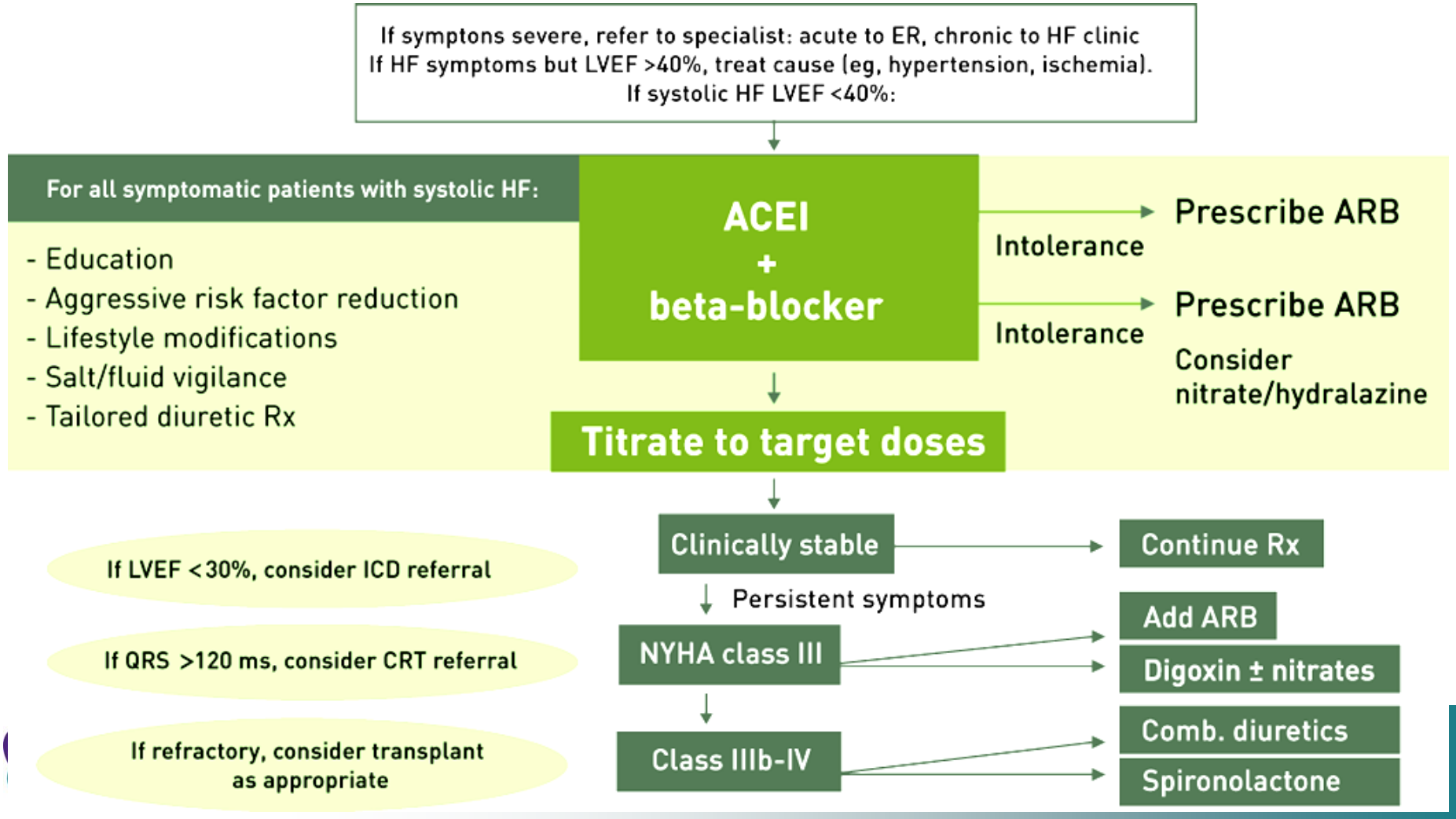
Arnold, Liu et al Can J Card 2006; Gross Arch Intern Med 88; Field Arch Intern Med 01; Heiat Arch Intern Med 02; Fuat BMJ 03

- CCS guidelines recommend usual medications for elderly *although use may depend on concomitant conditions*
- Potential benefits on cognition, function, mood, sleep
  - Particularly ACE-I

Philbin Am J Cardiol 96; Arling Ann Long Term Care 98; Ahmed J Am Geriatr Soc 02; Hutcheon Heart 02; Gambassi Arch Intern Med 00; Zuccala Eur Heart J 05; Heckman J Am Geriatr Soc 06; Connolly Pharmacoepi Drug Safety 98)

Management of systolic HF

Arnold, Liu et al Can J Card 2006



ACE-I Trials in Symptomatic HF

	Mortality %	Mortality %	
	ACE-I	Control	RR
Chronic HF			
CONSENSUS			6
SOLVD Treatm			2
Post-MI			
SAVE			1
AIRE	17	23	0.73
TRACE	35	42	0.78
Avg mortality	21%	25%	16%

IA
ACE-I should be used in all patients with reduced EF, unless contraindicated or unable to tolerate them.

ACE Inhibitors

Philbin Am J Cardiol 96; Arling Ann Long Term Care 98; Ahmed J Am Geriatr Soc 02; Hutcheon Heart 02; Gambassi Arch Intern Med 00; Zuccala Eur Heart J 05; Heckman J Am Geriatr Soc 06; Connolly Pharmacoepi Drug Safety 98

- fewer deaths, hospitalizations
  - including pts with chronic renal insufficiency
- slower functional decline vs. digoxin
- greater cognitive improvement in hospital, dose-response observed
- greater improvements in physical function
- potential benefits on mood, sleep, psychosis, nocturia

Clinical Data for BB with Systolic HF by age

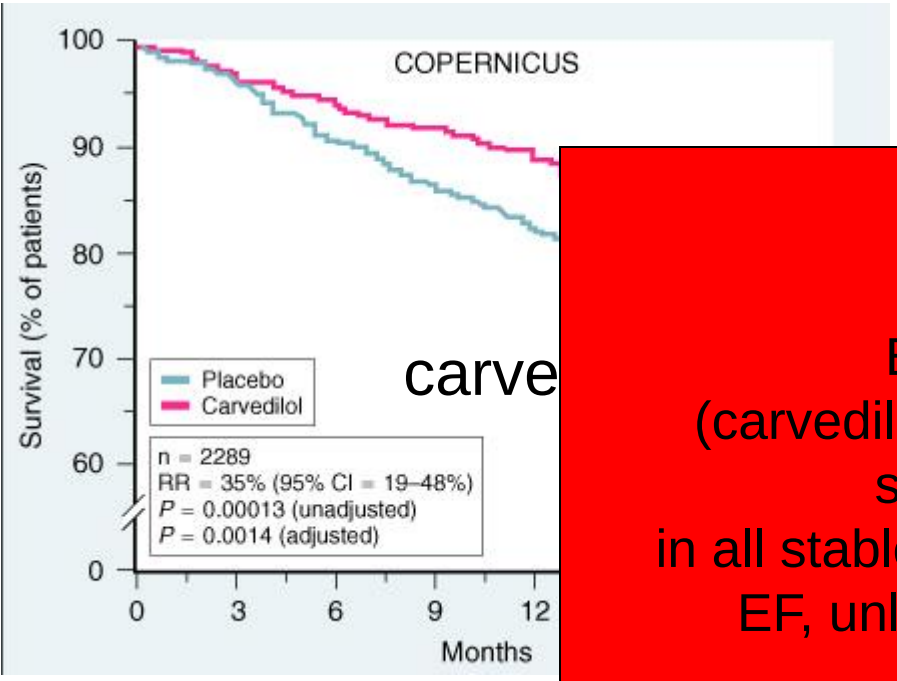
Long-term beta-blockade is beneficial in patients with HFREF and patients up to the age of 80 have been included in these trials with subgroup analyses indicate that beta-blockers are as effective in older as in younger adults

Clinical Trial Data for Beta-Blockers in Patients With Systolic Heart Failure: Effect on Mortality Stratified by Age

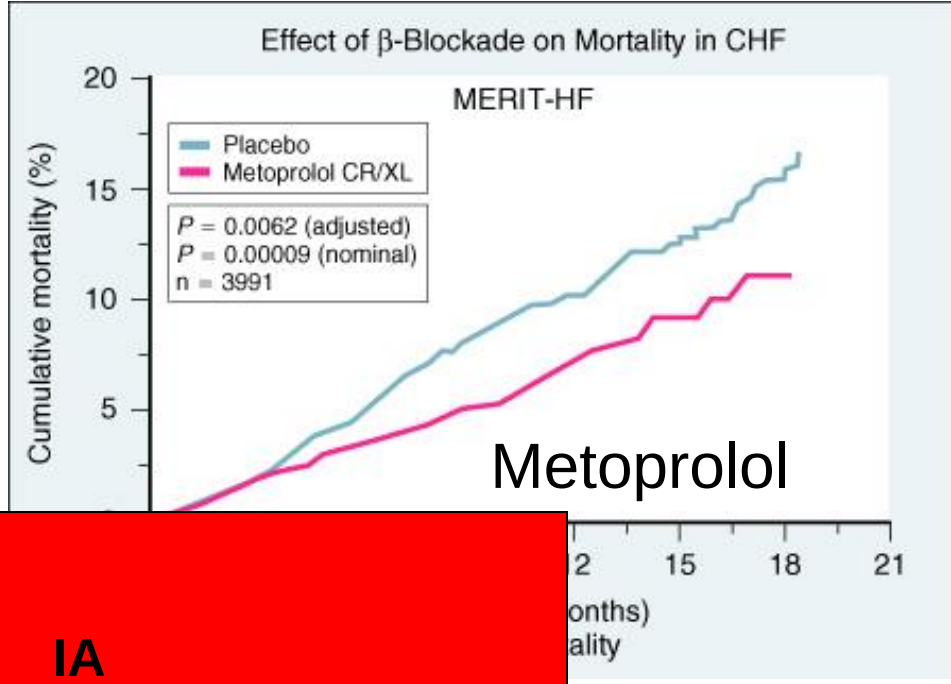
Trial	*Beta-Blocker*	*Total*	*# of Elderly Subjects*	*Definition of Elderly*	*RR Overall (95% CI)*	*RR for Elderly (95% CI)*
BEST	Bucindolol	2,708	1,095	≥65 years	0.91 (0.78-1.07)	0.91 (0.78-1.05)
US Carvedilol	Carvedilol	1,094	554	≥59 years	0.45 (0.24-0.86)	0.35 (0.14-0.88)
CIBIS-II	Bisoprolol	2,647	539	≥71 years	0.70 (0.49-0.99)	0.66 (0.53-0.82)
COPERNICUS	Carvedilol	2,289	1,102	≥65 years	0.75 (0.58-0.98)	0.57 (0.41-0.80)
MERIT-HF	Metoprolol	3,991	1,330	Upper tertile vs. others	0.70 (0.52-0.95)	0.61 (0.47-0.80)
SENIORS	Nebivolol	2,128	1,064	≥75 years	0.92 (0.75-1.12)	0.79 (0.63-0.98)

*Hazard ratio composite of all-cause mortality or cardiovascular hospital admission

Beta-blockers in HF

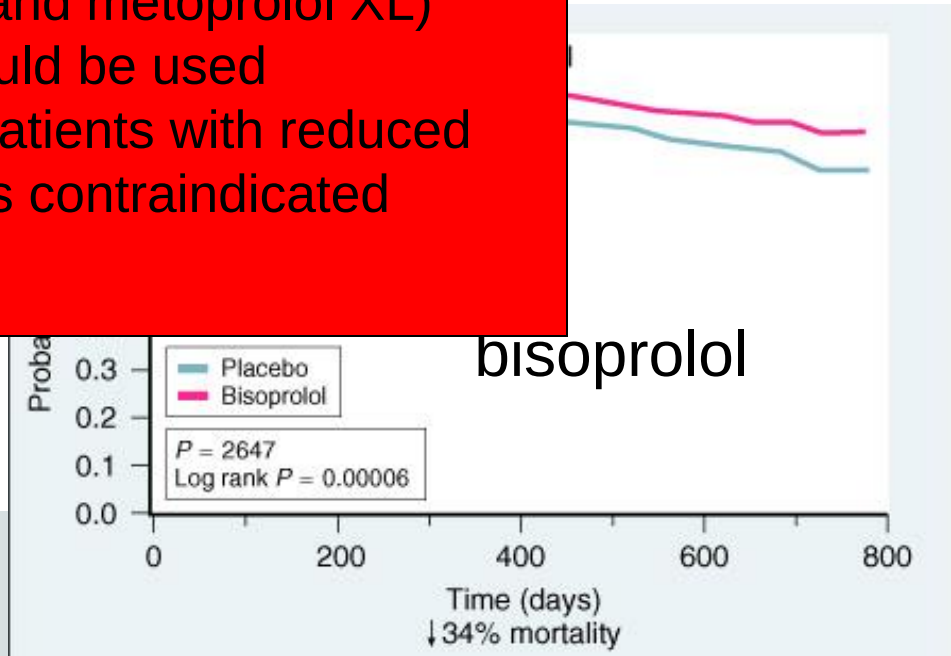


carve



Metoprolol

IA
Beta-blockers
(carvedilol and metoprolol XL)
should be used
in all stable patients with reduced
EF, unless contraindicated



bisoprolol

EAST CAROLINA
HEART INSTITUTE

Starting and Target Doses for Beta-blockers in Heart Failure

Agent	Starting Dose	Target Dose <75kg	Target Dose >75kg
Metoprolol CR/XL			200mg po daily
Bisoprolol			10mg po daily
Carvedilol	3.125mg po twice daily	25mg po twice daily	50mg po twice daily

IB

Beta-blockers should be initiated at very low doses, followed by gradual increments, in patients who have no or minimal evidence of fluid retention and have not required recent treatment with an IV inotropic agent

Beta-blockers

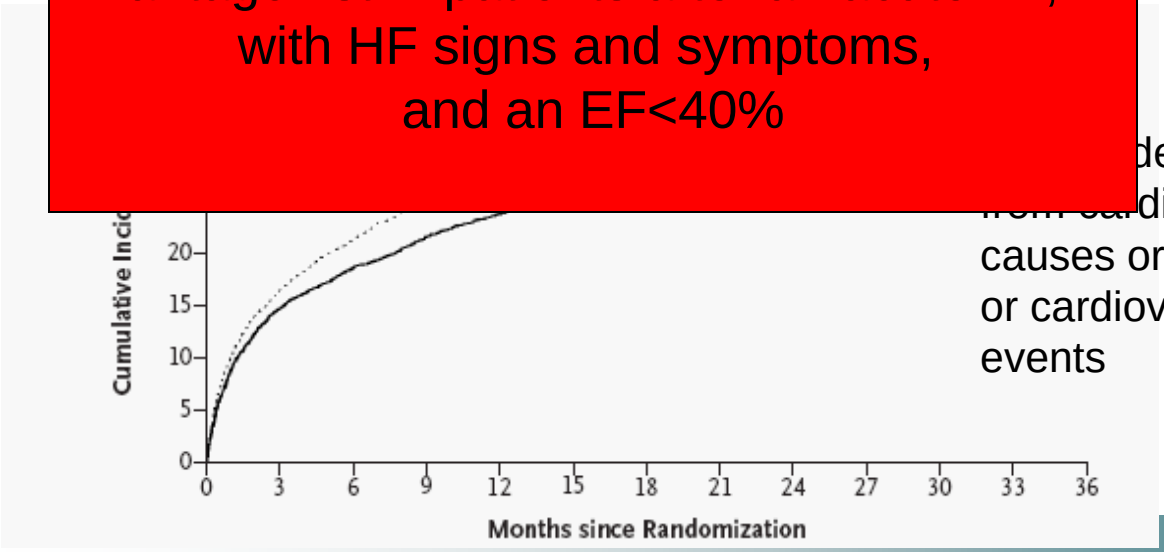
Chan Am Heart J 2005; Flather Eur Heart J 2005

- Cardiovascular Health Study
  - 950 pts, incident HF, 80+/-6 yrs
  - lower mortality: HR 0.74 (0.56-0.98)
- SENIORS: RCT (Nebivolol)
  - 2128 pts 70 yrs and over, f/u 2 years
  - lower death/CV hospitalization: HR 0.86 (0.74-0.99)
- Geriatric outcomes??

EPHESUS: Eplerenone for LV Dysfunction after MI

- Selective aldosterone blocker in 6632 patients
- Post-MI day 3-14, EF<40%, and CHF
- Exclusion
- Median fo

IB
Addition of an aldosterone antagonist in patients after an acute MI, with HF signs and symptoms, and an EF<40%



death
cardiovascular
causes or hospitalization
or cardiovascular
events

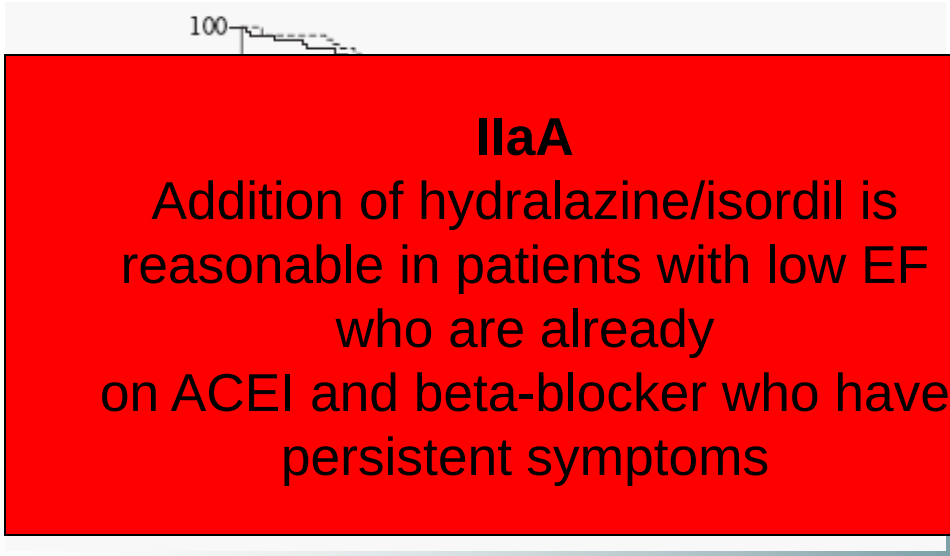
EAST CAROLINA
HEART INSTITUTE

Pitt et al. *NEJM* 2003;348:1309.

Hydralazine/Isordil

Study		years
V-Heft I		.028)
V-Heft II		.016)

IIbC
Combination hydralazine/isordil may be reasonable in patients with low EF and current or prior symptoms who cannot be given ACEI or ARB because of renal insufficiency or intolerance



IIaA
Addition of hydralazine/isordil is reasonable in patients with low EF who are already on ACEI and beta-blocker who have persistent symptoms

EAST CAROLINA HEART INSTITUTE

Taylor et al. NEJM 2004;351:2049.

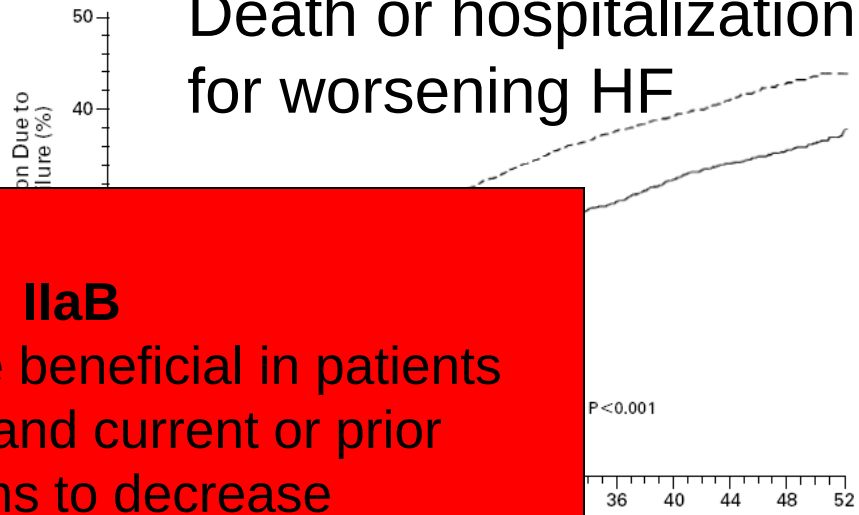
Digoxin: Improvement in symptoms but not survival

- Digitalis investigation group
- 6800 patien
- EF<45%
- Past or curr of HF
- On ACEI ar

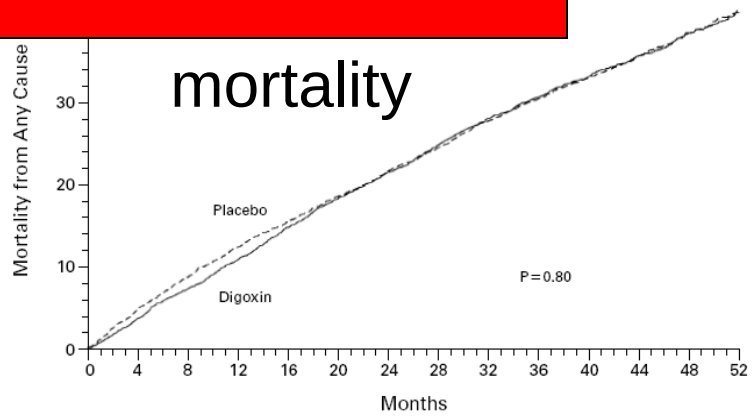
IIaB

Digitalis can be beneficial in patients with low EF and current or prior symptoms to decrease hospitalizations for HF

Death or hospitalization for worsening HF



mortality



NEJM 1997;336:525.

ACC/AHA Heart Failure Guidelines HFNEF

Recommendation	Class
Control systolic and diastolic hypertension	I
Ventricular rate control in patients with atrial fibrillation	I
Diuretics to control congestion and edema	I
Coronary revascularization is reasonable in patients with symptomatic coronary artery disease	IIa
Restoration and maintenance of sinus rhythm in patients with atrial fibrillation might be useful to improve symptoms	IIb
Beta-blocking agents, ACE inhibitors, AT II receptor blockers, or calcium antagonists might be effective to minimize symptoms	IIb
The use of digitalis is not established	IIb

Hunt et al. ACC/AHA Practice Guidelines JACC 2005;46:1-82

Management of HF in LTC

- LTC residents with HF less likely to receive recommended therapies
- concerns cited:
  - multiple co-morbidities
  - adverse drug reactions
  - generalizability and relevance of trials
  - diagnostic uncertainty: autopsy study found 30% of HF deaths misdiagnosed

Heart failure management

Phillips JAMA 04; Gwadry-Sridhar 04; AMDA 02; Martinen 04; Valle 01; Mentes 02; Resnick 04; Colón-Emeric 07; Grimshaw 04; Greenhalgh 04; Lewis 05; Harrington 08

- Multidisciplinary approach to HF care:
  - systematic reviews suggest lower morbidity and possibly lower mortality
- HF management in LTC in U.S. and Italy suggest improved outcomes
- However
  - targeted relatively high function patients
  - did not address geriatric syndromes directly
  - not developed with end-user input

Final thoughts

- HF is a significant health problem among seniors
- Geriatric syndromes central features of HF
- Recommended HF-specific therapies can improve symptoms
  - particularly ACE inhibitors
- Importance of multidisciplinary approach and disease management, but model needs to be developed for LTC

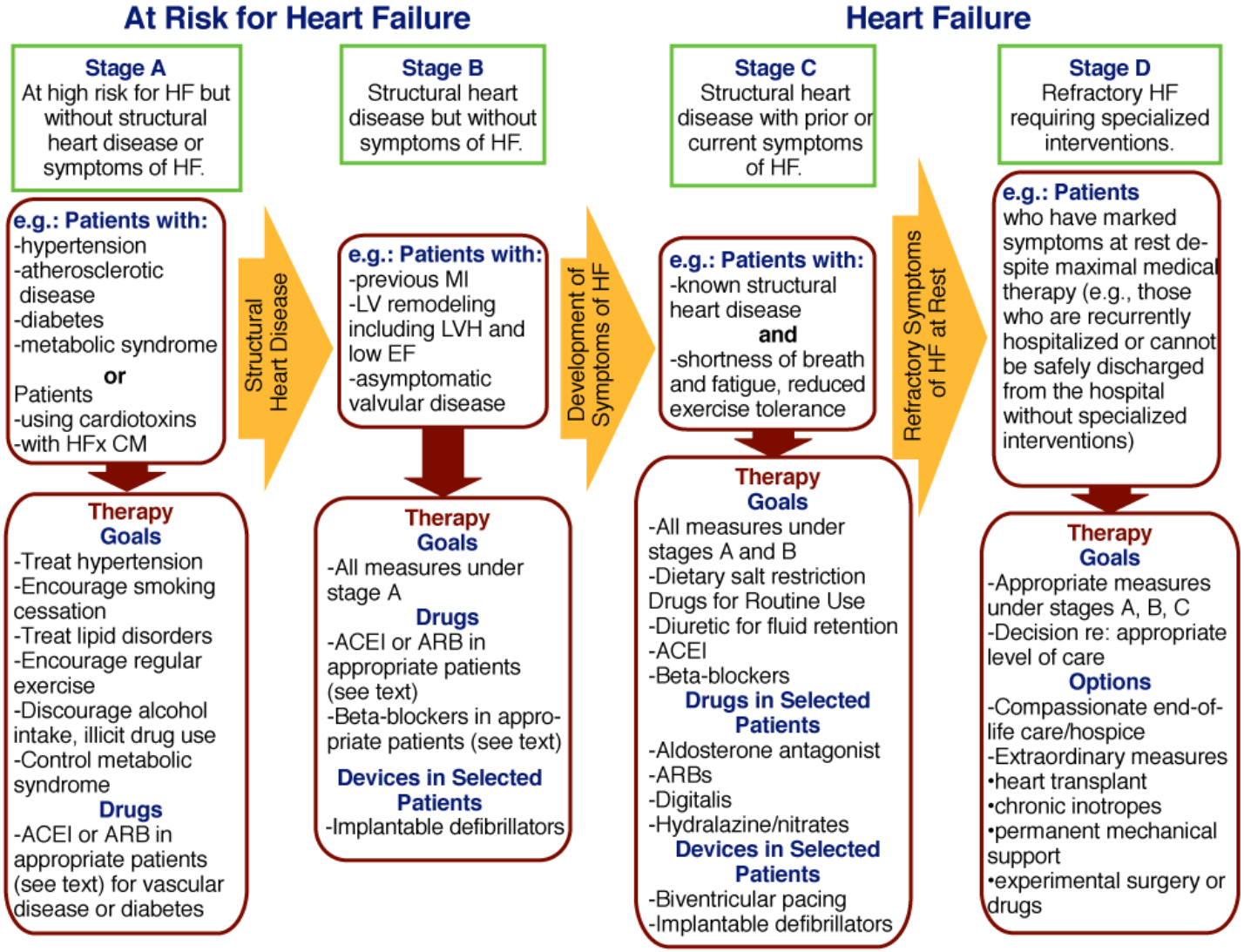
Heart Failure Pearls

- Use IV Lasix (instead of oral) for inpatients
  - Lowers pulmonary pressures, rapid symptom relief
- Use nitropaste in the ED
  - Lowers pulmonary pressures, rapid symptom relief
- Be aggressive in patients with normal EF, good BP and normal renal function
- Go slowly in patients with HCM, cor pulmonale, severe AS and low EF
  - Preload dependent
- Closely monitor renal function
- Don't be afraid of beta-blockers

Heart Failure Pearls

- Titrate up quickly on ACE-I, ARB and hydralazine/isordil while inpatient
- Titrate up slowly on beta-blockers as an outpatient
- Rate control is critical
- Stay ahead on electrolyte replacement
- Check weights, I/Os, telemetry on patients daily
- Review the echo
- Review fluid, salt restrictions and medication compliance with patients at each outpatient visit

Questions?



EAST CAROLINA HEART INS