

Heart Failure Primer: 2015

4.28.15

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Heart Failure Educational Resources



www.HFSA.org



www.heart.org

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Plan:

- Define What is Heart Failure
- Who Gets It (Epidemiology)
- What Causes It (Etiology)
- Types of Heart Failure
- Classification Systems
- Diagnostics
- Therapeutics
- Prognostics

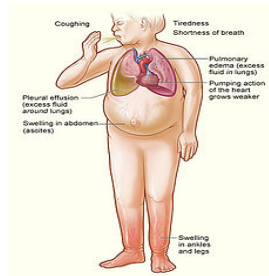
Case Presentation

- ***A 47 year old woman is a loyal 15 year employee of the US Cathode Ray Manufacturing.***
- ***She went for a regular checkup and a breast mass was discovered. Mammography led to a breast biopsy and a diagnosis of breast cancer. She was on a leave from work for 16 weeks to have a mastectomy and went through a course of chemotherapy and radiation and maintenance therapy. Her heart function was tested prior to beginning therapy and was normal.***
- ***At the end of 16 weeks she returned to work. A new supervisor had arrived and told the woman that the “only job he could offer her was the one she left—take it or leave it” She accepted the job.***
- ***At the end of 4 months she began to get short of breath limiting her job performance.***
- ***A detailed evaluation showed no evidence of recurrent cancer but a profound form of heart failure.***



Definition

- Heart failure, sometimes known as congestive heart failure, occurs when your heart muscle doesn't pump blood as well as it should. Certain conditions, such as narrowed arteries in your heart (coronary artery disease) or high blood pressure, gradually leave your heart too weak or stiff to fill and pump efficiently.

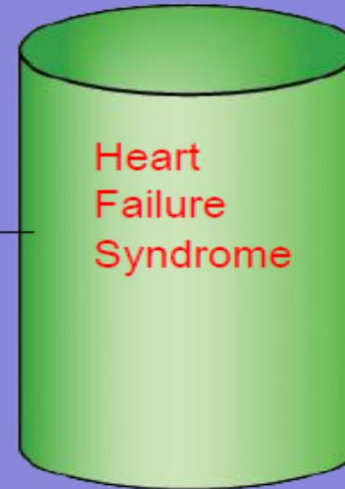
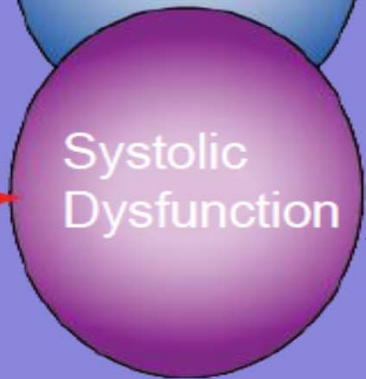




Obesity
Diabetes
Hypertension
Abn. Sleep



Hypertension
Smoking
Lipids
Diabetes



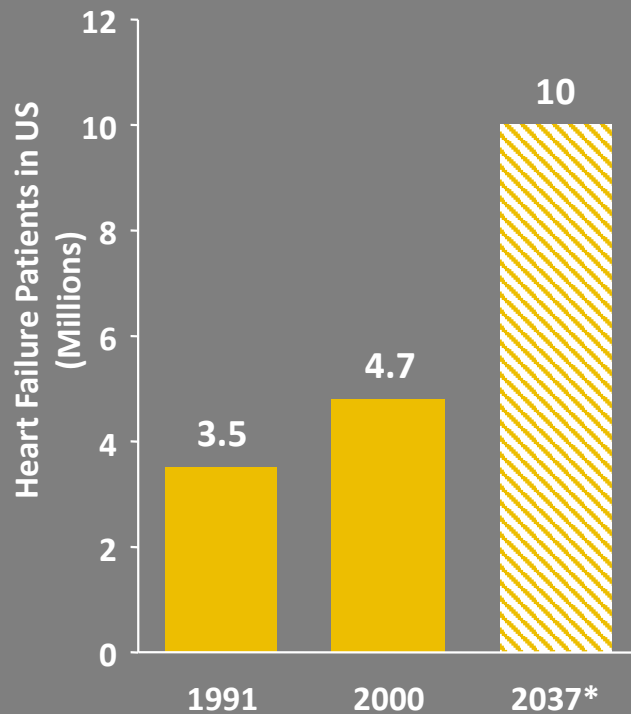
LV Remodels



Time Months



The Epidemic of Heart Failure in the US



- More deaths from heart failure than from all forms of cancer combined
- 550,000 new cases/year
- 4.7 million symptomatic patients; estimated 10 million in 2037

*Rich M. *J Am Geriatric Soc.* 1997;45:968–974.

American Heart Association. 2001 *Heart and Stroke Statistical Update.* 2000.

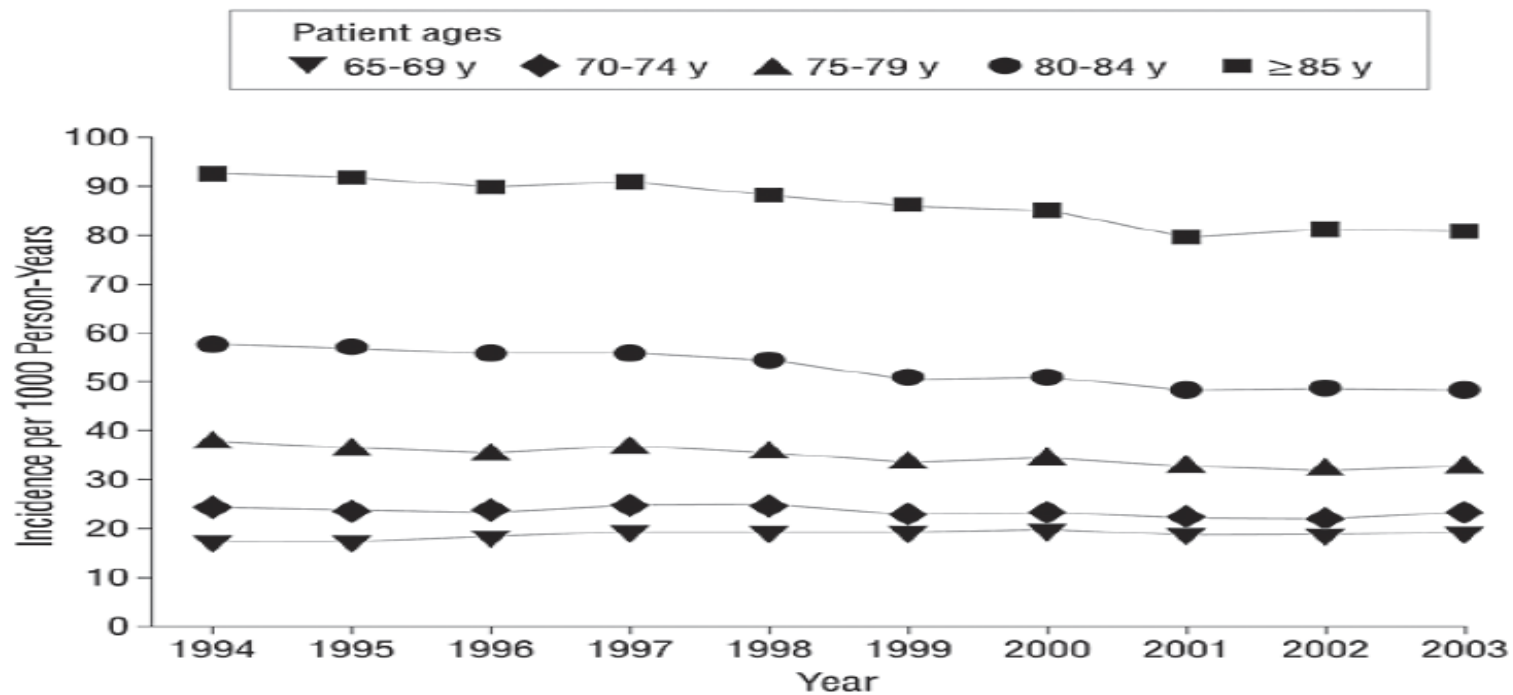
Economic Impact

- 5.8 million subjects in the United States have HF
- > 550,000 patients are diagnosed each year.
- 15 million office visits
- 6.5 million hospital days each year.
- Annual number of hospitalizations
 - > 1 million as primary diagnosis
 - > 3million as primary or secondary diagnosis.
- Re-hospitalization rates post-discharge
 - 25% within one month
 - 50% within 6 month
- The estimated direct and indirect cost of HF in the United States for 2010 is \$39.2 billion

AHA/ACC 2005 heart failure guidelines
AHA Heart disease and stroke statistics 2010

Incidence – Age Medicare Population

Curtis L, Arch Intern Med 2008;168:418-424



Heart Failure Prevalence

Trends in Elderly Curtis L et al Arch Int Med 2008-168: 418-424

Prevalence

Rates per 1000 eligible Medicare beneficiaries. P<0.01 for all trends

Year	Female	Male	Total
1994	86.3	95.4	89.9
1995	94.0	103.7	97.9
1996	100.4	110.4	104.4
1997	105.6	117.1	110.3
1998	109.7	122.6	114.9
1999	112.4	125.6	117.8
2000	114.4	127.9	119.9
2001	114.4	128.3	120.1
2002	114.6	128.2	120.2
2003	115.1	129.2	121.0

Hospitalizations – Major cost driver

Table 20-1. Estimated Direct and Indirect Costs (in Billions of Dollars) of CVD and Stroke: United States: 2010¹⁻⁵

	Heart Diseases*	CHD	Stroke	Hypertensive Disease	HF	Total CVD†
Direct costs						
Hospital	\$110.2	\$56.6	\$21.0	\$8.5	\$20.9	\$155.7
Nursing home	\$24.7	\$13.0	\$17.1	\$5.1	\$4.7	\$50.8
Physicians/other professionals	\$24.7	\$13.9	\$3.8	\$13.9	\$2.5	\$48.1
Drugs/other						
Medical durables	\$21.5	\$10.0	\$1.3	\$24.7	\$3.2	\$50.7
Home health care	\$8.3	\$2.5	\$5.0	\$2.7	\$3.8	\$18.8
Total expenditures‡	\$189.4	\$96.0	\$48.2	\$54.9	\$35.1	\$324.1
Indirect costs						
Lost productivity/morbidity	\$25.6	\$11.3	\$7.5	\$9.0	...	\$41.7
Lost productivity/mortality‡	\$101.4	\$69.8	\$18.0	\$12.7	\$4.1	\$137.4
Grand totals‡	\$316.4	\$177.1	\$73.7	\$76.6	\$39.2	\$503.2

AHA Heart disease and stroke statistics 2010

Who Gets Heart Failure.....Equal Opportunity Disease

Table 1. Established and Hypothesized Risk Factors for HF

Major Clinical Risk Factors

- Age, male sex
- Hypertension, LVH
- Myocardial infarction
- Diabetes mellitus
- Valvular heart disease
- Obesity

Minor Clinical Risk Factors

- Smoking
- Dyslipidemia
- Sleep-disordered breathing
- Chronic kidney disease
- Albuminuria
- Homocysteine
- Immune activation, IGF1, TNF α , IL-6, CRP
- Natriuretic peptides
- Anemia
- Dietary risk factors
- Increased HR
- Sedentary lifestyle
- Low socioeconomic status
- Psychological stress

Toxic Risk Precipitants

- Chemotherapy (anthracyclines, cyclophosphamide, 5-FU, trastuzumab)
- Cocaine, NSAIDs
- Thiazolidinediones
- Doxazosin
- Alcohol

Genetic Risk Predictors

- SNP (eg, α 2CDe1322-325, β 1Arg389)

Morphological Risk Predictors

- Increased LVID, mass
- Asymptomatic LV dysfunction
- LV diastolic dysfunction

5-FU indicates 5-fluorouracil; SNP, single-nucleotide polymorphism; LVID, left ventricular internal dimension; LVH, left ventricular hypertrophy; NSAIDs, nonsteroidal antiinflammatory drugs; IGF, insulinlike growth factor; TNF, tumor necrosis factor; IL, interleukin; CRP, C-reactive protein; and HR, heart rate.

Over 100 risk factors associated with HF have been described.

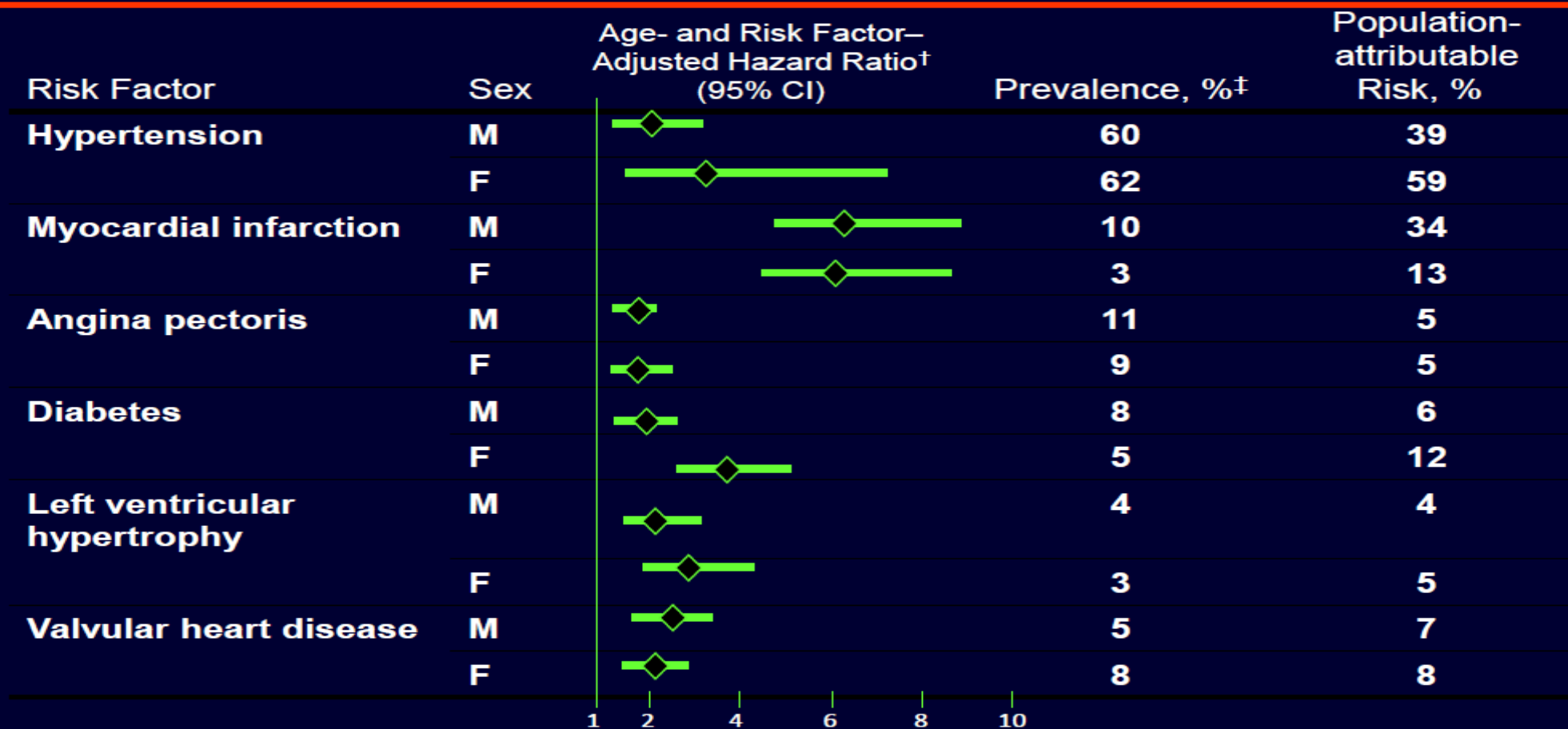
Varying degrees of 'independent' association

Clinically relevant vs. esoteric

Risk marker vs. risk factor

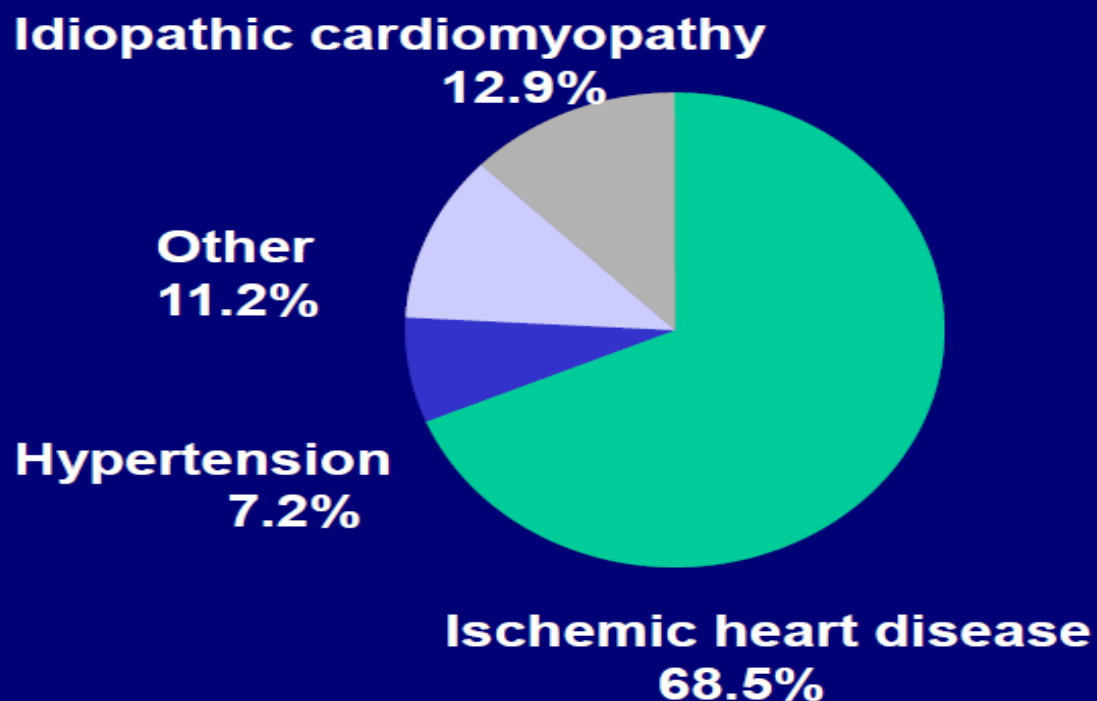
Risk Factors - Population Based

Framingham Heart Study



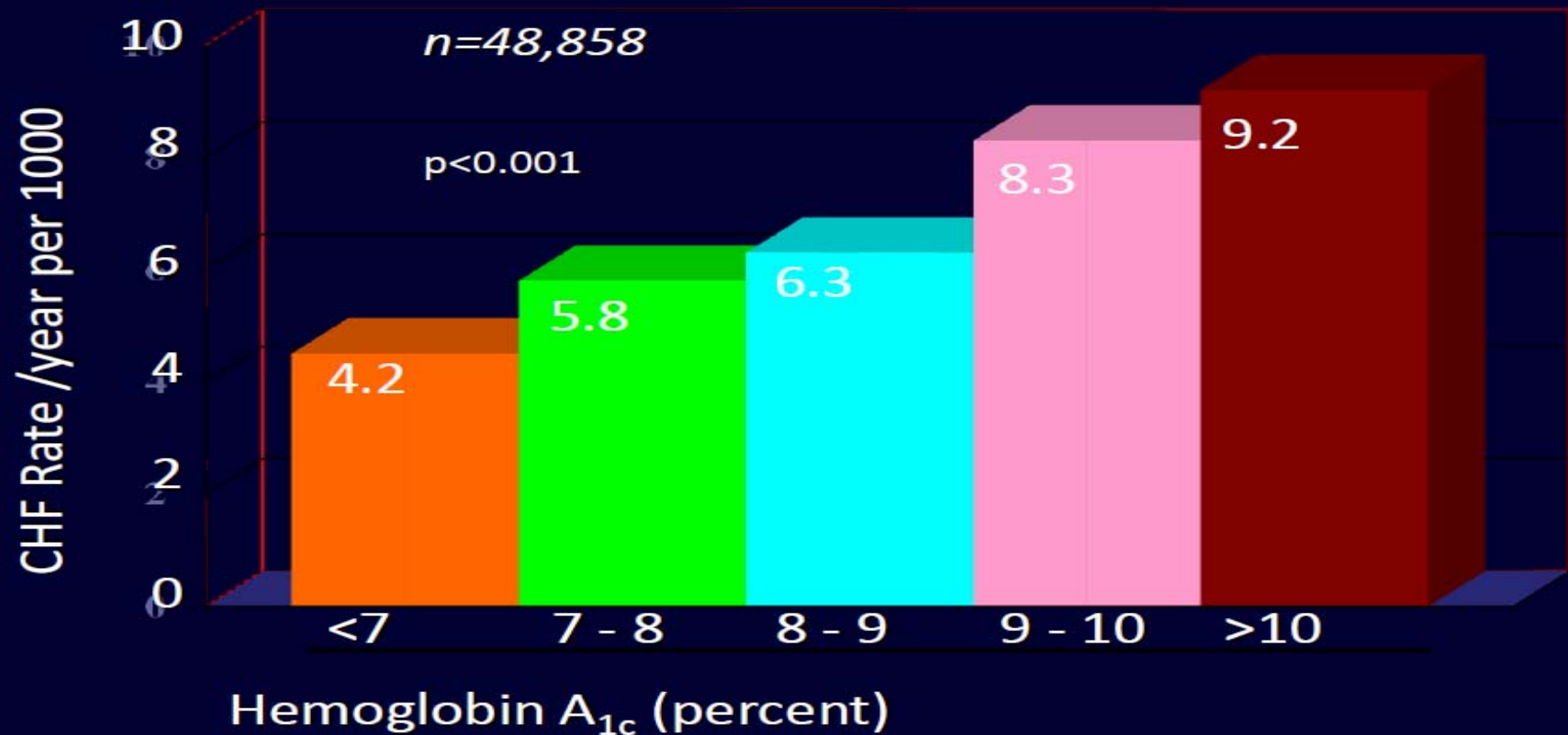
Levy D et al. *JAMA*. 1996;275:1557-1562

Etiology of heart failure



- Valve disease
- Myocarditis
- Drugs – adriamycin 550 mg/m²
herceptin
- Systemic disease
 - Amyloid
 - Sarcoid
 - Chagas
 - HIV
 - Thyroid
 - Hemachromatosis
 - Rheumatologic
 - Muscular dystrophy
 - Peripartum
 - Pheochromocytoma
- Alcohol

Diabetes and Onset of Heart Failure: Impact of Glycemic Control on Risk



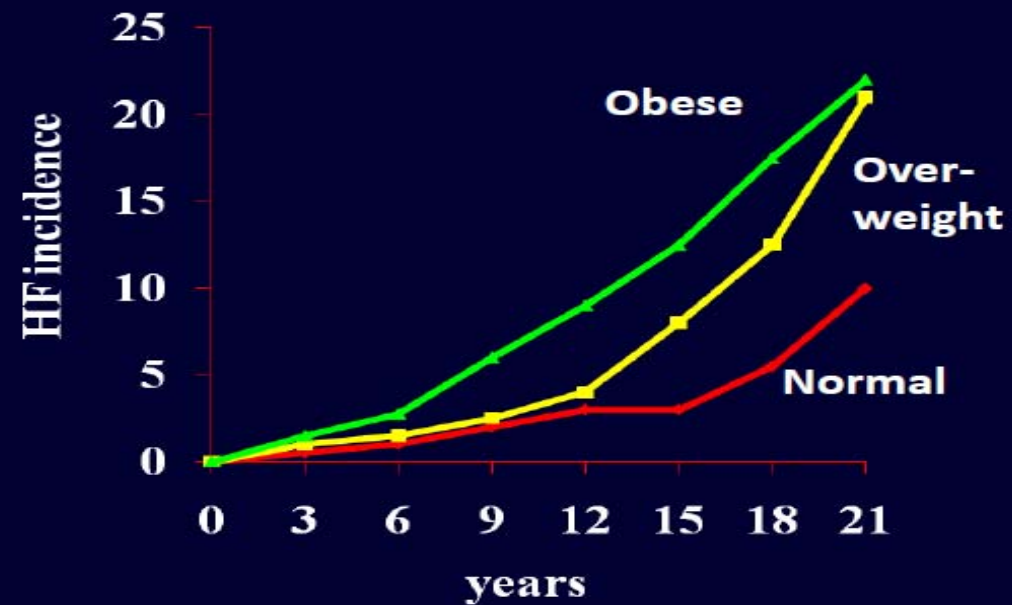
Iribarren et al. *Circulation* 2001;103:2668-2673

Obesity and the Risk of New Onset HF

Men



Women

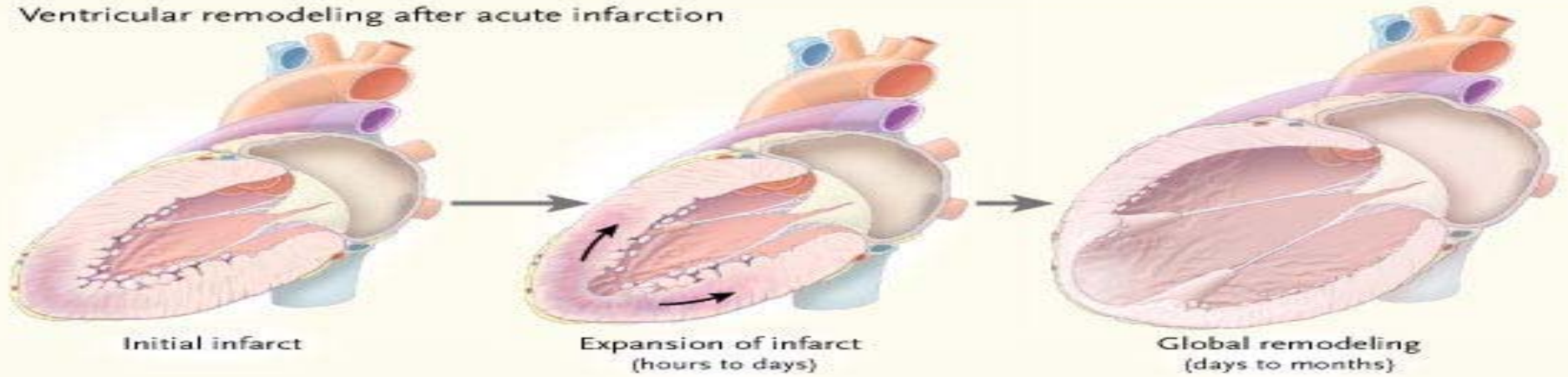


Framingham Cohort, n = 5881

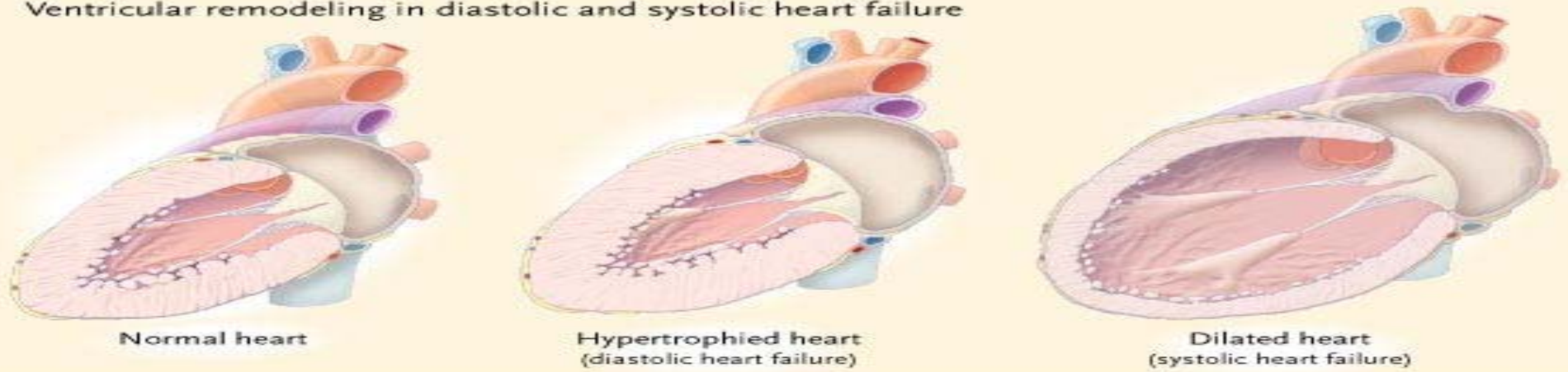
Normal = BMI 18.5 – 24.9 kg/m²; Overweight = 25 – 29.9 kg/m²; Obese = BMI > 30 kg/m²

Kenchiah. et al. NEJM 2002;347:305-313

A Ventricular remodeling after acute infarction



B Ventricular remodeling in diastolic and systolic heart failure



Types of Heart Failure (Phenotypes)

Classification	Ejection Fraction	Description
I. Heart Failure with Reduced Ejection Fraction (HFrEF)	$\leq 40\%$	Also referred to as systolic HF. Randomized clinical trials have mainly enrolled patients with HFrEF and it is only in these patients that efficacious therapies have been demonstrated to date.
II. Heart Failure with Preserved Ejection Fraction (HFpEF)	$\geq 50\%$	Also referred to as diastolic HF. Several different criteria have been used to further define HFpEF. The diagnosis of HFpEF is challenging because it is largely one of excluding other potential noncardiac causes of symptoms suggestive of HF. To date, efficacious therapies have not been identified.
a. HFpEF, Borderline	41% to 49%	These patients fall into a borderline or intermediate group. Their characteristics, treatment patterns, and outcomes appear similar to those of patient with HFpEF.
b. HFpEF, Improved	$>40\%$	It has been recognized that a subset of patients with HFpEF previously had HFrEF. These patients with improvement or recovery in EF may be clinically distinct from those with persistently preserved or reduced EF. Further research is needed to better characterize these patients.

Additional Types of Heart Failure

- **Low-Output Heart Failure**

- Systolic Heart Failure:
 - decreased cardiac output
 - Decreased Left ventricular ejection fraction
- Diastolic Heart Failure:
 - Elevated Left and Right ventricular end-diastolic pressures
 - May have normal LVEF

- **High-Output Heart Failure**

- Seen with peripheral shunting, low-systemic vascular resistance, hyperthyroidism, beri-beri, carcinoid, anemia
- Often have normal cardiac output

- **Right-Ventricular Failure**

- Seen with pulmonary hypertension, large RV infarctions.

New York Heart Association (NYHA) Class of Heart Failure

Focuses on symptoms

Class I: No limitation of physical activity.

Class II: Slight limitation with ordinary exertion.

Class III: Marked limitation with less than ordinary exertion.

Class IV: Symptoms are present at rest.

ACC/AHA Classification (Stages)

Emphasizes evolution and progression of heart failure.

Class A: At risk for CHF, but heart is structurally normal.

Class B: Structural abnormality of the heart, never had symptoms

Class C: Structural abnormality; current or previous symptoms.

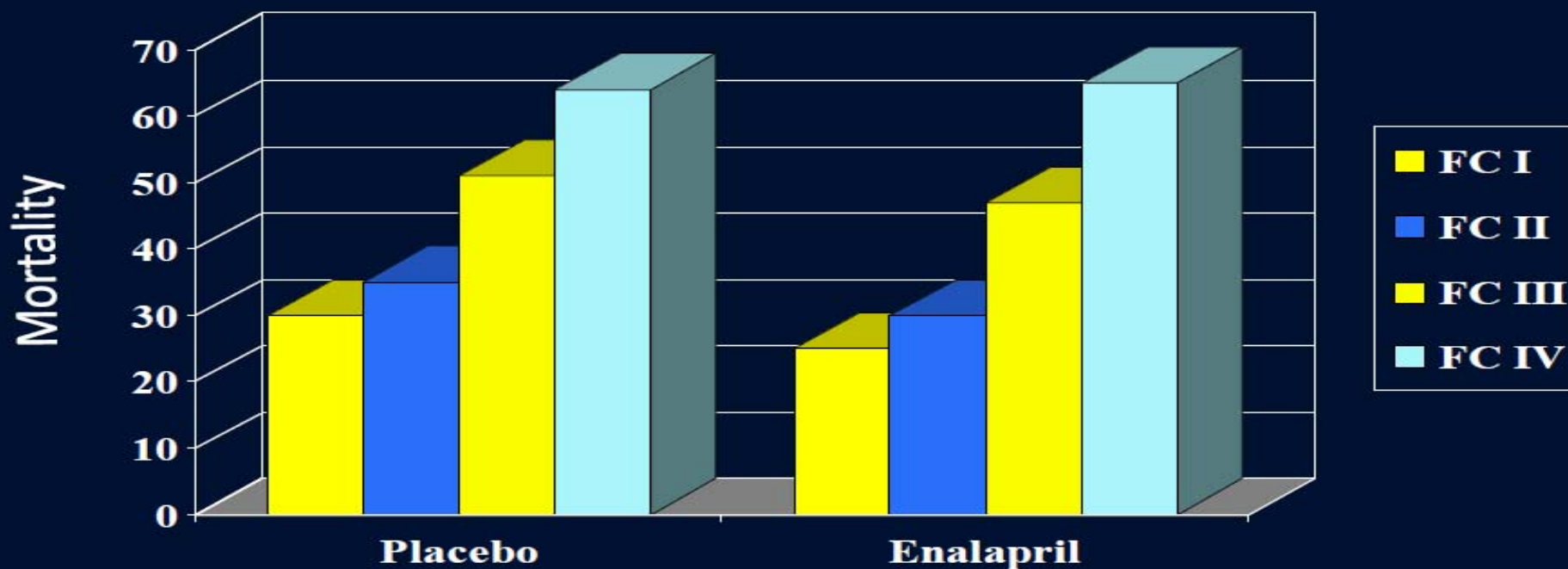
Class D: End-stage symptoms; refractory to standard treatment.

Functional Capacity NYHA Classification

NYHA Class	Symptoms
I	No symptoms and no limitation in ordinary physical activity, e.g. shortness of breath when walking, climbing stairs etc.
II	Mild symptoms (mild shortness of breath and/or angina) and slight limitation during ordinary activity.
III	Marked limitation in activity due to symptoms, even during less-than-ordinary activity, e.g. walking short distances (20-100 m). Comfortable only at rest.
IV	Severe limitations. Experiences symptoms even while at rest. Mostly bedbound patients.

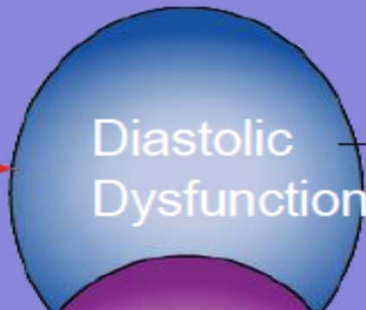
New York Heart Association Class

SOLVD

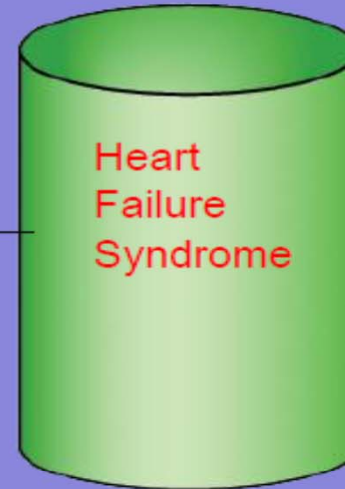
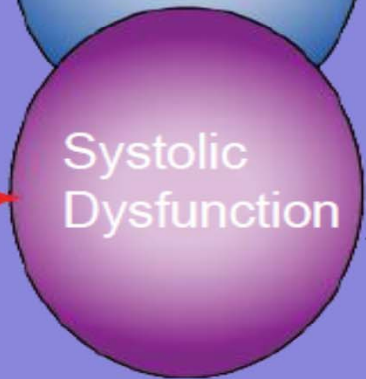




Obesity
Diabetes
Hypertension
Abn. Sleep



Hypertension
Smoking
Lipids
Diabetes



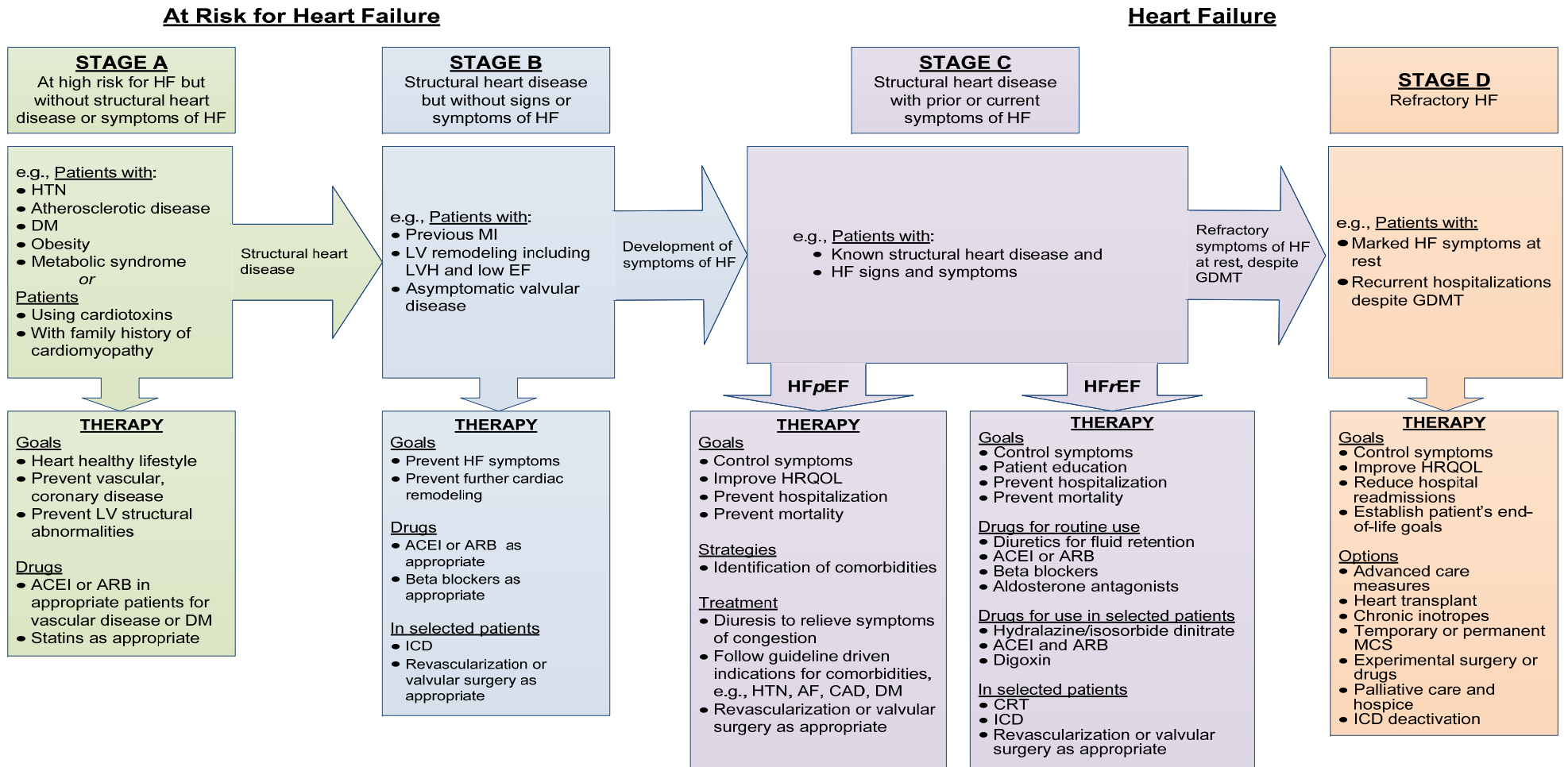
LV Remodels



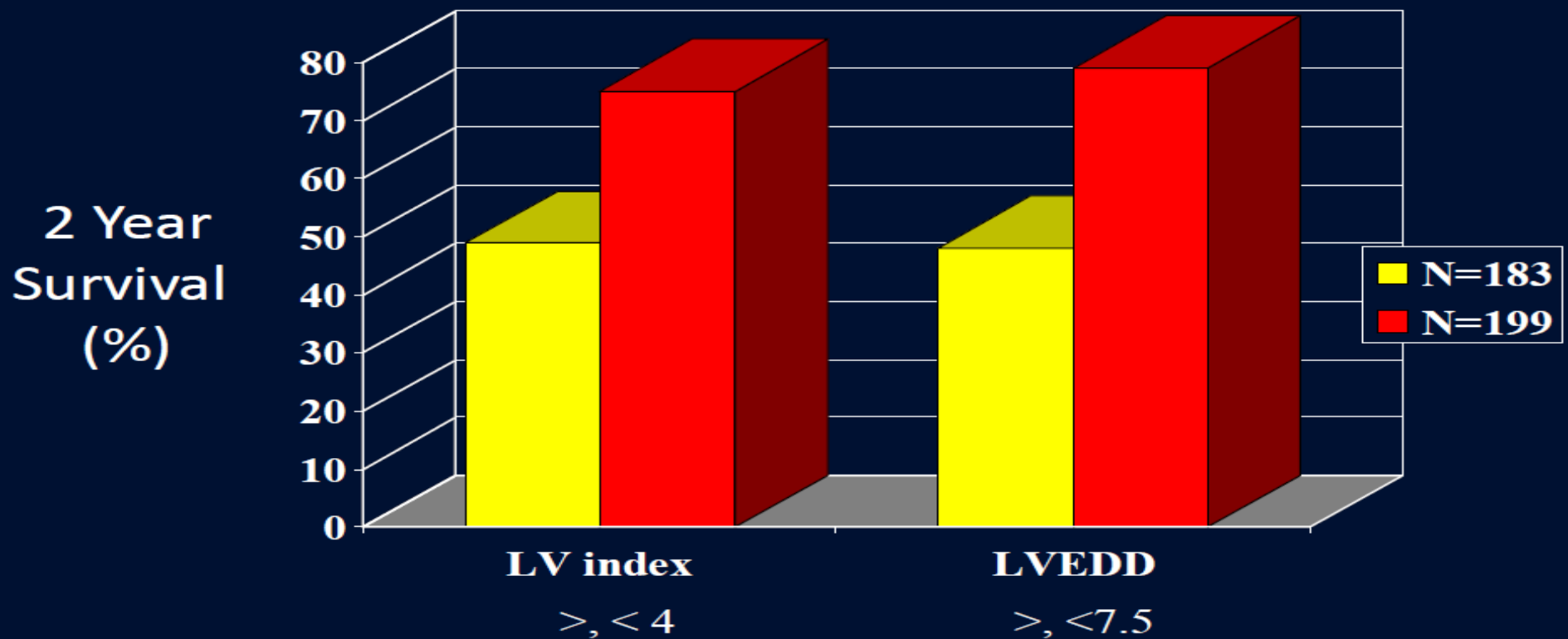
Time Months



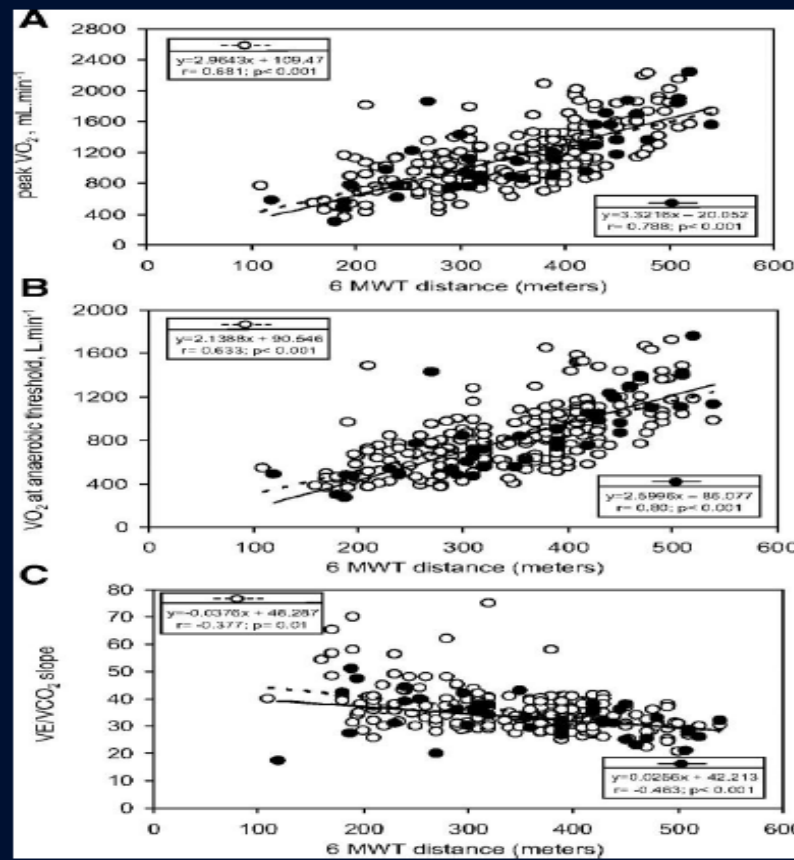
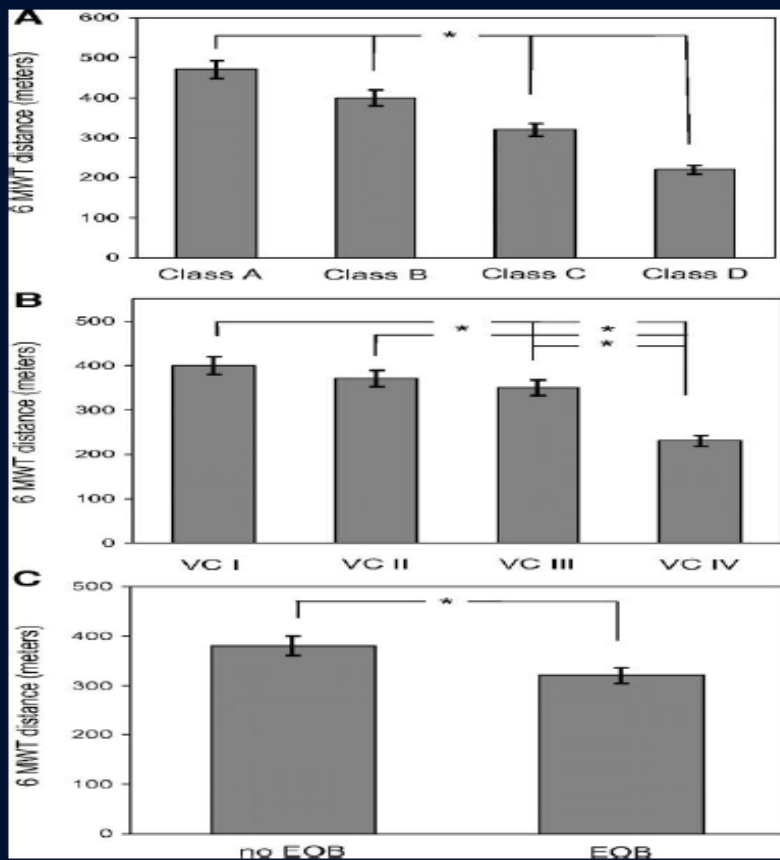
Stage Drives Treatment of HF



Left Ventricular Dimensions



Six Minute Walk Test



Guazzi, M. et al.
Circ Heart Fail
2009;2:549-555

Correlates with cardiopulmonary exercise test parameters
Independent predictor of mortality unless controlled for CPX

METS

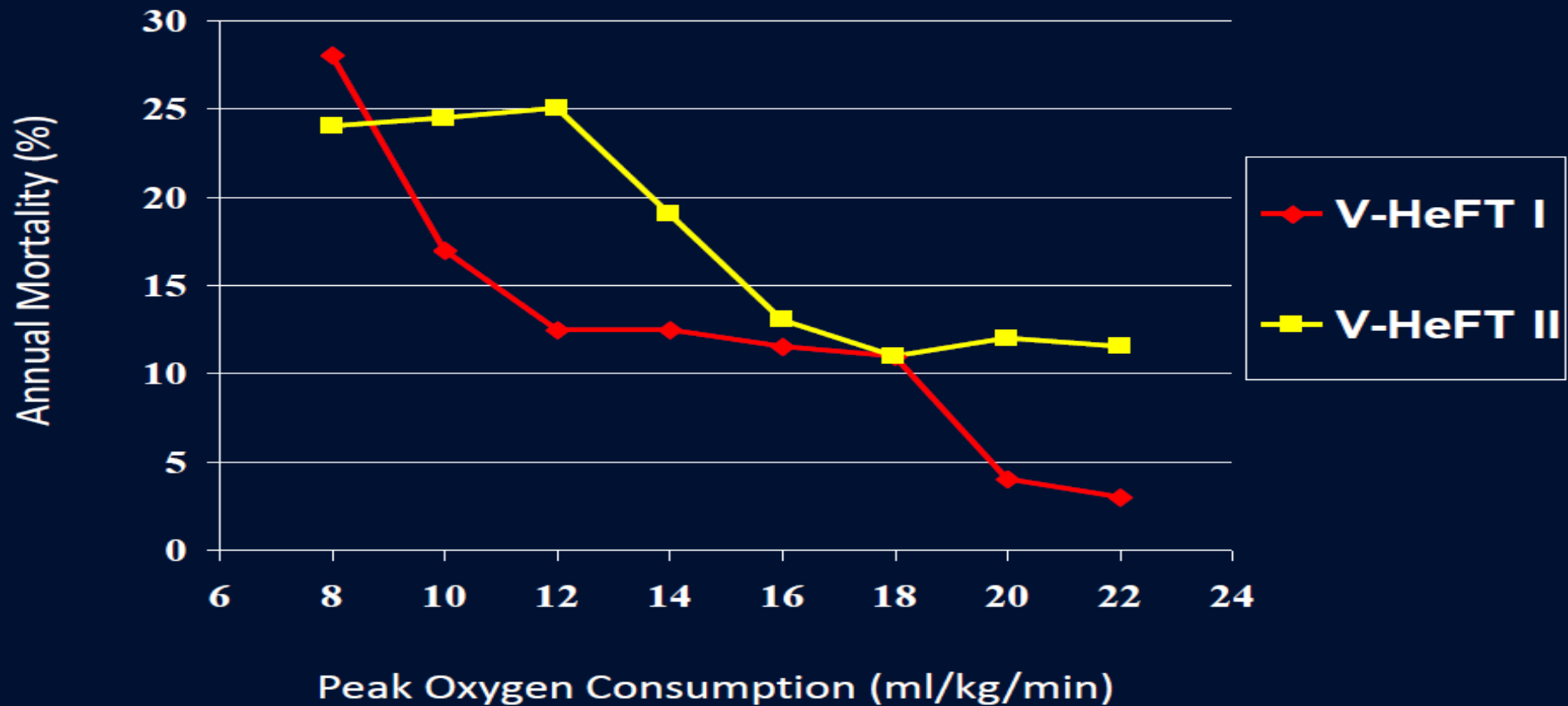
1 MET = 3.5 ml/kg of VO₂

METABOLIC COSTS OF SELECTED ACTIVITIES

METS

- 1.5** Sitting at a desk; driving a car; walking < 2 mph
- 3.0** Stocking shelves; janitorial work; walking 3 mph
- 5.0** ADL's (Activities of Daily Living); lawn work; walking 4 mph
- 7.0** Lifting/carrying 65 lbs.; Tennis; jogging 5 mph
- 9.0** Shoveling (10/min - 14 lbs); **Peak for POLICE and FIREFIGHTERS**

Peak Exercise Oxygen Consumption V-HeFT I & II



Hemodynamic Predictors in Ambulatory Patients with Advanced Heart Failure

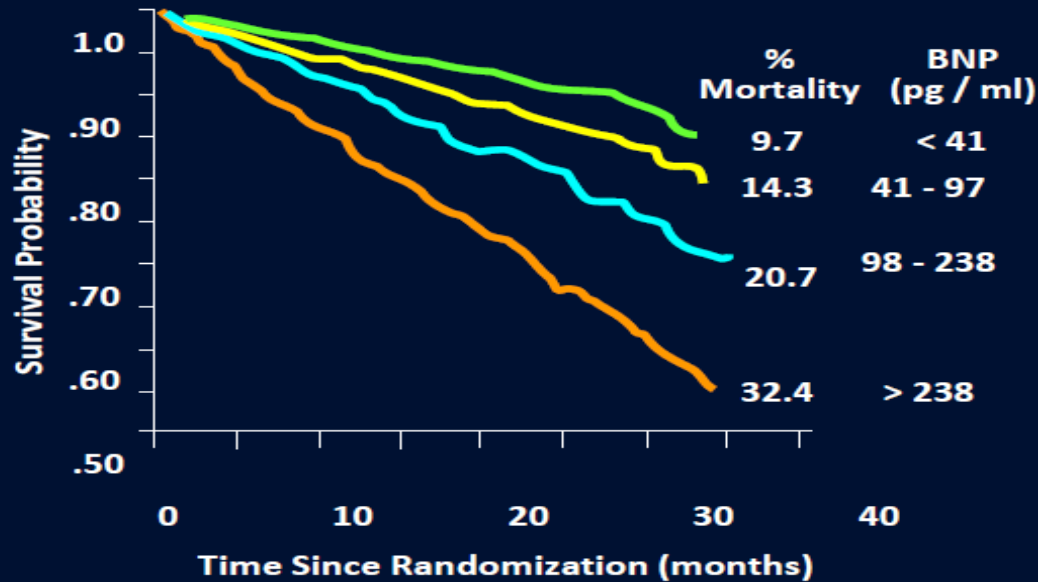
Predictor	Hazard Ratio	95% Confidence Interval	p Value
All-cause mortality			
CI	0.46	0.299–0.707	<0.001
MPA	1.021	1.001–1.004	0.04
Mitral valve regurgitation	1.3	1.116–1.514	0.001
Creatinine	2.032	1.461–2.827	<0.001
Age	1.024	1.005–1.044	0.014
Cardiac transplantation			
CI	0.431	0.278–0.668	<0.001
MPA	1.075	1.033–1.078	<0.001
Mitral valve regurgitation	1.273	1.121–1.457	0.001
Heart failure hospitalization			
CI	0.702	0.518–0.951	0.023
MPA	1.027	1.007–1.044	0.007
Mitral valve regurgitation	1.19	1.077–1.316	0.001

CI = cardiac index; MPA = mean PA pressure

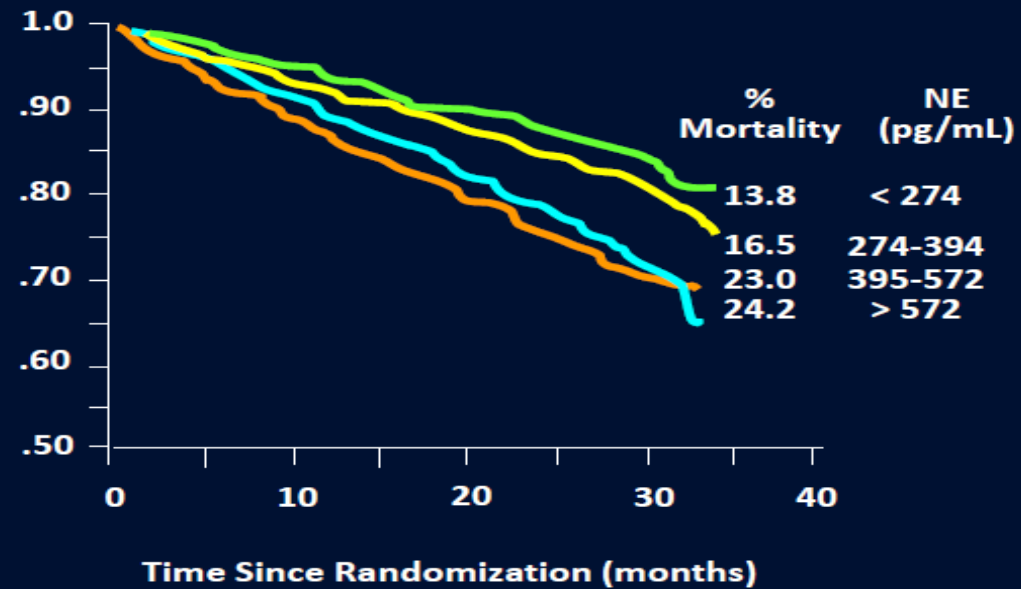
Mullens et al, *Am J Cardiol* 2008

Biomarkers: Val-HeFT

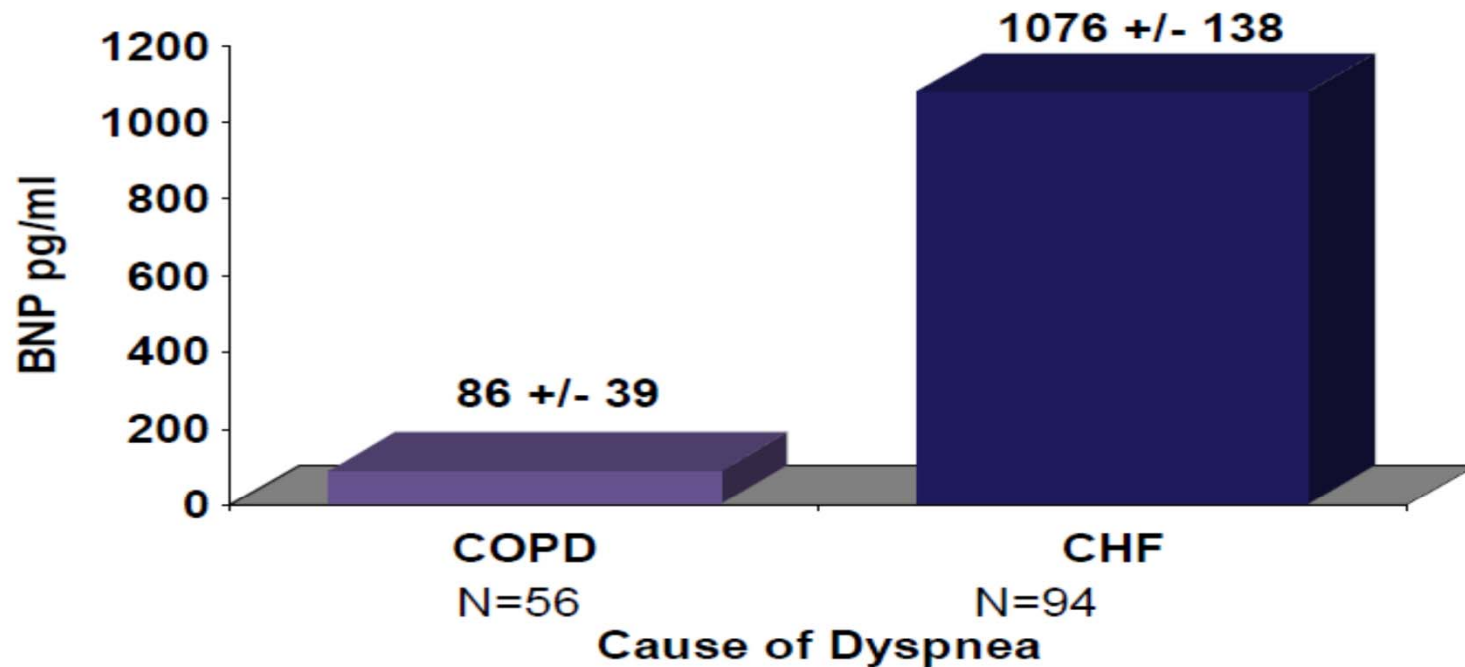
B-Type Natriuretic Peptide (BNP)



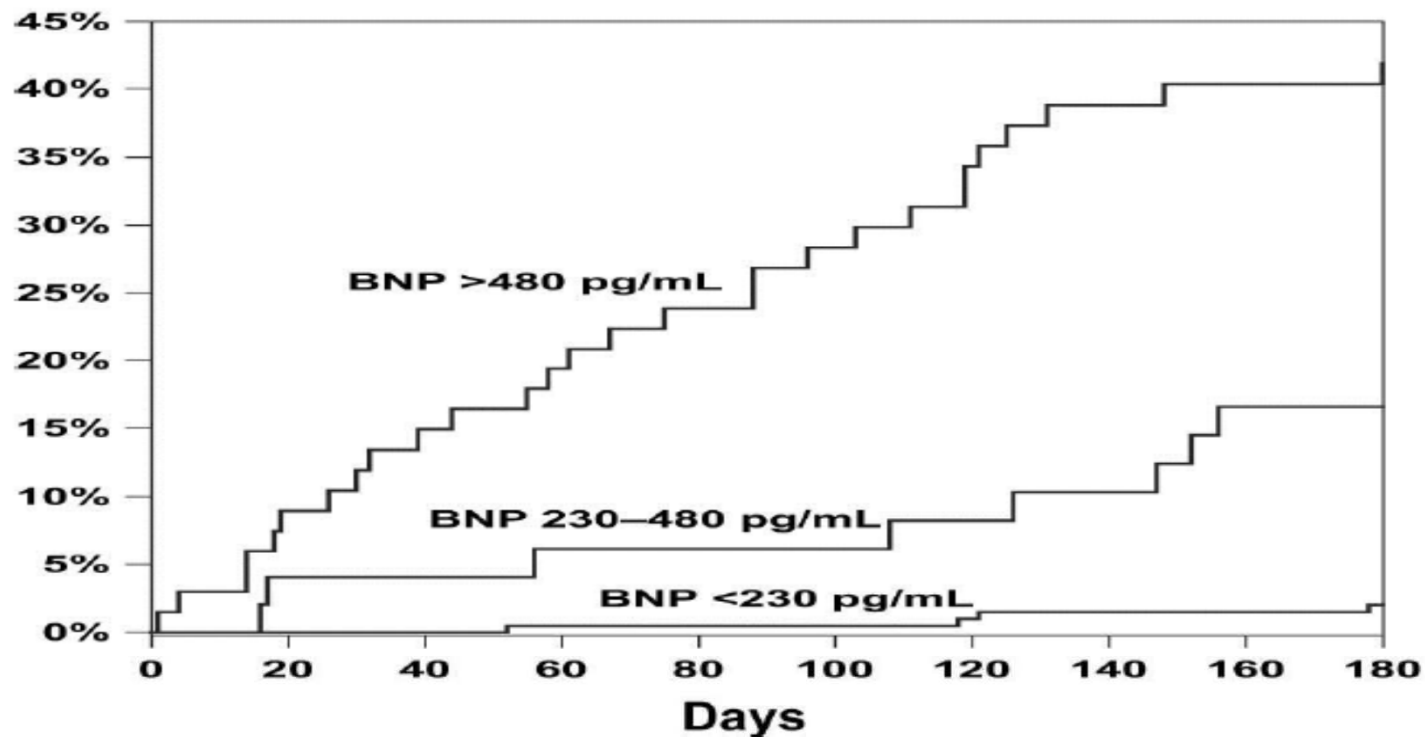
Norepinephrine (NE)



BNP Levels in Patients With Dyspnea Secondary to CHF or COPD

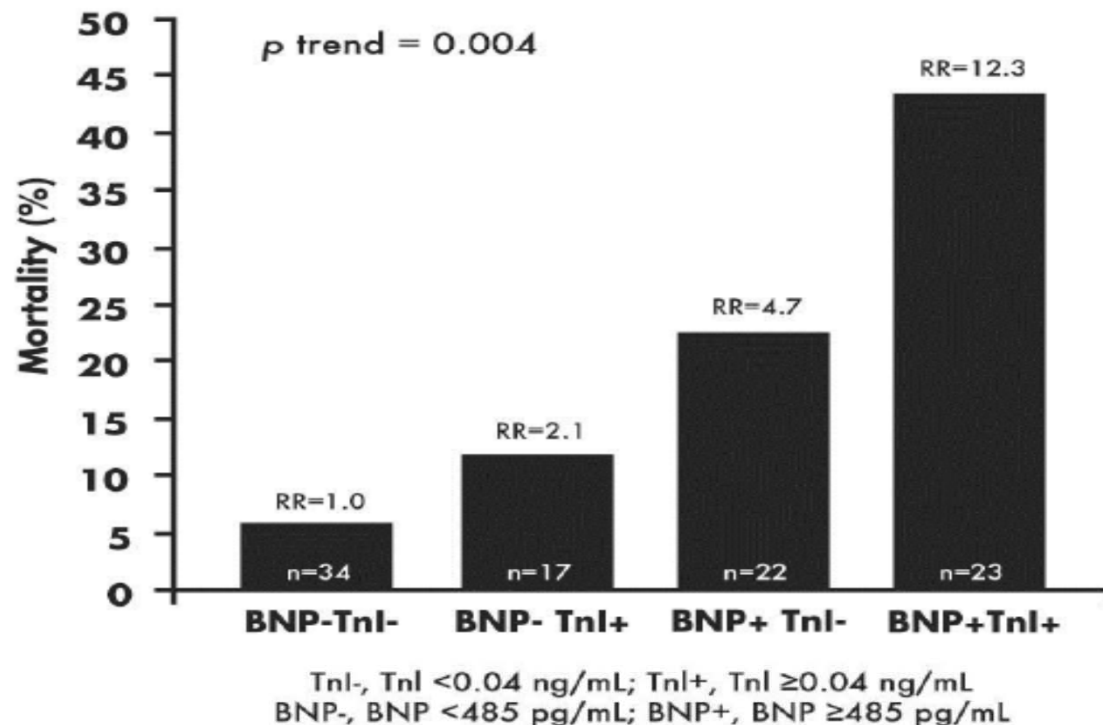


Prognostic (Admission Level—Death of HF Hospitalization)



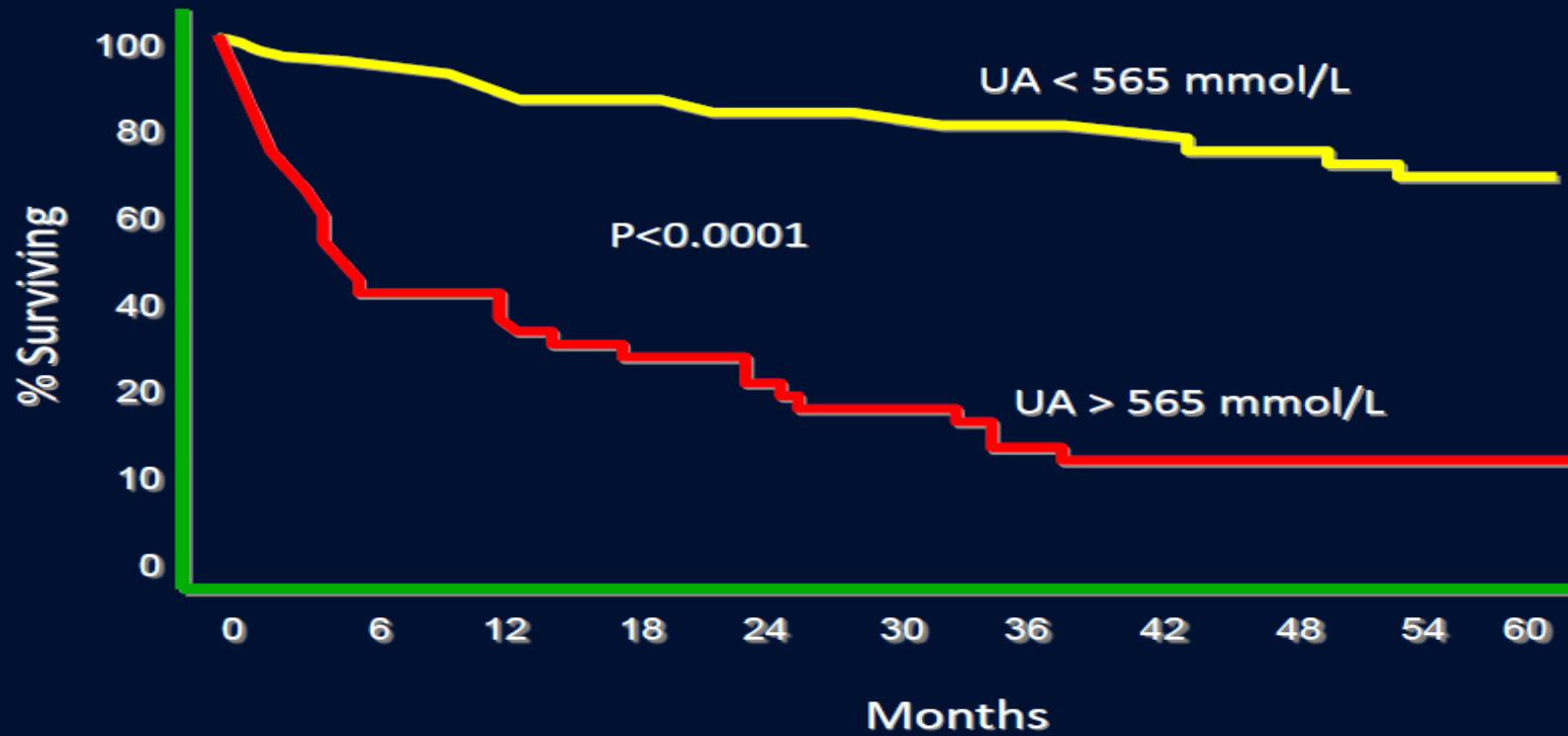
- Figure 12. Relationship of B-type natriuretic peptide (BNP) determined in emergency room care to death or heart failure hospitalization. Reprinted with permission from *Ann Emerg Med.* 2002;39:131-138.

Prognostic—Multi-biomarker Strategies



- Figure 15. Combination of B-type natriuretic peptide (BNP) and troponin-I (Tnl) levels in patients with heart failure.

Oxidative Stress: Uric Acid



Anker et al, Circ 2003

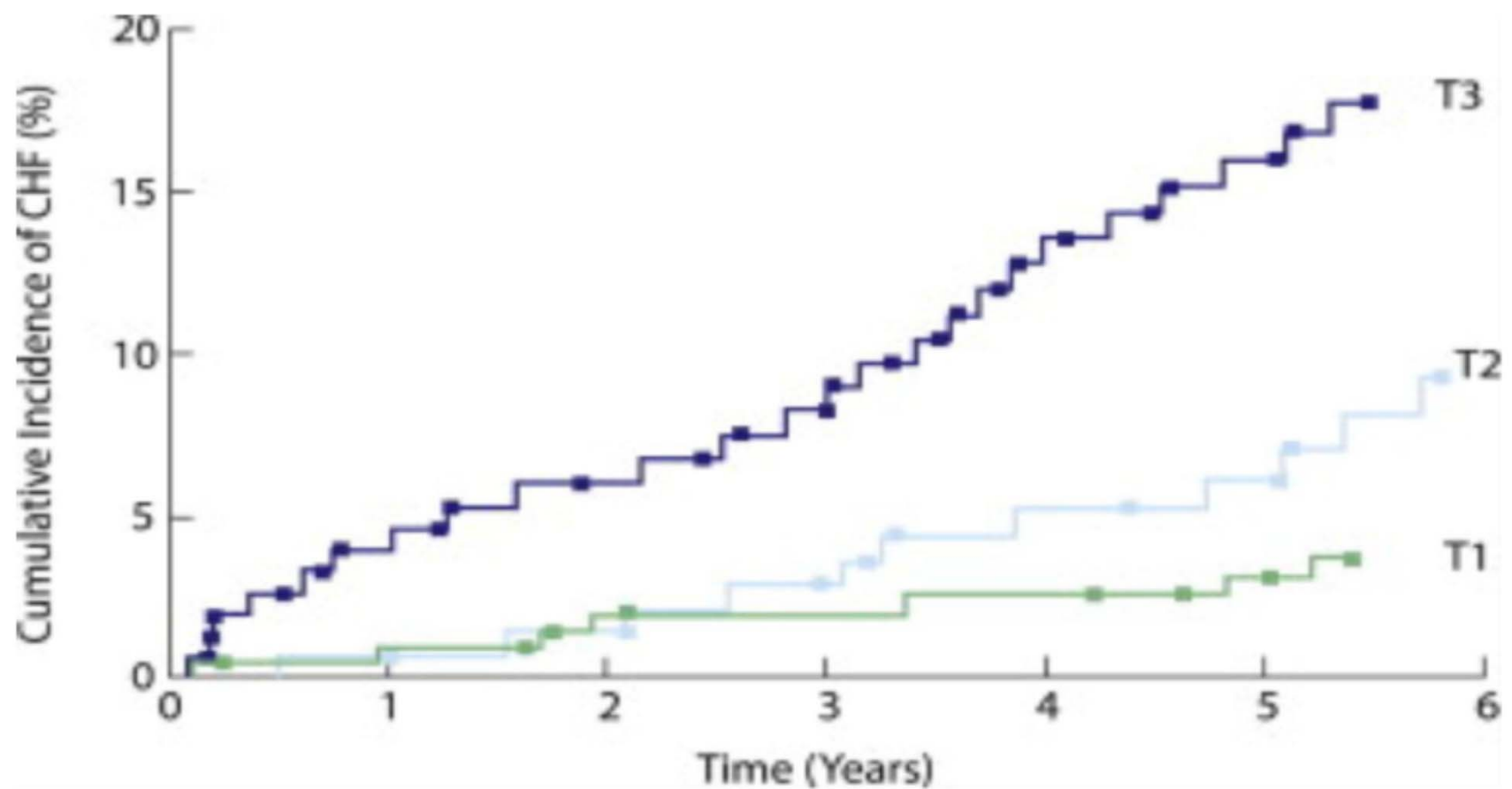


Figure Legend:

Interleukin-6 and the Risk for Heart Failure

Circulating interleukin-6, an inflammatory cytokine, was prospectively related to heart failure incidence in a continuous, graded fashion among participants in the Framingham Heart Study. CHF = congestive heart failure. T1, T2, and T3 represent the lowest, middle, and highest tertiles of

How Heart Failure Is Diagnosed

- **Medical history is taken to reveal symptoms**
- **Physical exam is done**
- **Tests**
 - **Chest X-ray**
 - **Blood tests**
 - **Electrical tracing of heart (Electrocardiogram or “ECG”)**
 - **Ultrasound of heart (Echocardiogram or “Echo”)**
 - **X-ray of the inside of blood vessels (Angiogram)**

Sleeping breathing disorder

- Obstructive sleep apnea
- Central sleep apnea
- Mixed
- Obesity Hypoventilation syndrome

Approximately 50% of HF patients experience sleep-disordered breathing, with either Cheyne-Stokes respiration (CSR) or obstructive sleep apnea (OSA)

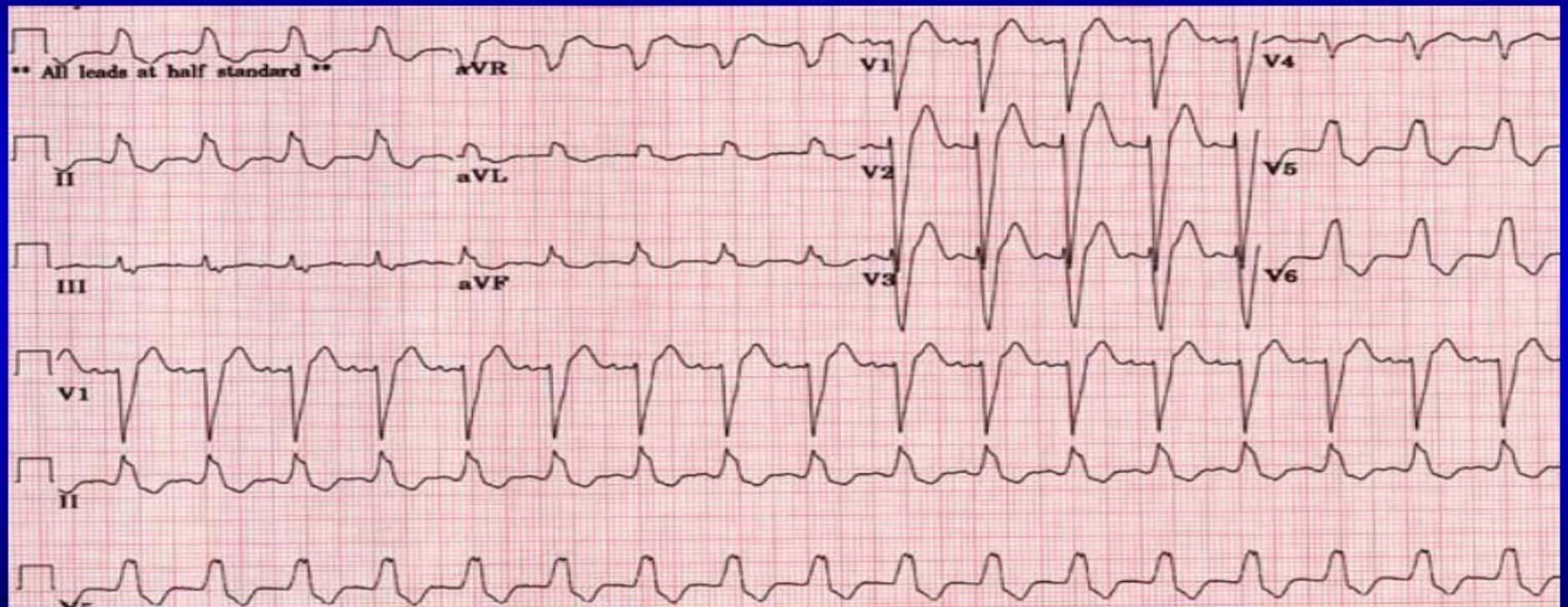
Lab Analysis in Heart Failure

- **CBC**
 - Since anemia can exacerbate heart failure
- **Serum electrolytes and creatinine**
 - before starting high dose diuretics
- **Fasting Blood glucose**
 - To evaluate for possible diabetes mellitus
- **Thyroid function tests**
 - Since thyrotoxicosis can result in A. Fib, and hypothyroidism can results in HF.
- **Iron studies**
 - To screen for hereditary hemochromatosis as cause of heart failure.
- **ANA**
 - To evaluate for possible lupus
- **Viral studies**
 - If viral mycocarditis suspected

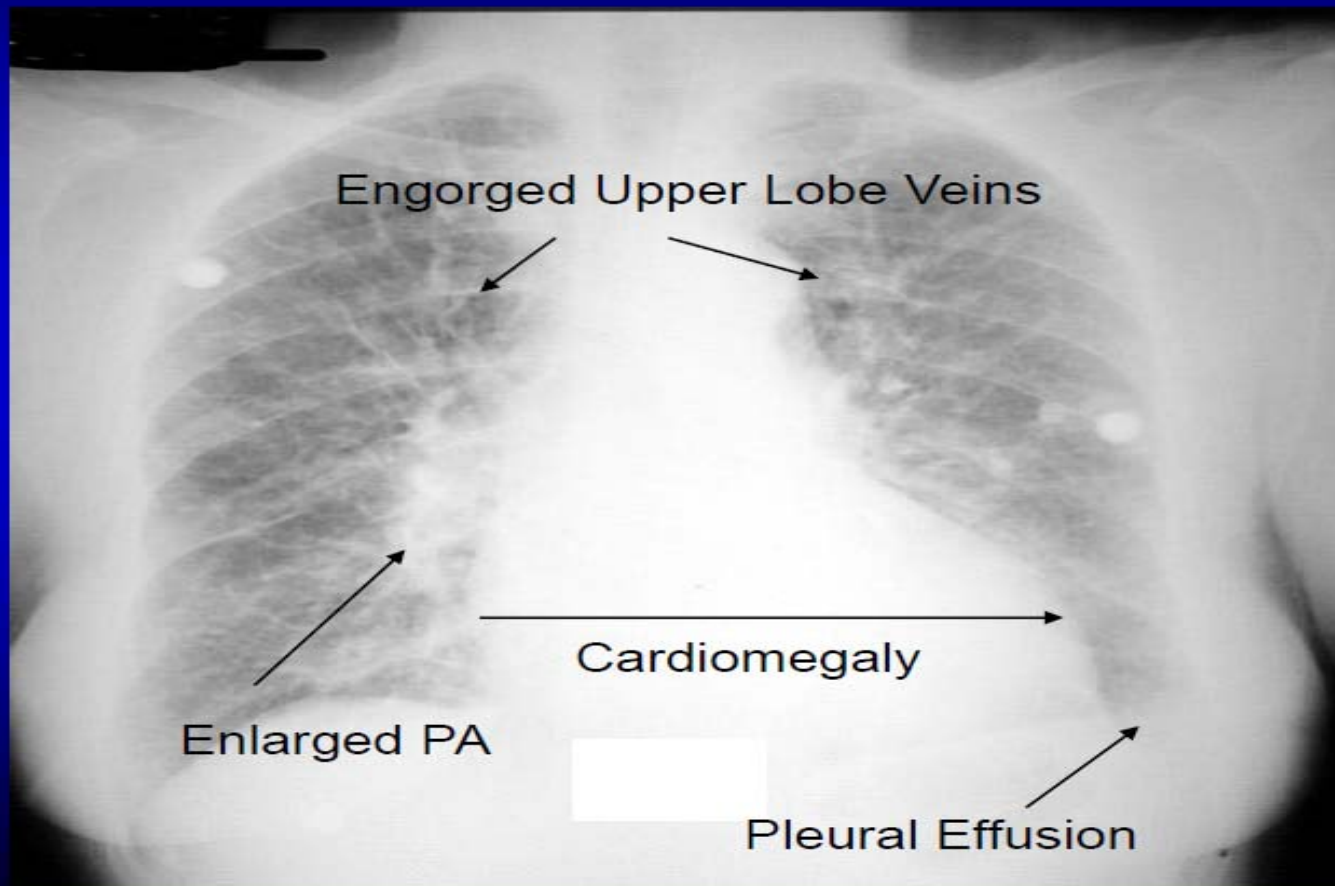
All HF Patients Should Have an ECG

- Assess cardiac rhythm and conduction
- Detect LVH
- Evaluate QRS duration, especially when EF is less than 35%
- Detect evidence of myocardial ischemia

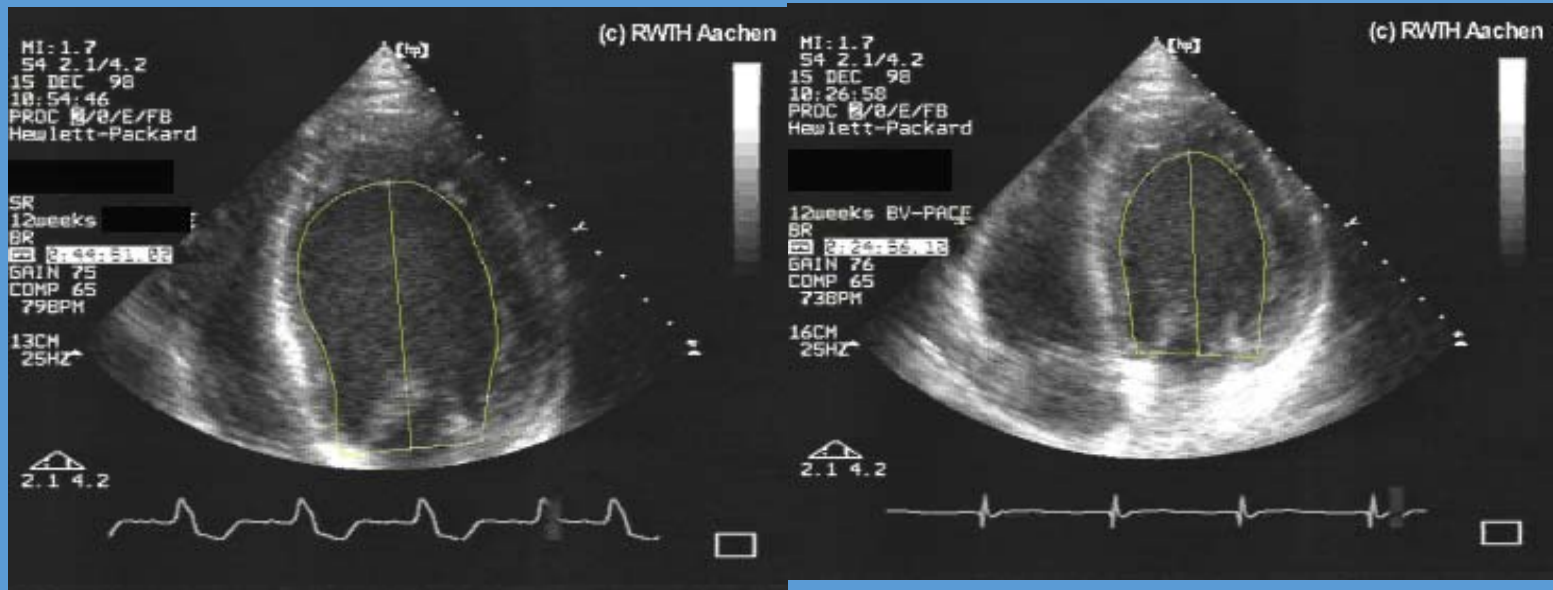
The ECG



CXR in Diagnosing Heart Failure

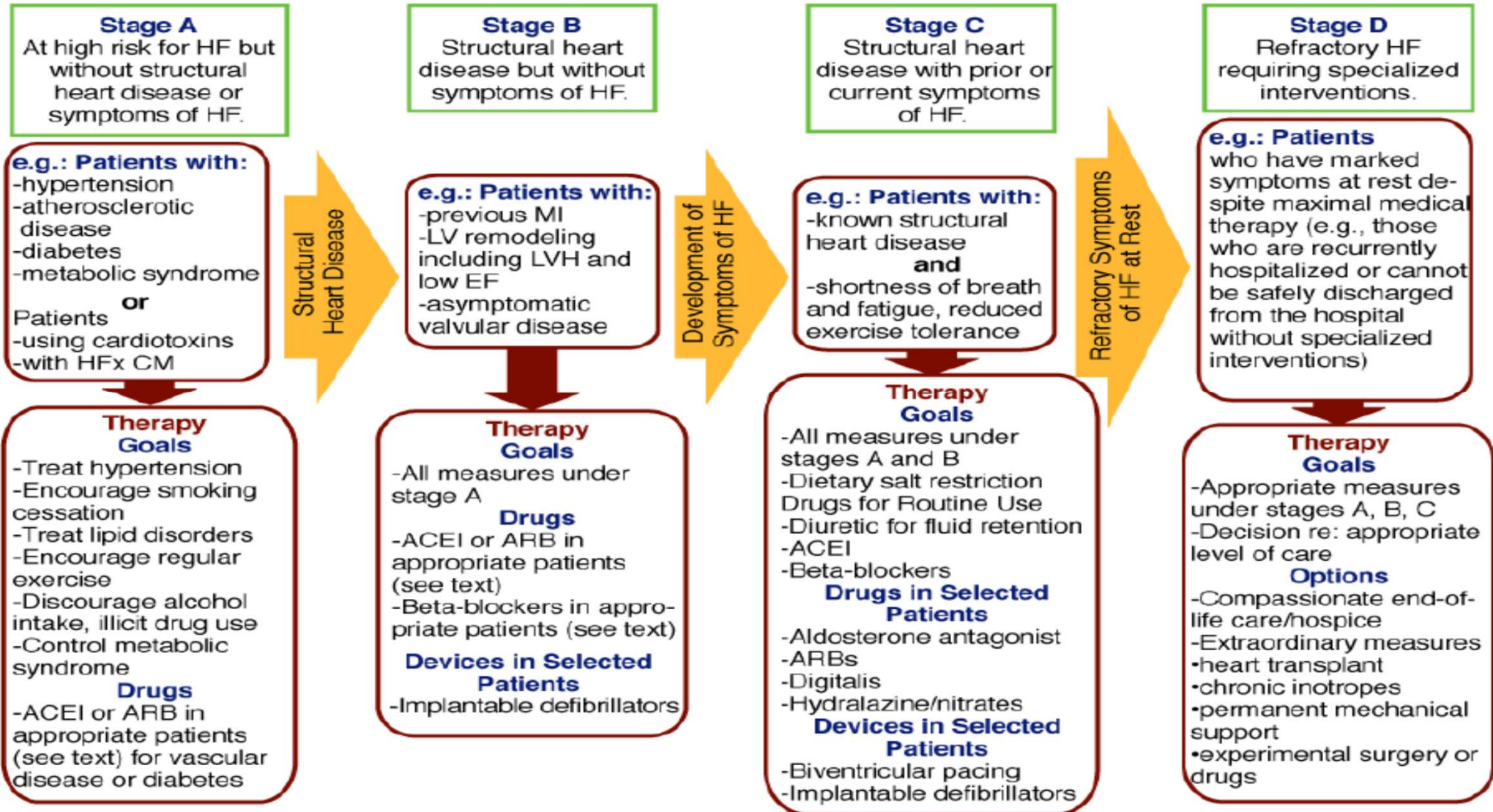


Echocardiogram



At Risk for Heart Failure

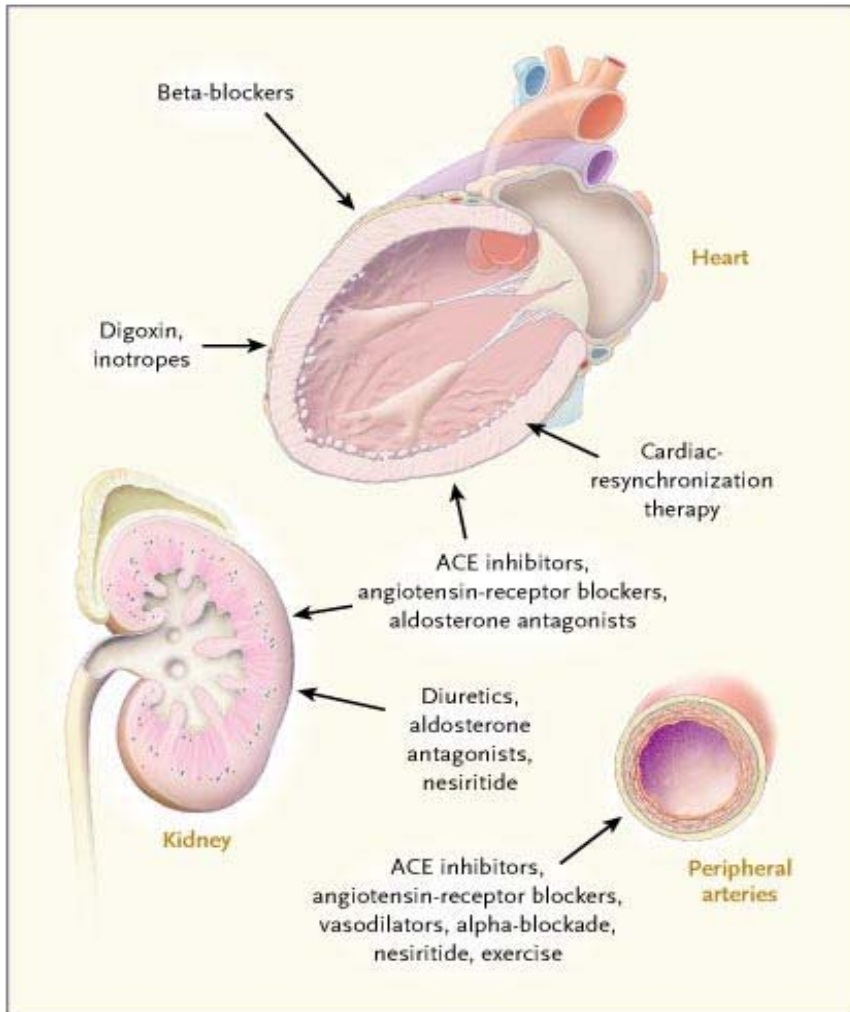
Heart Failure



Treatment of Chronic HF: Goals of Therapy

- Reduce or eliminate symptoms
- Improve quality of life
- Prolong survival

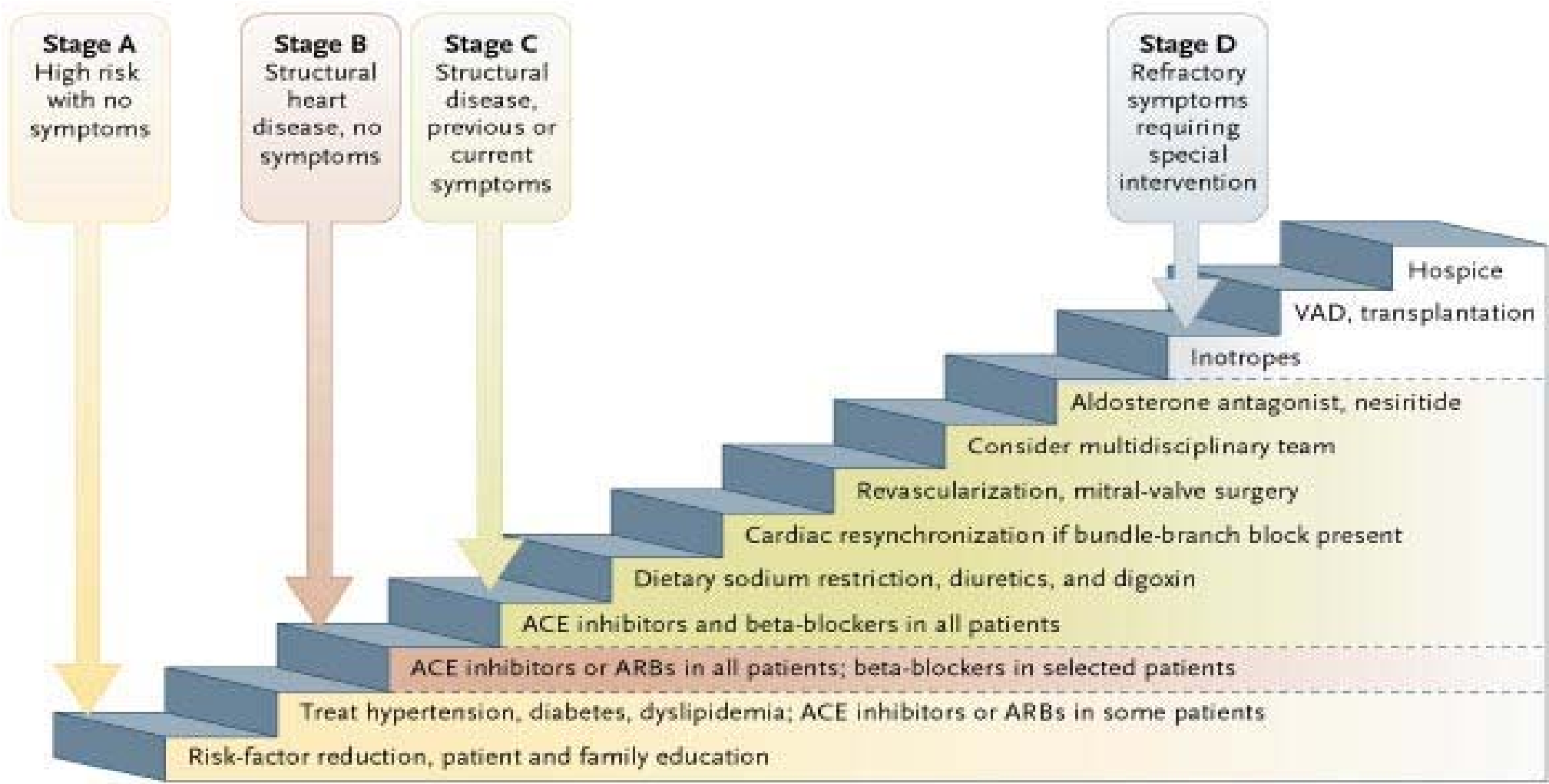
Management of Heart Failure



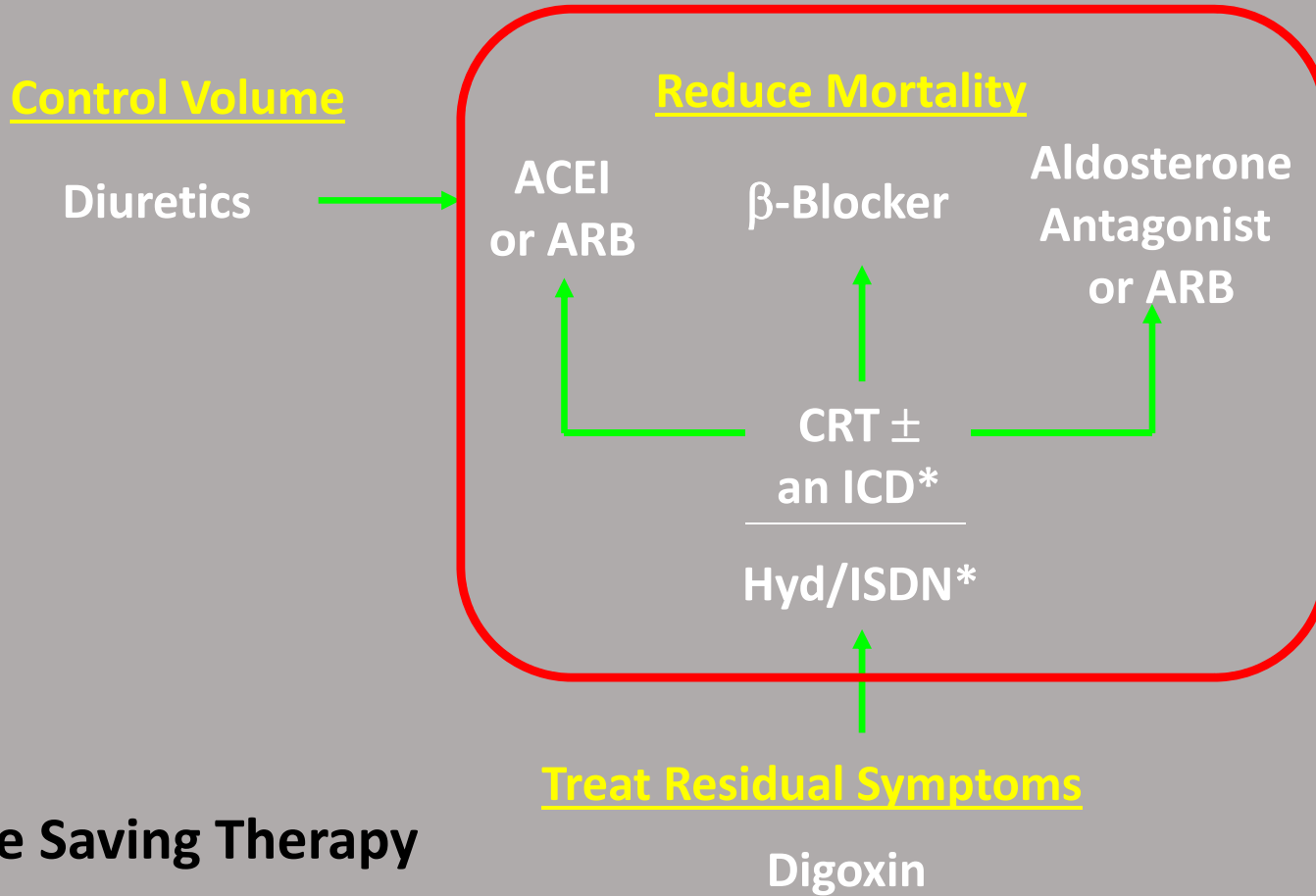
1. General measures
2. Correct underlying cause
3. Remove precipitating cause
4. Prevention of deterioration of cardiac function
5. Control of congestive HF state

Nonpharmacologic therapy

- **Exercise training for stable HF patients increased exercise capacity, decreased hospitalization rate, increased quality of life, decreased symptoms.**
- **Weight loss in obese patients**
- **Dietary Na restriction (≤ 2 g/day)**
- **Fluid and free water restriction (≤ 1.5 L/day) especially if hyponatremic**
- **Minimize medications known to have deleterious effects on heart failure (negative inotropes, NSAIDs, over-the-counter stimulants)**
- **Oxygen**
- **Fluid removal (dialysis, thoracentesis, paracentesis)**



Evidence-Based Treatment for Heart Failure (HFrEF)



 = Life Saving Therapy

Heart Failure and Sudden Cardiac Death

Sudden Cardiac Death (SCD)

- Your heart suddenly goes into a very fast and chaotic rhythm and stops pumping blood
- Caused by an “electrical” problem in your heart
- SCD is one of the leading causes of death in the U.S. – approximately 450,000 deaths a year
- Patients with heart failure are 6-9 times as likely to develop sudden cardiac death as the general population

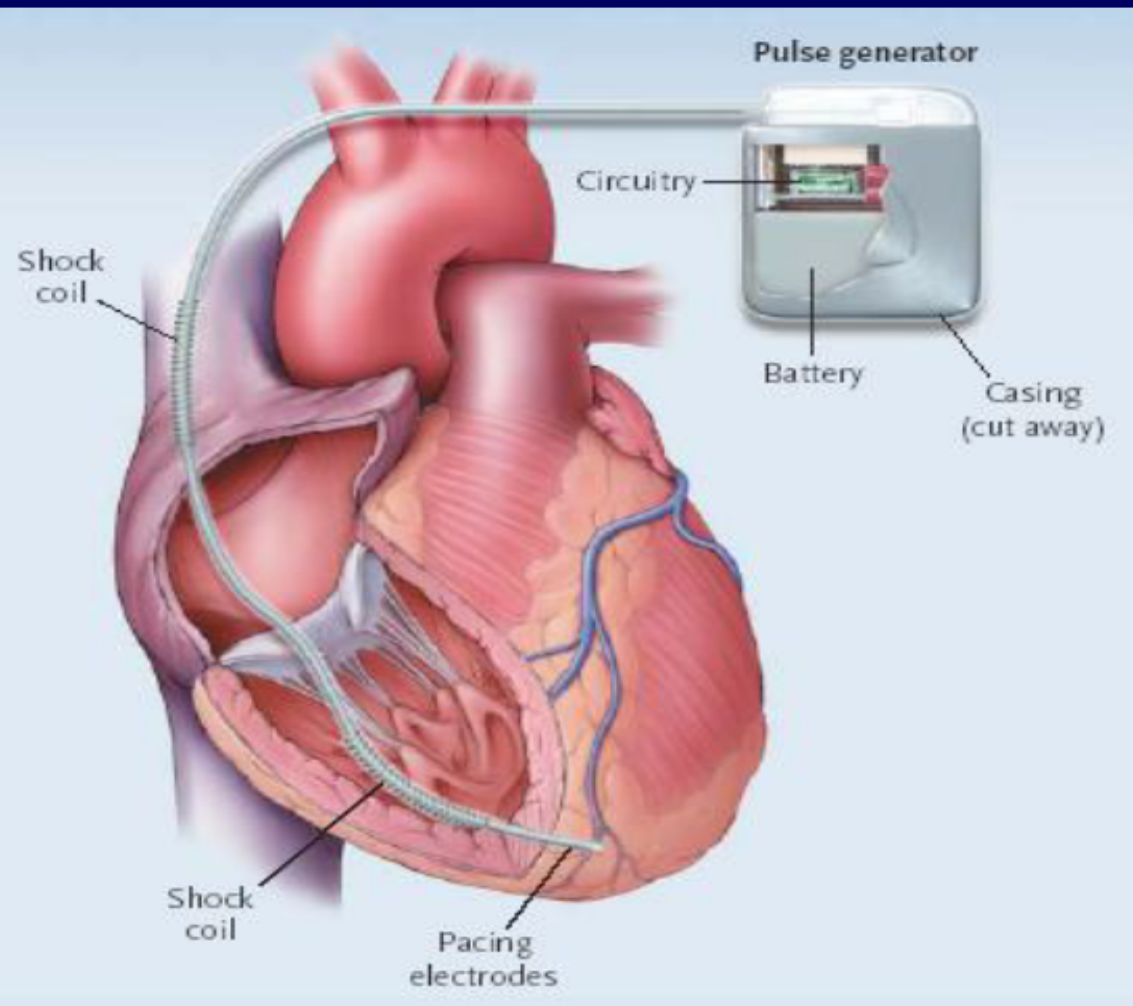
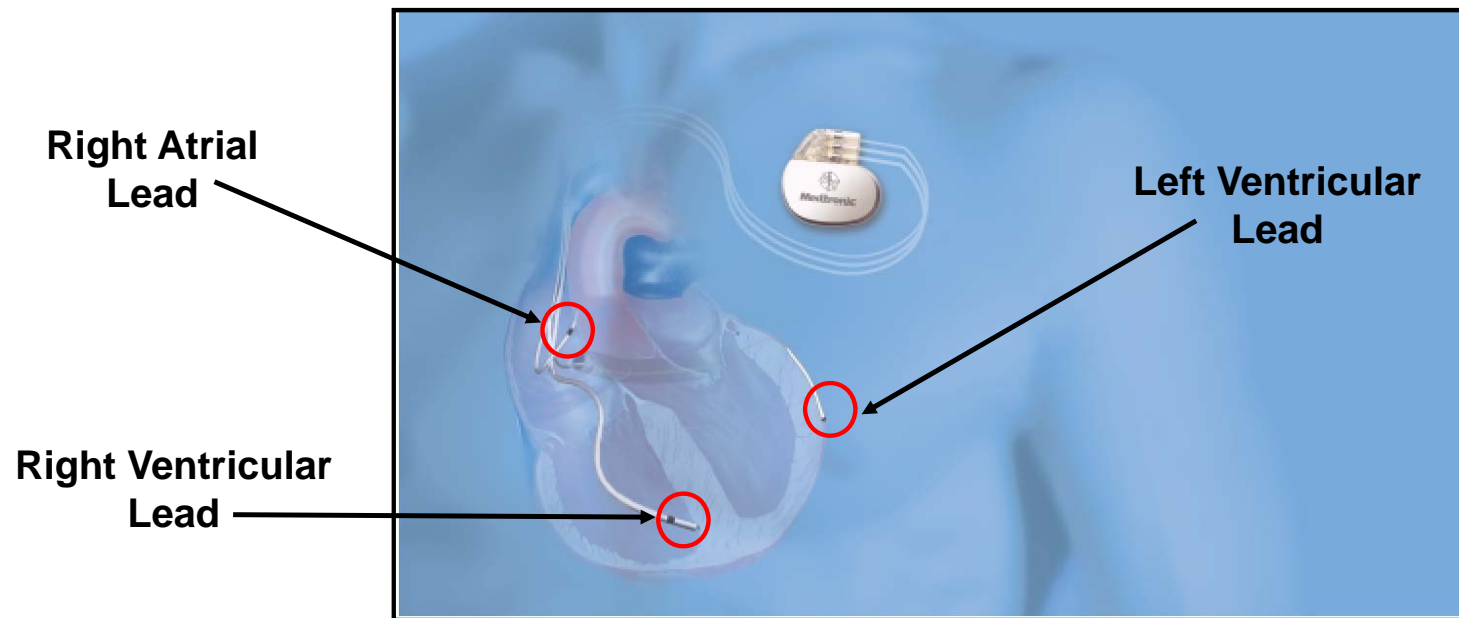


Figure 1. Diagram of a Single-Chamber Implantable Cardioverter–Defibrillator System.

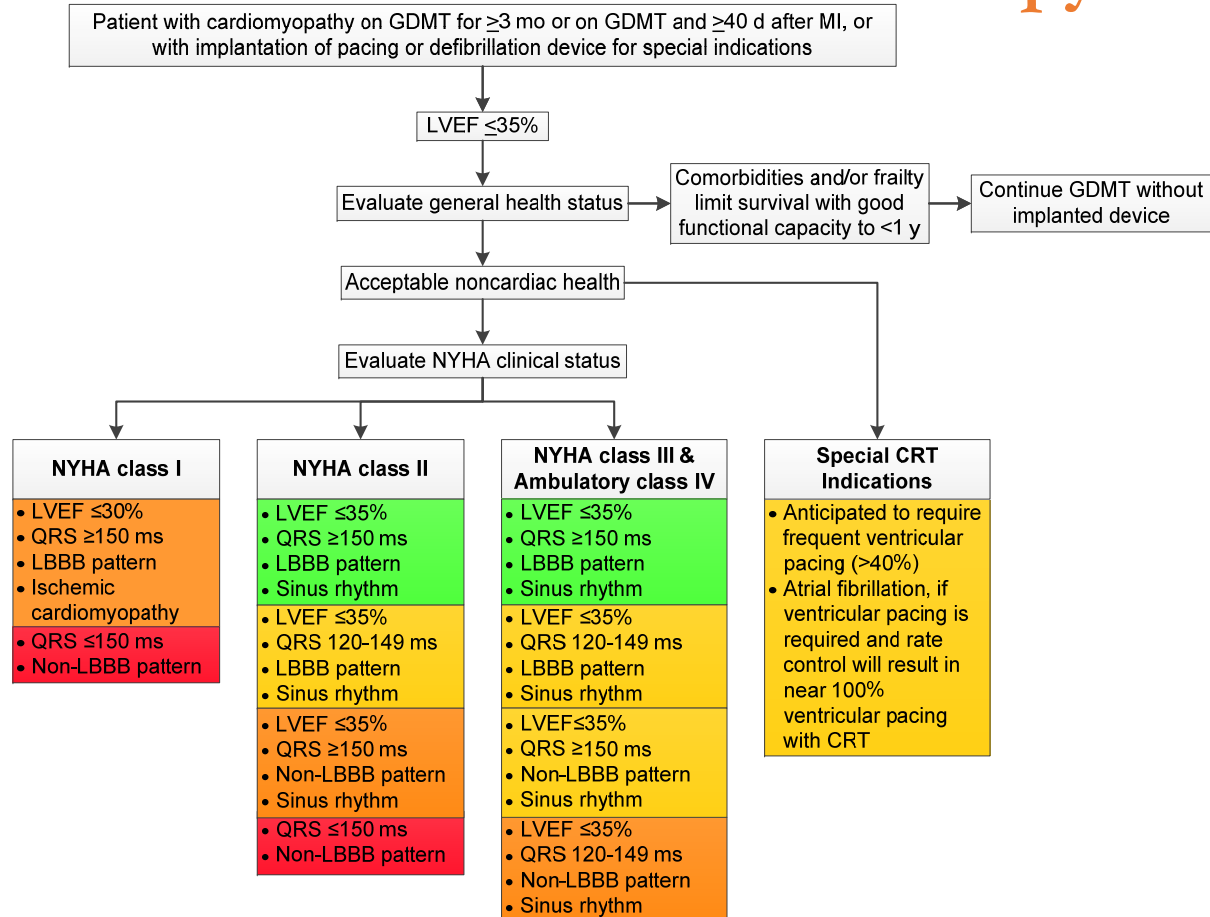
DiMarco JP. N Engl J Med 2003;349:1836–47.

Cardiac Resynchronization

- Transvenous Approach
 - Standard pacing lead in RA
 - Standard pacing or defibrillation lead in RV
 - Specially designed left heart lead placed in a left ventricular cardiac vein via the coronary sinus



Indications for CRT Therapy



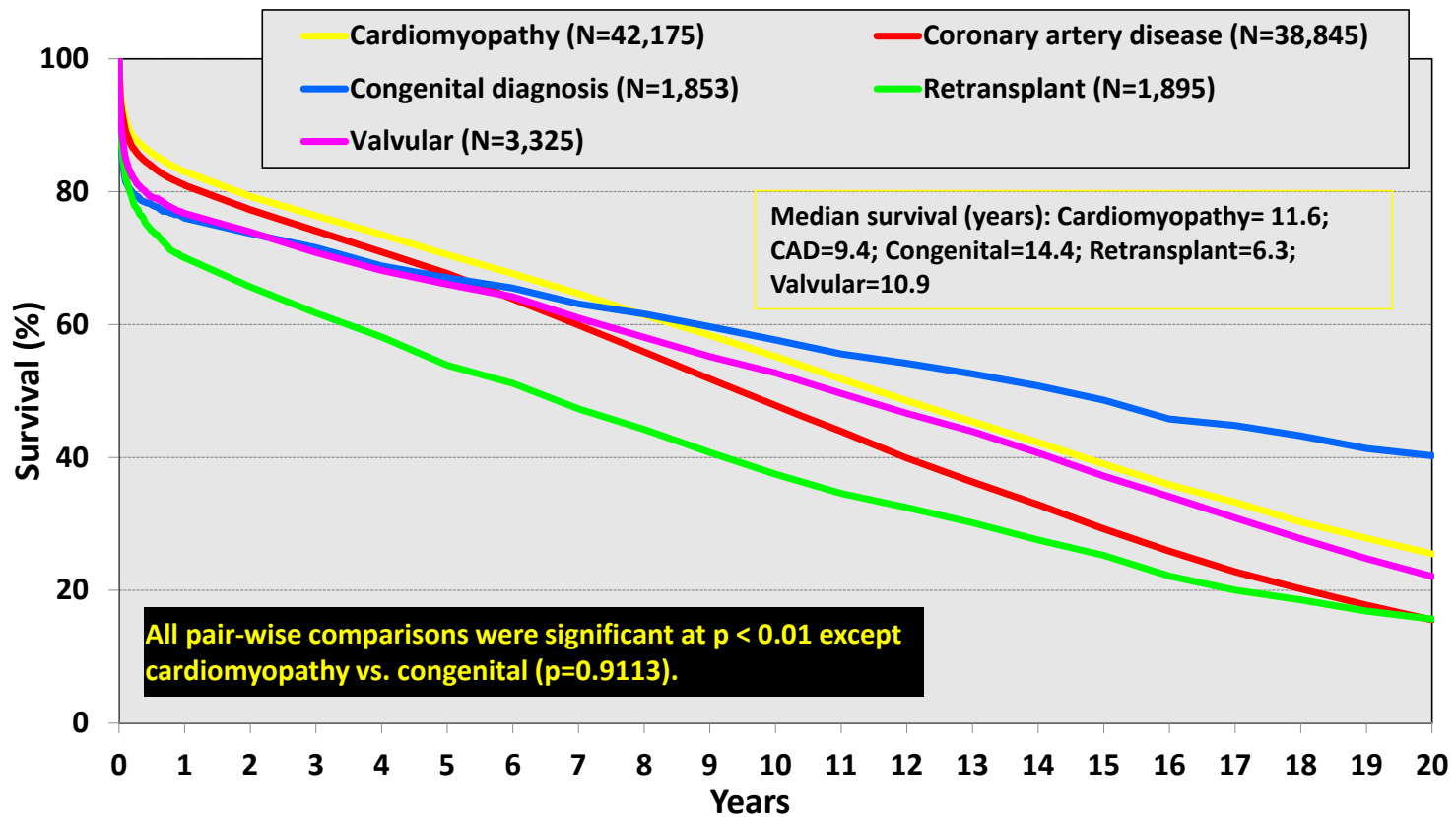
Colors correspond to the class of recommendations in the ACCF/AHA Table 1.

Benefit for NYHA class I and II patients has only been shown in CRT-D trials, and while patients may not experience immediate symptomatic benefit, late remodeling may be avoided along with long-term HF consequences. There are no trials that support CRT-pacing (without ICD) in NYHA class I and II patients. Thus, it is anticipated these patients would receive CRT-D unless clinical reasons or personal wishes make CRT-pacing more appropriate. In patients who are NYHA class III and ambulatory class IV, CRT-D may be chosen but clinical reasons and personal wishes may make CRT-pacing appropriate to improve symptoms and quality of life when an ICD is not expected to produce meaningful benefit in survival.

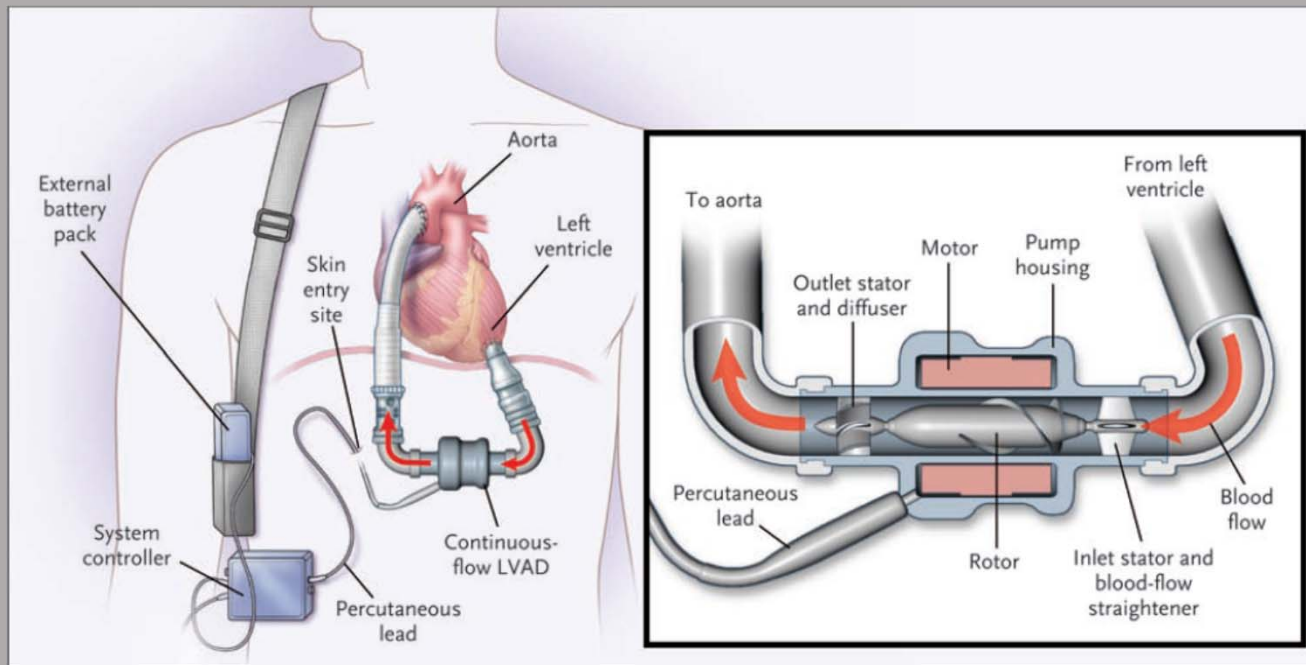
Adult Heart Transplants

Kaplan-Meier Survival by Diagnosis

(Transplants: January 1982 – June 2011)



Heartmate II (Non-pulsatile LVAD)



- Axial flow pump, simple blood path minimizes hemolysis/clotting
- Weighs only 375 gm, 4 cm x 6 cm
- Flows up to 10 L/min

The Insidious-ness of End of Life

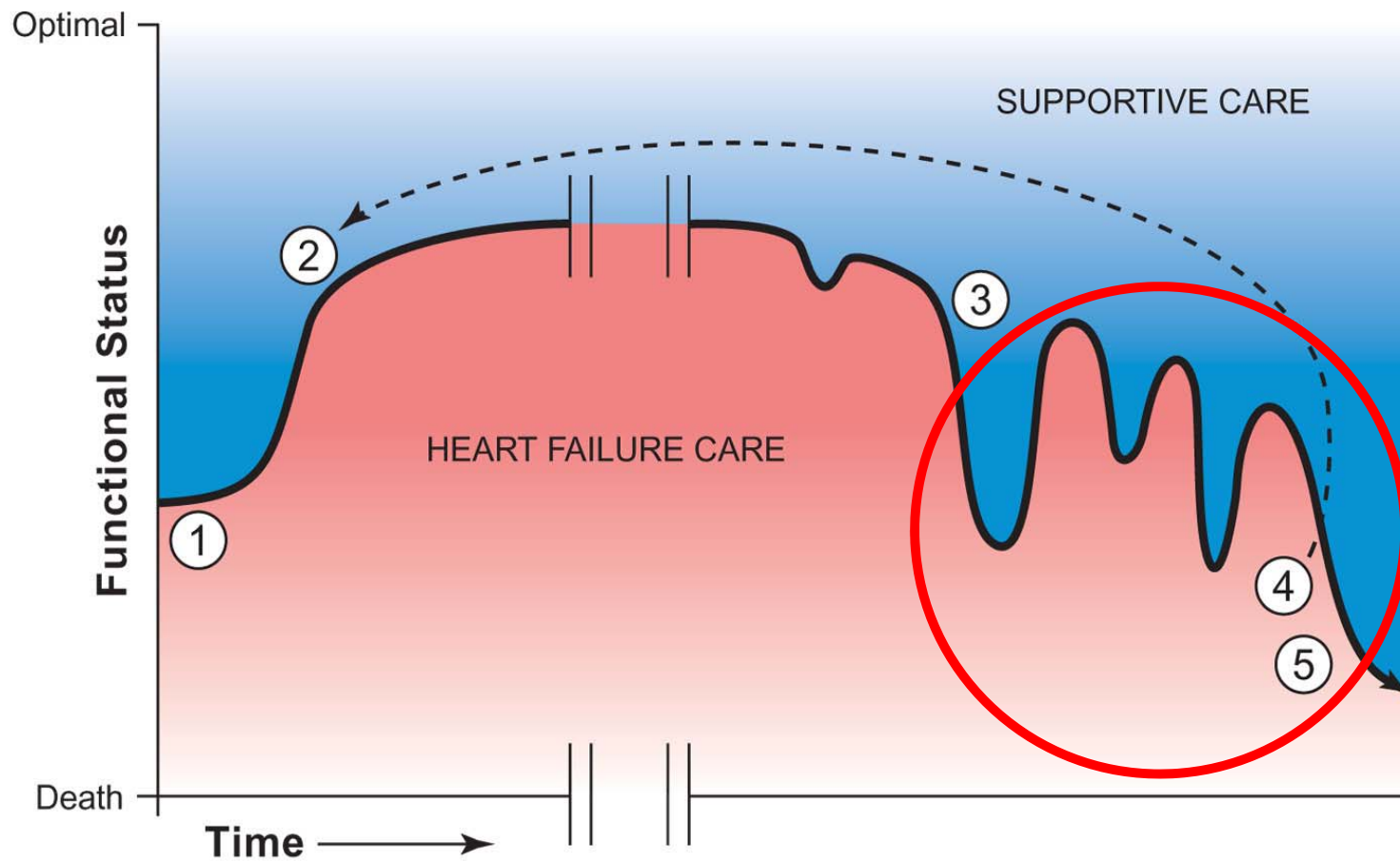
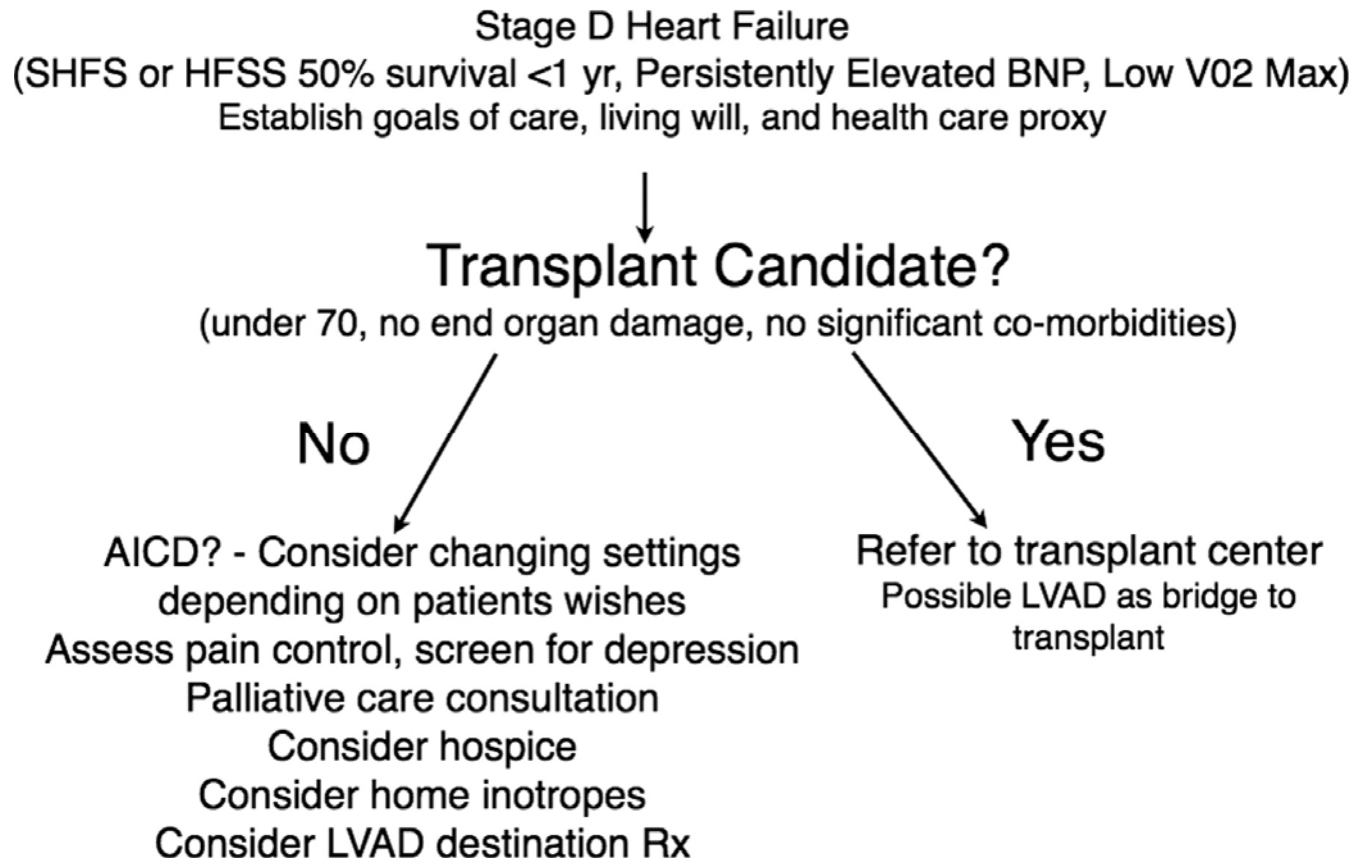


Figure 2. Sample algorithm for treatment of end-stage heart failure.



Eric D. Adler et al. Circulation. 2009;120:2597-2606





The Evolution of "Guidelines"

Barbossa: "First of all, Miss Turner, returning you to shore was never part of our agreement. Second, you are not a pirate, so the Pirate's Code does not apply. *And third, the Pirate's Code is more of a set of what you'd call "guidelines" than actual rules.* Welcome aboard the Black Pearl, Miss Turner."

Pirates of the Caribbean (2003)

Classification of Recommendations and Levels of Evidence

		SIZE OF TREATMENT EFFECT												
		CLASS I <i>Benefit >>> Risk</i> Procedure/Treatment SHOULD be performed/ administered	CLASS IIa <i>Benefit >> Risk</i> Additional studies with focused objectives needed IT IS REASONABLE to per- form procedure/administer treatment	CLASS IIb <i>Benefit ≥ Risk</i> Additional studies with broad objectives needed; additional registry data would be helpful Procedure/Treatment MAY BE CONSIDERED	CLASS III <i>No Benefit</i> or CLASS III <i>Harm</i>									
					<table border="1"> <thead> <tr> <th></th> <th>Procedure/ Test</th> <th>Treatment</th> </tr> </thead> <tbody> <tr> <td>COR III: No benefit</td> <td>Not Helpful</td> <td>No Proven Benefit</td> </tr> <tr> <td>COR III: Harm</td> <td>Excess Cost w/o Benefit or Harmful</td> <td>Harmful to Patients</td> </tr> </tbody> </table>		Procedure/ Test	Treatment	COR III: No benefit	Not Helpful	No Proven Benefit	COR III: Harm	Excess Cost w/o Benefit or Harmful	Harmful to Patients
	Procedure/ Test	Treatment												
COR III: No benefit	Not Helpful	No Proven Benefit												
COR III: Harm	Excess Cost w/o Benefit or Harmful	Harmful to Patients												
ESTIMATE OF CERTAINTY (PRECISION) OF TREATMENT EFFECT	LEVEL A Multiple populations evaluated* Data derived from multiple randomized clinical trials or meta-analyses	<ul style="list-style-type: none"> Recommendation that procedure or treatment is useful/effective Sufficient evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> Recommendation in favor of treatment or procedure being useful/effective Some conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> Recommendation's usefulness/efficacy less well established Greater conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> Recommendation that procedure or treatment is not useful/effective and may be harmful Sufficient evidence from multiple randomized trials or meta-analyses 									
	LEVEL B Limited populations evaluated* Data derived from a single randomized trial or nonrandomized studies	<ul style="list-style-type: none"> Recommendation that procedure or treatment is useful/effective Evidence from single randomized trial or nonrandomized studies 	<ul style="list-style-type: none"> Recommendation in favor of treatment or procedure being useful/effective Some conflicting evidence from single randomized trial or nonrandomized studies 	<ul style="list-style-type: none"> Recommendation's usefulness/efficacy less well established Greater conflicting evidence from single randomized trial or nonrandomized studies 	<ul style="list-style-type: none"> Recommendation that procedure or treatment is not useful/effective and may be harmful Evidence from single randomized trial or nonrandomized studies 									
	LEVEL C Very limited populations evaluated* Only consensus opinion of experts, case studies, or standard of care	<ul style="list-style-type: none"> Recommendation that procedure or treatment is useful/effective Only expert opinion, case studies, or standard of care 	<ul style="list-style-type: none"> Recommendation in favor of treatment or procedure being useful/effective Only diverging expert opinion, case studies, or standard of care 	<ul style="list-style-type: none"> Recommendation's usefulness/efficacy less well established Only diverging expert opinion, case studies, or standard of care 	<ul style="list-style-type: none"> Recommendation that procedure or treatment is not useful/effective and may be harmful Only expert opinion, case studies, or standard of care 									
Suggested phrases for writing recommendations		should is recommended is indicated is useful/effective/beneficial	is reasonable can be useful/effective/beneficial is probably recommended or indicated	may/might be considered may/might be reasonable usefulness/effectiveness is unknown/unclear/uncertain or not well established	COR III: No Benefit is not recommended is not indicated should not be performed/ administered/ other is not useful/ beneficial/ effective	COR III: Harm potentially harmful causes harm associated with excess morbidity/mortality should not be performed/ administered/ other								
Comparative effectiveness phrases*		treatment/strategy A is recommended/indicated in preference to treatment B treatment A should be chosen over treatment B	treatment/strategy A is probably recommended/indicated in preference to treatment B It is reasonable to choose treatment A over treatment B											

A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Although randomized trials are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

*Data available from clinical trials or registries about the usefulness/efficacy in different subpopulations, such as sex, age, history of diabetes, history of prior myocardial infarction, history of heart failure, and prior aspirin use.

†For comparative effectiveness recommendations (Class I and IIa; Level of Evidence A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

History and Physical Examination



A thorough history and physical examination should be obtained/performed in patients presenting with HF to identify cardiac and noncardiac disorders or behaviors that might cause or accelerate the development or progression of HF.



In patients with idiopathic DCM, a 3-generational family history should be obtained to aid in establishing the diagnosis of familial DCM.



Volume status and vital signs should be assessed at each patient encounter. This includes serial assessment of weight, as well as estimates of jugular venous pressure and the presence of peripheral edema or orthopnea.

Noninvasive Cardiac Imaging

I IIa IIb III



Patients with suspected or new-onset HF, or those presenting with acute decompensated HF, should undergo a chest x-ray to assess heart size and pulmonary congestion, and to detect alternative cardiac, pulmonary, and other diseases that may cause or contribute to the patients' symptoms.

I IIa IIb III



A 2-dimensional echocardiogram with Doppler should be performed during initial evaluation of patients presenting with HF to assess ventricular function, size, wall thickness, wall motion, and valve function.

I IIa IIb III



Repeat measurement of EF and measurement of the severity of structural remodeling are useful to provide information in patients with HF who have had a significant change in clinical status; who have experienced or recovered from a clinical event; or who have received treatment, including GDMT, that might have had a significant effect on cardiac function; or who may be candidates for device therapy.

Pharmacological Treatment for Stage C HFrEF (cont.)



Diuretics are recommended in patients with HFrEF who have evidence of fluid retention, unless contraindicated, to improve symptoms.



ACE inhibitors are recommended in patients with HFrEF and current or prior symptoms, unless contraindicated, to reduce morbidity and mortality.



ARBs are recommended in patients with HFrEF with current or prior symptoms who are ACE inhibitor-intolerant, unless contraindicated, to reduce morbidity and mortality.

- **CD ECHO 2D COMPLETE W DOP AND COLOR-ADLT Event Date: 05/19/12 10:21:26 Updated: 05/20/12 10:21**
- **CD ECHO 2D COMPLETE W DOP AND COLOR-ADLT**
- **This document has an image**
- **Reason For Exam**
- **CHF, CAD, DYSLIPIDEMIA**
- **RADRPT**
- **ECHOCARDIOGRAPHIC REPORT**
- **INDICATION: CHF, coronary artery disease, hyperlipidemia**
- **Height: 70 inches**
- **Weight: 187 lbs.**
- **Blood Pressure: 93/60**
- **MEASUREMENTS:**
- **Right Ventricular dimension in diastole (normal range 2.0cm-2.8cm)**
- **Diastolic intraventricular Septal Thickness (normal range 0.6cm-1.1cm) 1.0**
- **Left Ventricular Diastole(normal range men 4.2-5.9cm, women 3.9-5.3cm) 7.8**
- **Left Ventricular Systole (normal range 1.5cm-4.0cm) 7.1**
- **Diastolic Left Ventricular Posterior Wall Thickness (normal range 0.6cm-1.1cm) 0.93**
- **Aortic Root diastolic dimension (normal range <3.8cm) 3.1**
- **Left Atrial dimension in systole (normal range < 4.0cm) 4.9**
- **Ejection Fraction by Simpson's method (normal range >or equal to 50%) 12.6%**
- **Pulmonary Systolic Pressure 45-50 mmHg**

- **This study was technically difficult.**
- **The left ventricle is markedly dilated, with thinning of the interventricular septum and apex and**
- **exhibits severely reduced overall systolic function.**
- **Regional wall motion analysis reveals severe global hypokinesis with the inferolateral segment exhibiting the best contractility. Although the apex is**
- **poorly seen, there appears to be good filling of color in the left ventricular apex. Contrast echo could be considered for further evaluation**
- **Ejection fraction is visually estimated at about 15% .**
- **Aortic valve is poorly seen.**
- **Mitral valve exhibits symmetric echodensity which could be consistent with placement of a mitral annuloplasty ring.**
- **Left atrium is severely enlarged. Left atrial end systolic volume index is 45.3 mL/sq m**
- **Aortic root is normal.**
- **Right ventricle is upper limits of normal to mildly dilated and exhibits moderately reduced function.**
- **Right atrium is normal.**
- **Tricuspid valve is poorly seen.**
- **Pulmonic valve is poorly seen.**
- **Pulmonary artery is poorly seen.**
- **There is no pericardial effusion seen.**
- **There are no intracardiac masses seen.**
- **There is a linear echodensity within the right sided chambers consistent with an intracardiac lead.**

- DOPPLER
- Doppler of mitral valve inflow is suggestive of a restrictive filling pattern and there is probably mild to moderate mitral regurgitation. There is a very
- dense continuous-wave Doppler signal seen. Mitral regurgitation could be underestimated on this study and clinical correlation is advised. The mean
- gradient across the mitral valve is 4 millimeters of mercury which is acceptable
- Doppler of aortic valve is normal. There is no LVOT obstruction seen. There is no aortic insufficiency.
- Doppler of tricuspid valve is normal and shows mild regurgitation.
- Pulmonary pressure was estimated in the moderately elevated range.
- Doppler of pulmonic valve is normal and there is no significant pulmonic insufficiency.
- Tissue Doppler shows extremely low E prime velocities and elevated E to E prime ratios suggesting increased filling pressures.

- **CONCLUSION:**
- **Markedly dilated left ventricle with thinning of the interventricular septum and apex and severe, global reduction in left ventricular systolic function as**
- **detailed above. The study was technically difficult and apical segments were poorly seen. Contrast echo could be considered for further evaluation if**
- **clinically relevant.**
- **Severe left atrial enlargement present. Mitral inflow suggests a restrictive pattern of diastolic filling abnormality.**
- **Mitral valve appearance suggestive of placement of a mitral annuloplasty ring with a mean gradient of 4 mmHg across the valve and probably mild to**
- **moderate mitral regurgitation. MR could be underestimated on this study as detailed above and clinical correlation is advised.**
- **Mild tricuspid regurgitation and moderately elevated PA systolic pressure.**
- **Tissue Doppler suggests elevated filling pressures.**
- **Right ventricle appears to be hypocontractile.**
- **Signature Line**
- ***** FINAL *****
- **Performing Technologists: Rzuczkowski, Tomasz**
- **Transcribed By : TP**
- **05/20/2012 10:10 am**
- **Dictated By:**