Outpatient Management of Heart Failure

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How do we define heart failure?

- Presence or absence of impaired left ventricular systolic function
- Etiology
- Time-course
- Presence of LV dilation (a marker of chronicity)
- Degree of symptoms
- Stage of disease

How do we define heart failure?

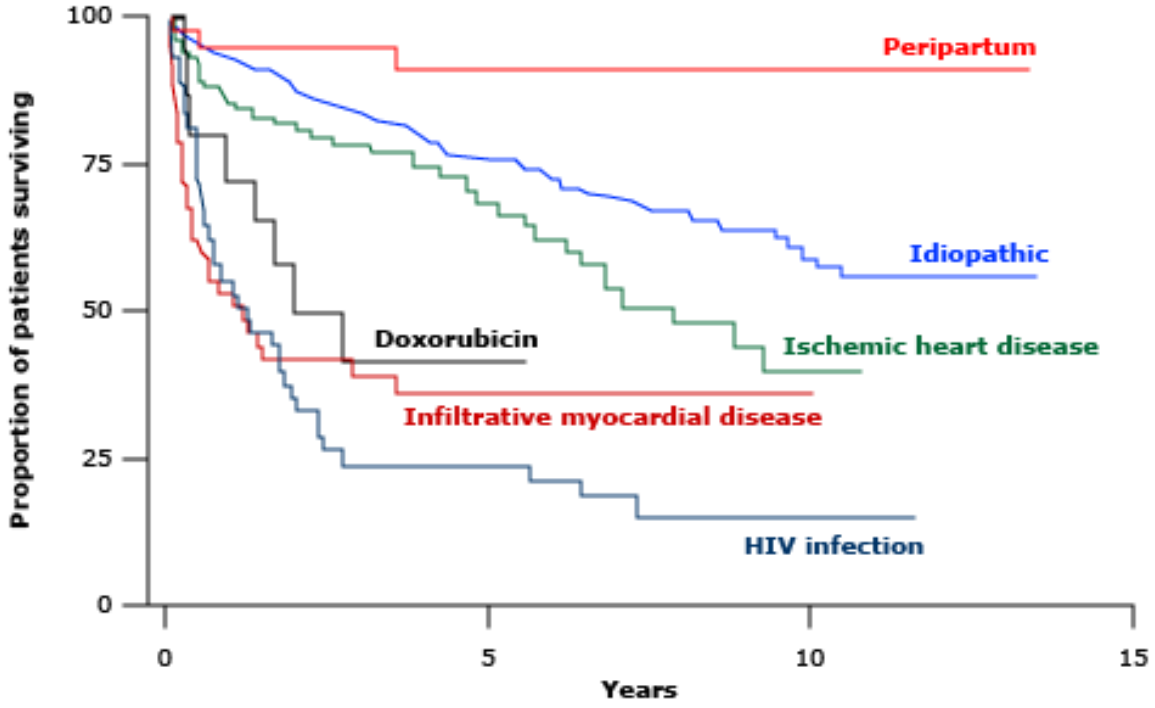
- Presence or absence of impaired left ventricular systolic function (HFrEF):
  - If yes:
    - LVEF < 40%
    - Severe: LVEF < 35%
    - LVEF < 50% should be treated as systolic heart failure, but evidence for efficacy of therapy is less compelling
  - If no:
    - Heart failure with preserved EF; aka HFpEF
    - Diastolic heart failure is an imprecise term and should be avoided

How do we define heart failure?

- Etiology
  - Ischemic (Most common in the US)
  - Non-ischemic
    - Hypertensive (Most common in sub-Saharan Africa)
    - Primary valvular heart disease (AS, rheumatic disease)
    - Idiopathic (Up to 50% of unexplained cases, may be viral)
    - Toxin mediated (Alcohol, Chemotherapeutics)
    - Connective Tissue Disease
    - Myocarditis
    - Peripartum cardiomyopathy
    - Tachycardia-mediated
  - "Stress CM"(an inpatient topic, primarily)

Felker GM, Thompson RE, Hare JM, et al. Underlying causes and long-term survival in patients with initially unexplained cardiomyopathy. N Engl J Med 2000;342:1077-1084

Outcome with a cardiomyopathy is related to the etiology



In a study of 1230 patients with a cardiomyopathy of various etiologies, the adjusted Kaplan-Meier estimates of survival is related to the underlying cause of cardiomyopathy; only idiopathic cardiomyopathy and cardiomyopathy due to causes for which survival was significantly different from that in patients with idiopathic cardiomyopathy are shown. The best outcome is in those with a peripartum cardiomyopathy and the worst outcome is in those with an infiltrative cardiomyopathy or that due to HIV infection.

Data from Felker, CM, Thompson, RE, Hare, JM, et al. N Engl J Med 2000; 342:1077.

How do we define heart failure?

- Symptoms
  - Dyspnea
  - Fatigue
  - Shortness of breath
  - *Orthopnea*
  - *Paroxysmal nocturnal dyspnea (PND)*
- Signs
  - LE edema
  - *Elevated JVP*
  - Cardiomegaly
  - Rales
  - *Pulmonary edema on CXR*
  - *S_3 gallop*
- Any constellation of symptoms should be confirmed with echocardiography

McMurray, JJV. Systolic Heart Failure. N Engl J Med 2010; 362: 228-238

From: **β-Blockers in Heart Failure: Clinical Applications**
JAMA. 2002;287(7):890-897. doi:10.1001/jama.287.7.890

ACC-AHA Stage	NYHA Functional Classification
A At high risk for heart failure but without structural heart disease or symptoms of heart failure (eg, patients with hypertension or coronary artery disease)	None
B Structural heart disease but without symptoms of heart failure	I Asymptomatic
C Structural heart disease with prior or current symptoms of heart failure	II Symptomatic with moderate exertion
	III Symptomatic with minimal exertion
D Refractory heart failure requiring specialized interventions	IV Symptomatic at rest

How do we define heart failure?

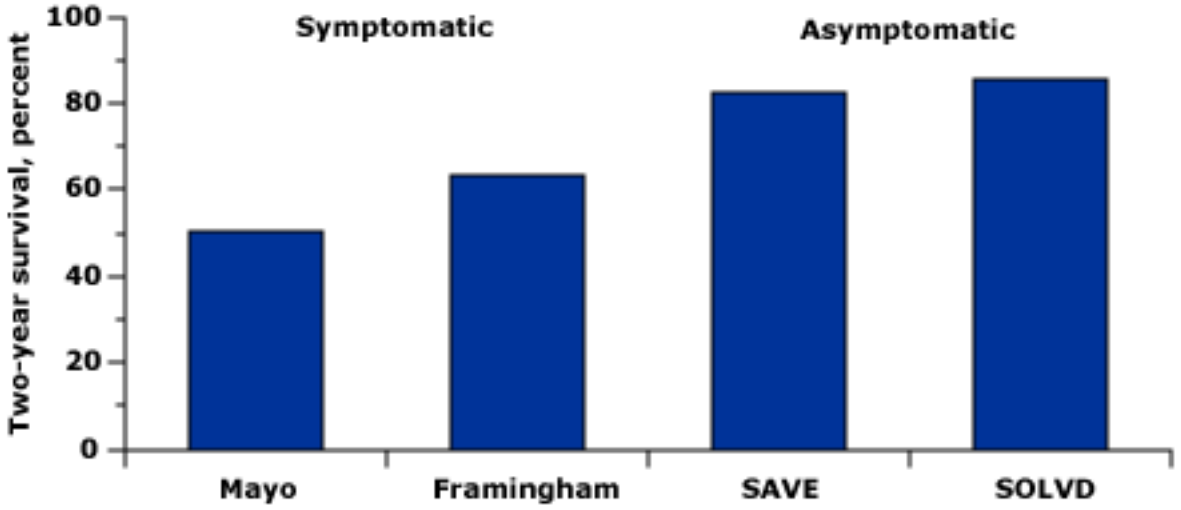
- Ideally, these elements can be combined to most accurately describe a patient:
  - Mr. X is a 55 yo M with chronic systolic heart failure (most recent EF 30%), NYHA class III symptoms who presents for…
  - Ms. Y is a 29 yo F with recently recognized peripartum cardiomyopathy (EF 40%), NYHA class II symptoms who is improving with optimal medical therapy…
- Stage is rarely used in clinical practice

Heart failure is a chronic condition with high mortality

- Morbidity and mortality occurs in two distinct phases
  - Acute decompensate heart failure (severe congestion requiring hospitalization)
  - Chronic Heart Failure

- Can you guess the degree of mortality associated with each?

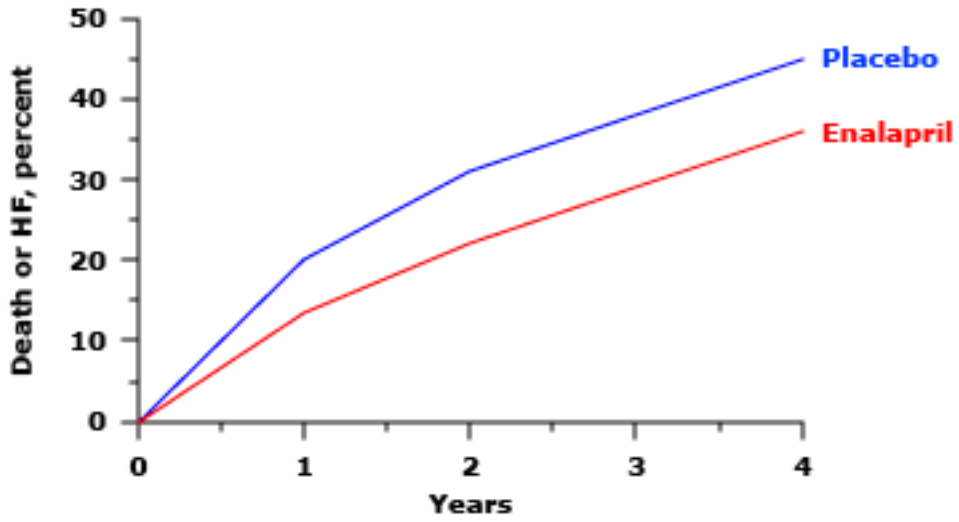
Survival in HF and disease severity



Impact of severity of disease on mortality in patients with heart failure. Patients with symptomatic heart failure had a two-year survival rate of 50 percent in the Mayo study and 63 percent in the Framingham study. In contrast, asymptomatic patients had survival rates of 82 percent in the SAVE trial and 85 percent in the SOLVD trial.

Data from: Rodeheffer RJ, Jacobsen SJ, Gersh BJ, et al. Mayo Clinic Proc 1993; 68:1143; Ho, KK, Anderson, KM, Kannel, WB, et al, Circulation 1993; 88:107; Pfeffer, MA, Braunwald, E, Moye, LA, et al, N Engl J Med 1992; 327:669; The SOLVD Investigators, N Engl J Med 1992; 327:685.

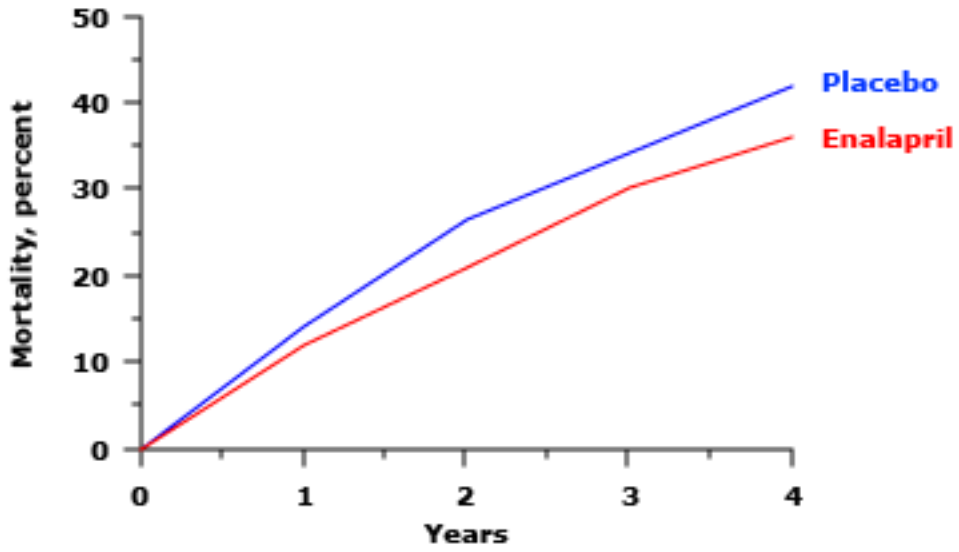
Enalapril improves outcome in asymptomatic LV dysfunction



In the SOLVD prevention trial of 4228 patients (83 percent post-MI) with asymptomatic left ventricular dysfunction, prophylactic administration of enalapril reduced the probability of death or heart failure ($p < 0.001$).

Data from: The SOLVD Investigators. N Engl J Med 1992; 327:685.

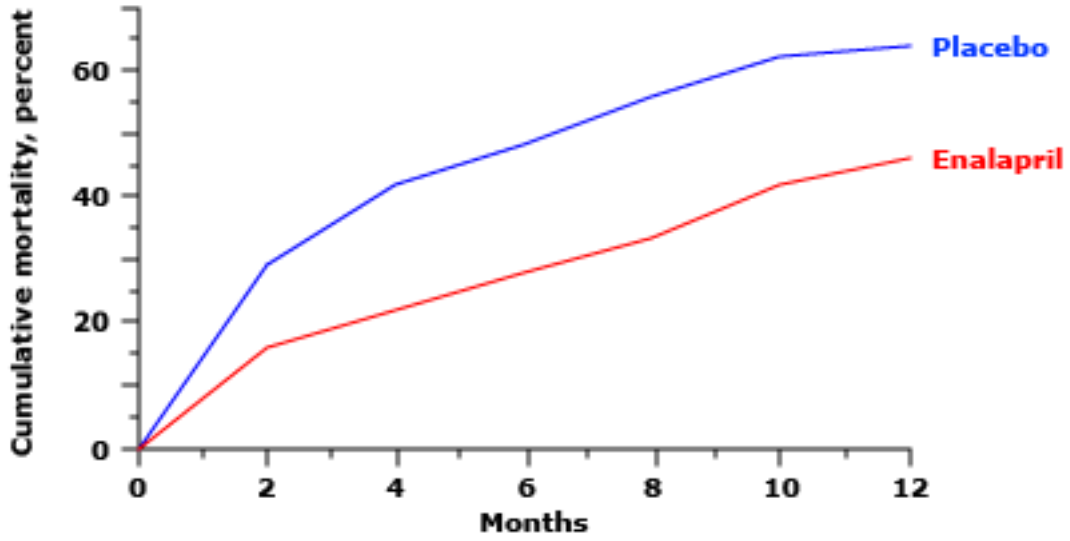
ACE inhibitor improves survival in moderate HF



Enalapril, compared to placebo, decreases patient mortality in NYHA class II and III heart failure (p = 0.0036).

Data from: The SOLVD Investigators, N Engl J Med 1991; 325:293.

ACE inhibitor improves survival in advanced HF



Decreased mortality in patients with advanced NYHA class III or IV heart failure after treatment with enalapril compared to placebo (p = 0.003).

Data from: The CONSENSUS Trial Study Group, N Engl J Med 1987; 316:1429.

From: Clinical Determinants of Mortality in Patients With Angiographically Diagnosed Ischemic or Nonischemic Cardiomyopathy

J Am Coll Cardiol. 1997;30(4):1002-1008. doi:10.1016/S0735-1097(97)00235-0

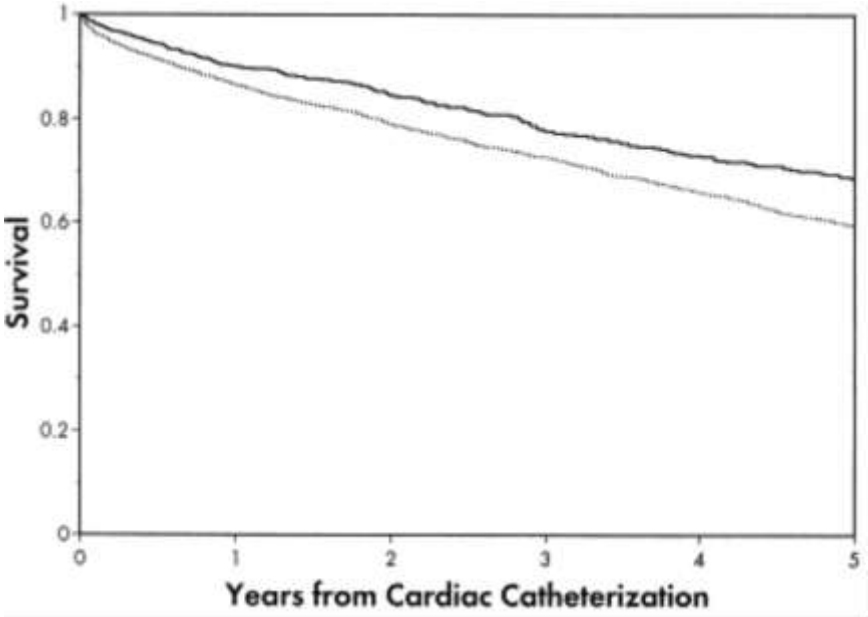


Figure Legend:

Adjusted Kaplan-Meier survival estimates for patients with nonischemic (solid line) and ischemic (dashed line) cardiomyopathy ($p < 0.0001$).

From: Clinical Determinants of Mortality in Patients With Angiographically Diagnosed Ischemic or Nonischemic Cardiomyopathy

J Am Coll Cardiol. 1997;30(4):1002-1008. doi:10.1016/S0735-1097(97)00235-0

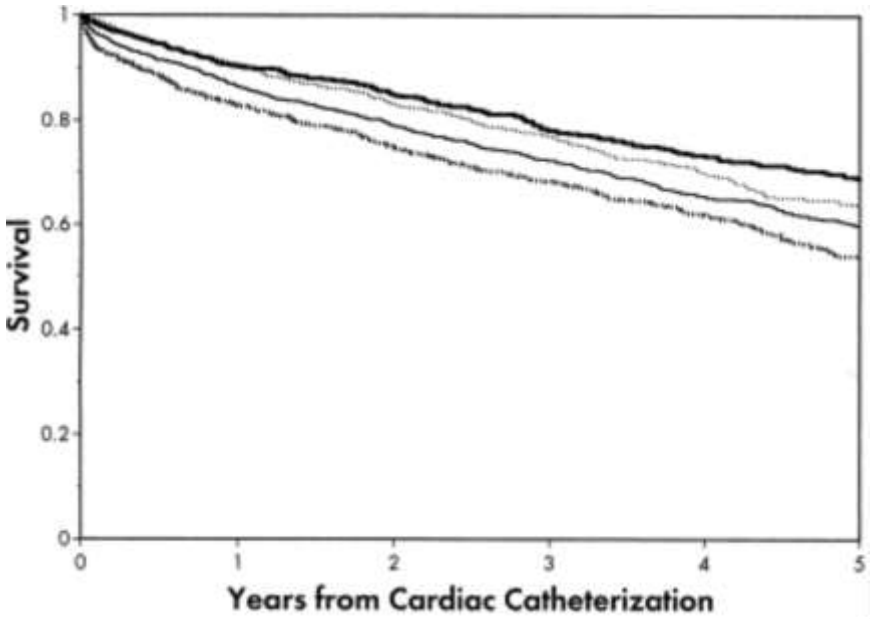


Figure Legend:

Adjusted Kaplan-Meier survival estimates for patients with nonischemic cardiomyopathy (heavy solid line), ischemic cardiomyopathy with mild CAD (light dashed line), ischemic cardiomyopathy with moderate CAD (light solid line) and ischemic cardiomyopathy with severe CAD (heavy dashed line).

Recommendations

- Therapeutic recommendations are based on stage of disease
- We will focus on the recommendations for those with stage B and C disease that you will see in clinic follow up
- Class I and III recommendations from most recent guidelines will be discussed (2009)

Hunt SA, Abraham WT, Chin MH, Feldman AM, Francis GS, Ganiats TG, Jessup M, Konstam MA, Mancini DM, Michl K, Oates JA, Rahko PS, Silver MA, Stevenson LW, Yancy CW. 2009 Focused update incorporated into the ACC/AHA 2005 guidelines for the diagnosis and management of heart failure in adults: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Circulation. 2009;119:e391– e479.

Initial Evaluation (Class I)

- Thorough History and Physical
  - History should focus on potential causes of HF including MI or anginal symptoms, family history of cardiac disease, drug or alcohol use, clinical conditions that predispose to cardiac disease (HIV, malignancy), etc.
  - Physical exam should establish a baseline volume status and include weight, height and BMI
- 12 lead ECG, PA/Lat CXR and labs should be performed (CBC, Chemistry, LFTs, TSH, HgbA1c, fasting lipids)
- TTE should be performed
- Coronary angiogram should be performed if the patient has a history of MI or anginal symptoms (unless revascularization is contraindicated)

Continuing Evaluation (Class I)

- Assessment of ability to perform activities of daily living should be performed each visit
- A clinical assessment of volume status and weight should be obtained at each visit
- Medication and substance use history should be revisited at each appointment

Stage A Heart Failure (at risk)

- HTN, lipids, thyroid function and DM should be controlled in accordance with guidelines
- In patients with known CAD, providers should adhere to secondary prevention guidelines
- Patients should be counseled to abstain from risky behaviors including smoking, illicit drug use and excess alcohol consumption
- Patients should be assessed regularly for signs and symptoms of heart failure
- Assessment of LVEF is indicated only in patients receiving cardiotoxic chemo or strong family history of CM

Stage B Heart Failure

- All recommendations from above
- β-blockers and ACEI should be used, if possible, for all patients with prior MI
- β-blockers and ACEI are indicated for those without prior MI and reduced EF
- ARB should be used in post-MI patients with intolerance to ACEI and reduced EF
- Revascularization and/or valve repair should be recommended in accordance with current guidelines

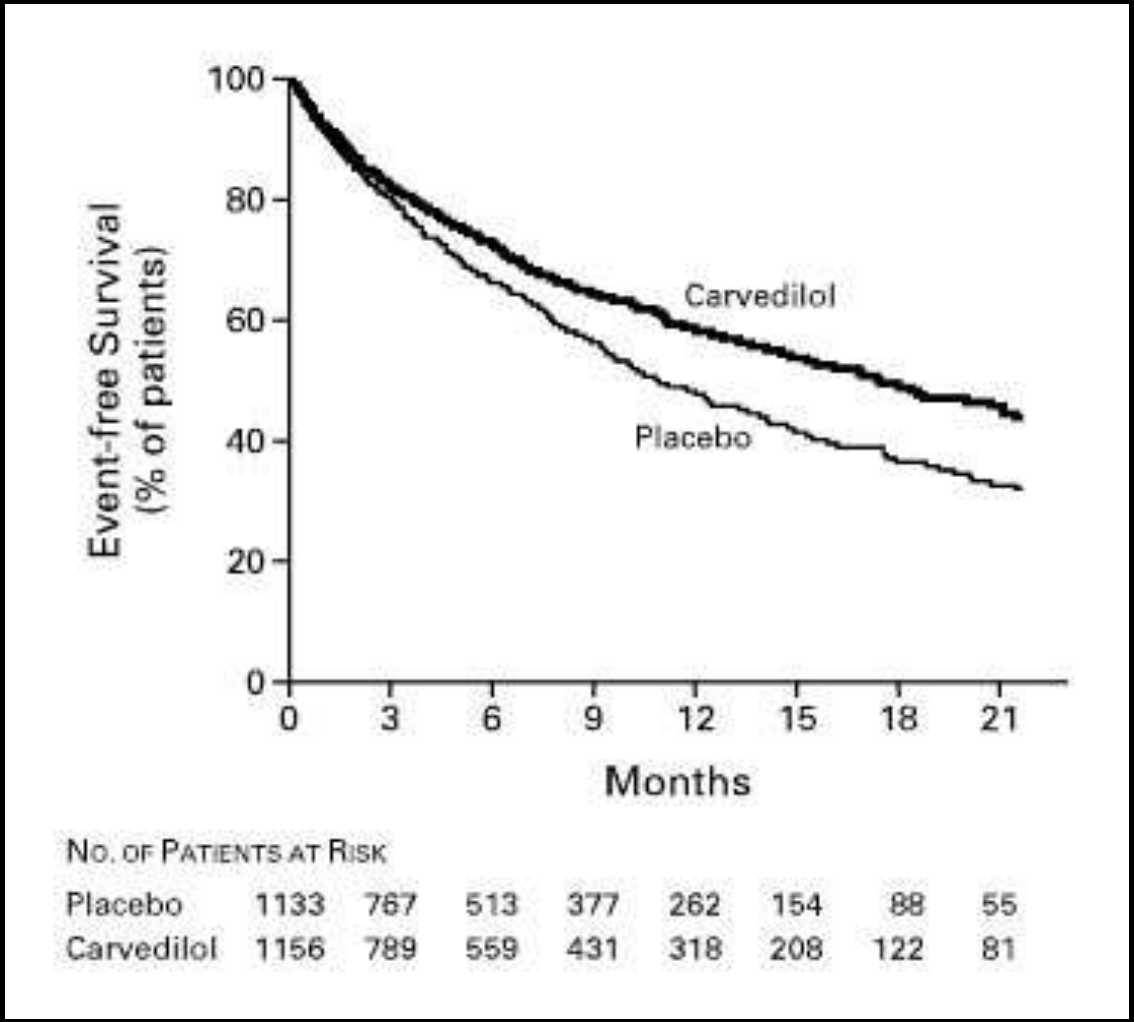
Stage B Heart Failure

- Class III recommendations (HARM)
  - If the patient remains in sinus rhythm, digoxin should not be used in this group as the risk outweighs the benefits
  - Use of calcium channel blockers with negative inotropic effects may be harmful in asymptomatic patients with low EF and prior MI

Stage C Heart Failure

- All measures discussed for Stage A and B patients
- Salt restriction (< 2 g/d) and diuretics are indicated for those with current or prior symptoms of HF, reduced LVEF and fluid retention.
- ACEI are indicated for all patients with current or prior HF symptoms, unless contraindicated
- Carvedilol, bisoprolol or metoprolol succinate are recommended for all stable patients with current or prior HF symptoms and reduced LVEF, unless contraindicated
- ARB are indicated for all patients with current or prior HF symptoms and reduced LVEF if intolerant of ACEI (only candesartan and valsartan have proven mortality benefit)

Kaplan–Meier Analysis of Time to Death or First Hospitalization for Any Reason in the Placebo Group and the Carvedilol Group.



No. of Patients at Risk

Placebo	1133	767	513	377	262	154	88	55
Carvedilol	1156	789	559	431	318	208	122	81

Packer M et al. N Engl J Med 2001;344:1651-1658.

Stage C Heart Failure (cont.)

- Drugs known to adversely effect HF should be withdrawn (CCBs, NSAIDs and anti-arrhythmic medications)
- Exercise training is a beneficial adjunct to improve clinical status in ambulatory patients
- Implantation of ICD for *primary* prevention is indicated for those with LVEF < 35%, functional class II or III symptoms, are on optimal medical therapy and in whom a 1 year survival is expected.

From: Analysis of mortality events in the multicenter automatic defibrillator implantation trial (MADIT-II)

J Am Coll Cardiol. 2004;43(8):1459-1465. doi:10.1016/j.jacc.2003.11.038

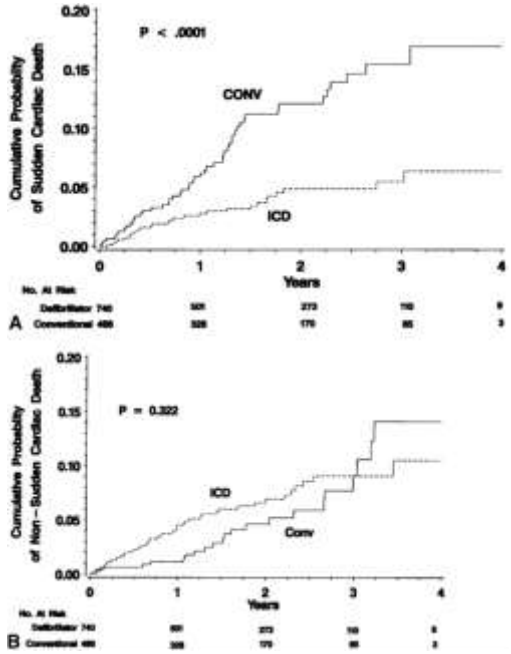


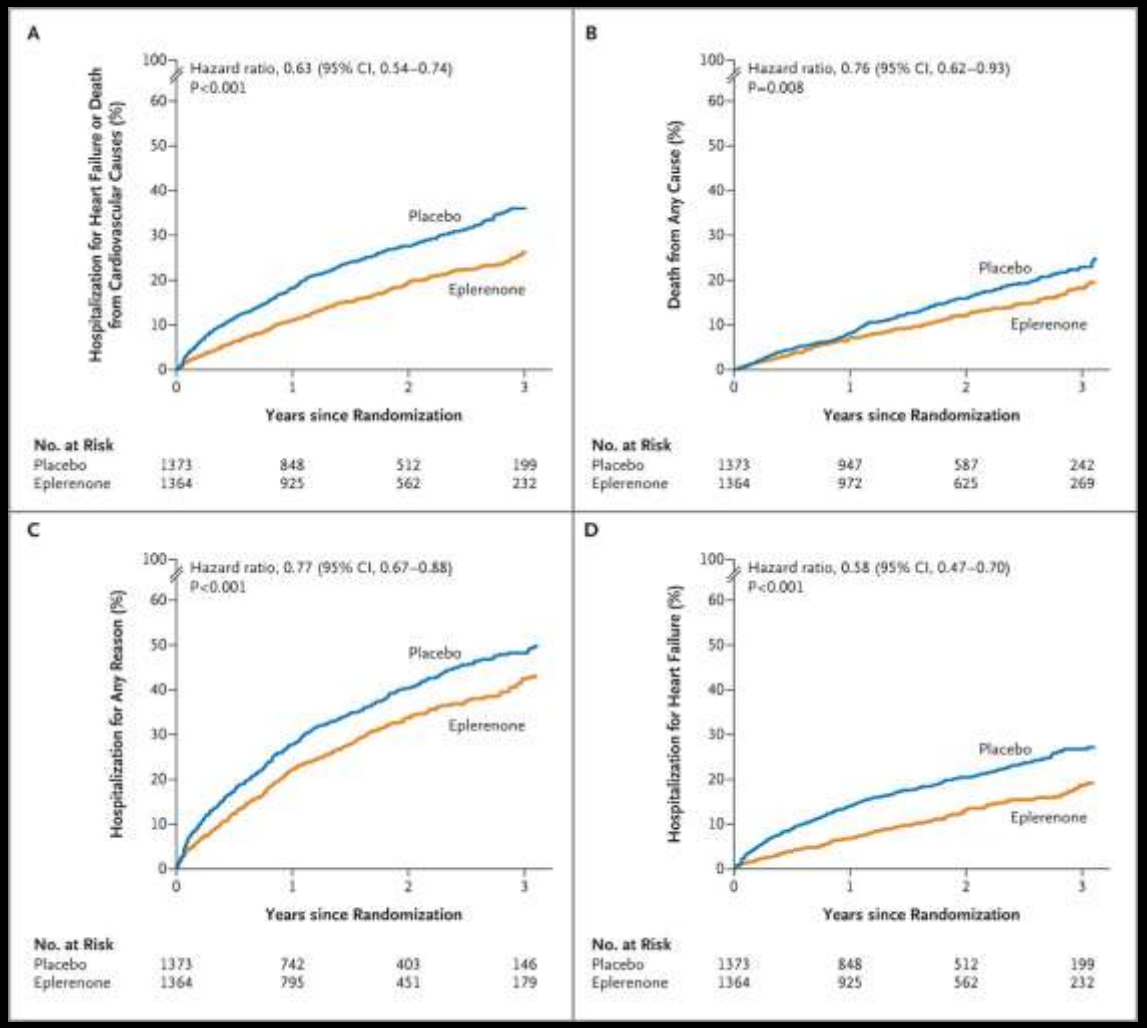
Figure Legend:

Kaplan-Meier estimates of the cumulative probability of sudden cardiac death (SCD) (A) and non-sudden cardiac death (B) in the groups assigned to receive an implantable cardioverter-defibrillator (ICD) or conventional medical therapy (CONV). For SCD, the overall difference in mortality between the two treatment groups was significant (nominal p < 0.0001), with two-year SCD rates of 4.9% and 12.1% in the ICD and CONV groups, respectively. For non-SCD, the overall difference in mortality between the two treatment groups was not significant (nominal p = 0.32), with two-year non-SCD rates of 7.0% and 4.6% in the ICD and CONV groups, respectively.

Stage C Heart Failure (cont.)

- Cardiac resynchronization should be considered In patients with LVEF < 35%, NYHA class III or IV (ambulatory) symptoms despite OMT who have cardiac dyssynchrony (defined in guidelines as (QRS > 0.12 msec)
- Addition of aldosterone antagonist is indicated in patients with moderate to severe HF symptoms (on OMT) and reduced EF so long as Cr and K can be monitored closely.
- The combination of hydralazine and nitrates is recommended to improve the outcome of “self-described African Americans” who are currently on optimal doses of ACEI, β-blockers and diuretics.

Cumulative Kaplan–Meier Estimates of Rates of the Primary Outcome and Other Outcomes, According to Study Group.



Zannad F et al. N Engl J Med 2011;364:11-21.

Stage C Heart Failure – Class III

- Combined use of ACEI, ARB and aldosterone antagonist is not recommended.
- As above, CCB are not indicated
- Long term use of inotropic agents is not recommended, as it is known to increase mortality

Stage D

- Refer to cardiology with advanced capabilities (consideration of LVAD, transplant, investigational therapeutics or palliative therapies).

Performance Measures in HF

- They are coming
- Given the number of objectively measurable Class I recommendations, physicians will be evaluated on their adherence to guidelines for HF
- Recent recommendations have been released by the AHA/ACC

Bonow RO, Ganiats TG, Beam CT, Blake K, Casey DE Jr, Goodlin SJ, Grady KL, Hundley RF, Jessup M, Lynn TE, Masoudi FA, Nilasena D, Piñ˜a IL, Rockswold PD, Sadwin LB, Sikkema JD, Sincak CA, Spertus J, Torcson PJ, Torres E, Williams MV, Wong JB. ACCF/AHA/AMA-PCPI 2011 performance measures for adults with heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Performance Measures and the American Medical Association–Physician Consortium for Performance Improvement. Circulation. 2012;125:2382–2401.

Performance Measure	Criteria	Setting
1. LVEF assessment	% Pts with documented LVEF in a 12-mo period	Outpt
2. Symptom and activity assessment	% patient visits for patients with HF dx with quantitative eval of current level of activity and clinical symptoms	Outpt
3. Symptom management	% patient visits, as compared to above, in which treatment goals are stable/improved OR clinically important	Outpt
4. Patient self-care education	% provided with self-care education during ≥1 visit within a 12-mo period	Outpt
5. Beta-blocker therapy for LVSD	% with a current or prior LVEF of <40% who were prescribed bisoprolol, carvedilol, or sustained-release metoprolol succinate in the outpatient setting over 12 mo.	Inpt & Outpt
6. ACE inhibitor or ARB therapy for LVSD	Percentage of patients aged ≥18 y with a diagnosis of HF with a current or prior LVEF of <40% who were prescribed ACE inhibitor or ARB therapy either within a 12-mo period when seen in the outpatient setting or at hospital discharge	Inpt & Outpt
7. Counseling about ICD implantation	% with current LVEF ≤35% despite ACE inhibitor/ARB and beta-blocker therapy for at least 3 mo who were counseled about ICD implant	Outpt
8. Post-discharge appointment for HF patients	% discharged from an inpatient facility with a principal discharge diagnosis of HF for whom a follow-up appointment was scheduled and documented.	Inpt (& Outpt)

An example…

CC: "Mostly my hands and my R foot is swollen, my L foot swollen and my flu shot and you told me to come back today."

Per family -- 1 week, really tired, breathing been "not normal, wheezing a lot", balance has been off, and just not seeming herself -- forgetful and "I can't remember, but something was off balance". Admits to wheezing, Little cough, dry, no phlegm/blood, no fever/chills. Denies pain/burning with urination, increased or decreased urination, no hematuria, no urgency different than normal. No cp, + sob "if I walk up the stairs", No change in bed position (2 pillows), no new PND has CPaP and using. Today, awoke at 3 AM with pain in R leg, but has pain in both. Not red or any color/temp changes. B legs swollen, 1-2 days, new, no changes in meds since Lisinopril.

Denies trauma, but maybe walking more. R hand swollen, hurts, denies injury, but then says B hands hurt. Recently appears to have restarted her Lisinopril on 9/19 at 10 mg. Reviewed problem list, past history, medications and allergies. Reviewed and updated family and social history.

Filed Vitals: 10/15/12 1046 BP: 140/82 Pulse: 86 Weight: 254 lb 12.8 oz (115.577 kg)

- Awake, alert, + wheezing, seems fatigued, + cough with clear phlegm which she then says is chronic and her normal.
- heent ncat, sinuses not tender, nares clear, throat moist and wnl
- Neck supple, obese, not able to see jvd, no stridor
- Lungs - clear to percussion, RR low 20s, diffuse wheezes, improve with coughing, no obvious crackles
- Cv s1,s2 RRR soft SEM only.
- Marked B pedal edema pitting extending to just below knee, B & symmetric, not tender, not red/hot/cold, no color changes,
- Abdomen obese, +bs, no obvious ascites, + L sided tenderness diffusely, but no rebound/guarding.

Plan:

Wheezing - INFLUENZA VACCINE - (3 YEARS +), PEAK FLOW PRE&POST MED, PANEL BASIC METABOLIC (BMP), PANEL BASIC METABOLIC (BMP)

Pedal edema - PANEL BASIC METABOLIC (BMP), PANEL BASIC METABOLIC (BMP)

Productive cough

COPD (chronic obstructive pulmonary disease) - CBC WITH PLATELET, CBC WITH PLATELET

CHF (congestive heart failure) - NT PROBNP, NT PROBNP

ddx - chf/pu edema, pneumonia, exacerbation of copd with heart strain, maybe aki due to restarting ace

cxr - to my reading, pu edema vs chf, worse since last x-ray of 6/17.

Recommended admission to HCMC, daughter in agreement, but couldn't convince pt -- goal to give IV diuresis and to rule out ACS (high risk of silent ACS due to Dm, age, gender, phx of cabg, etc).

Declined going to ED also for IV diuretic.

Okay to try higher doses of lasix 40 mg bid for 2 days and prednisone 20 mg daily.

Recheck in 2 days, go to ED earlier prn. See pt instructions.

A second example…

Pt with CHF seen in f/u, nothing acute

chief complaint "Because I had an appointment. I'm not feeling good today."

Started about a week ago, but cough has worsened over last week. "coughing, coughing, coughing for 2 days, cough and take breathing machine and do my other medicines". Hurting in L upper back, ribcage under shoulder from/with coughing and now sometimes even when not coughing (worse with cough). Clear mucous production w/out blood. Very tired. Fevers (tactile) and chills. No ENT sx currently, but did have 'sniffles and nose started running". Some SOB at times, some DOE. Some wheezing, improves with "that machine".

No weight gain, no edema.sleeps on pillows, not a change, but no problem lying flat, never able to sleep except with 2 pillows "thats old", no obvious PND. Rare "every now and then" chest pain and palpitations, but nothing really worrying her. Discussion about HCD

Filed Vitals: 01/07/13 0941 BP: 104/70 Pulse: 108 Temp: 37 °C (98.6 °F)

General appearance: fatigued, cooperative, no distress, appears older than stated age

Head: Normocephalic, without obvious abnormality, sinuses nontender to percussion

Eyes: negative

Ears: normal TM's and external ear canals bilateral - DULL, o/w wnl

Nose: clear rhinorhea

Throat: lips, mucosa, and tongue normal. Teeth and gums normal

Neck: supple, symmetrical, trachea midline, no carotid bruit and no JVD

Back: negative

Lungs: clear to auscultation bilaterally, normal percussion bilaterally. Coughs frequently, non-productive.

Heart: regularrhythm, S1, S2 normal, tachy in low 100s no murmur, click, rub or gallop

Abdomen: soft, non-tender. Bowel sounds normal. No masses, no organomegaly

Extremities: extremities normal, atraumatic, no cyanosis or edema

Skin: no acute rashes

Lymph nodes: Cervical, supraclavicular, and axillary nodes normal.

Plan:

Cough - XR CHEST 2 VIEWS PA + LAT*, SPIROMETRY W/BRONCHODIAT POC, PF BREATHING CAPACITY TEST, PF INHAL RX, AIRWAY OBST/DX SPUTUM INDUCT, predniSONE (DELTASONE) 20 mg oral tablet

COPD exacerbation - predniSONE (DELTASONE) 20 mg oral tablet, COPD INITIATE HEALTH MAINTENANCE PROTOCOL

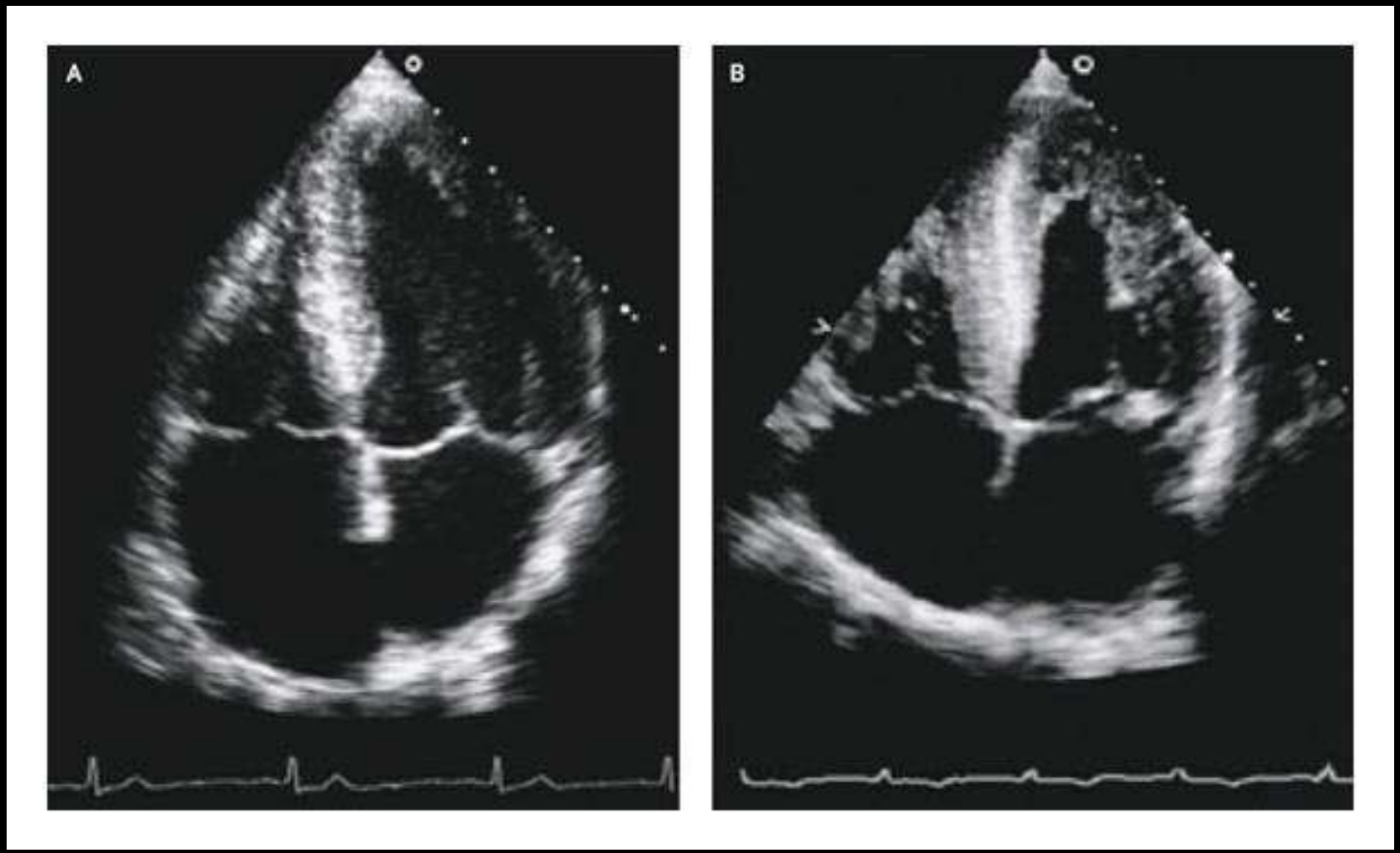
Sick sinus syndrome - INITIATE HEALTH MAINTENANCE PROTOCOL

Diabetes mellitus, type 2 - INITIATE HEALTH MAINTENANCE PROTOCOL

Hypokalemia - POTASSIUM, POTASSIUM, potassium chloride (K-DUR) 20 meq oral tablet CR

rtc 2 weeks or prn, to ED earlier prn. If doing better rtc 4 weeks.

Echocardiographic Images in a Normal Person (Panel A) and the Patient with Diastolic Heart Failure (Panel B).



Aurigemma GP, Gaasch WH. N Engl J Med 2004;351:1097-1105.

HFpEF

- Class I recommendations
  - Physicians should control BP in accordance with guidelines
  - Physicians should control rate in patients with HF symptoms, nl LVEF and atrial fibrillation
  - Diuretics should be used to control LE edema nd pulmonary congestion in patients with normal LVEF

- That's it – our knowledge of these folks is limited.