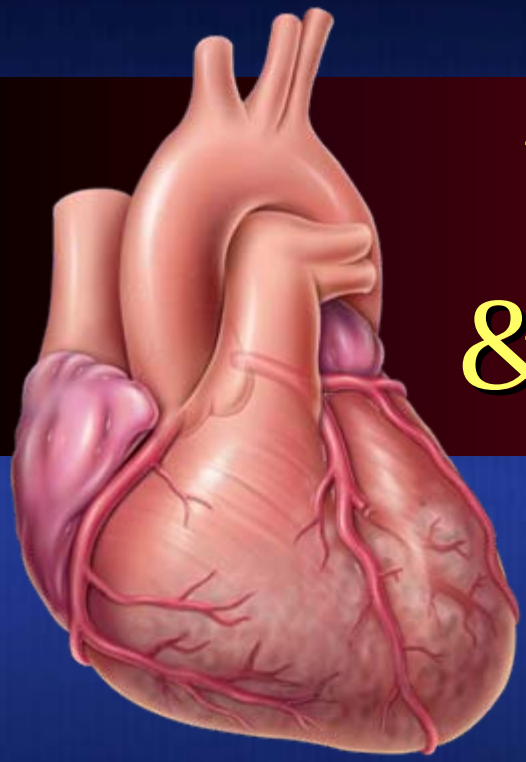

Updates in Diagnosis & Management of CHF

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ARIZONA HEART INSTITUTE

CHF

- CHF is reaching an epidemic level in U.S. and continues to worsen over time
- Reasons are:
  - ↑ HTN
  - ↑ Dm with sedentary lifestyle and obesity
  - Aging population

Epidemiology

- More than 5 million people have Heart Failure
- 580,000 new cases each year

Statistics

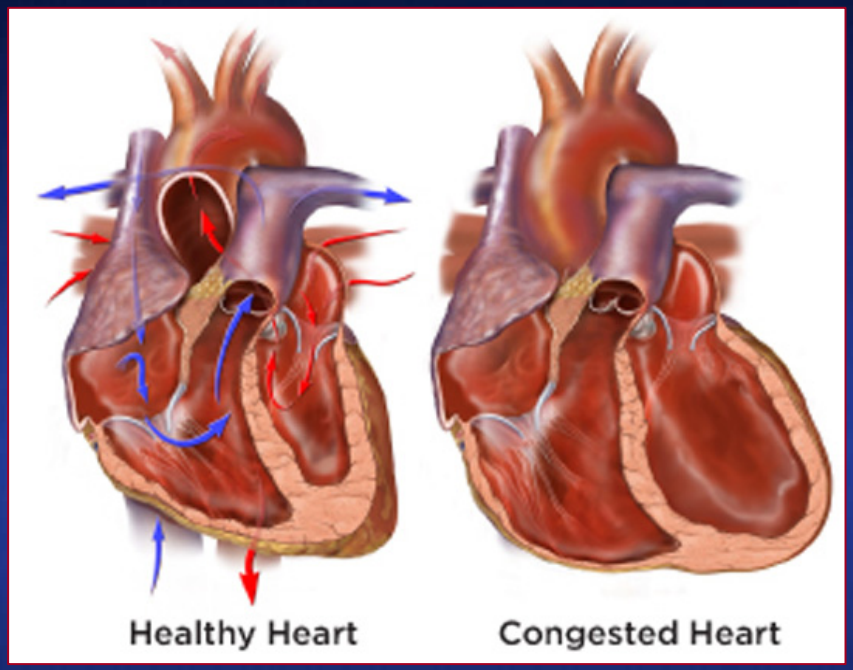
Heart Failure

- Incidence 10/1000 after age 65 years
- 75% have antecedent HTN
- After age 40, lifetime risk of developing CHF is 20% for men & women
  - Mortality after CHF hospitalization
    - 30 days 10.4%
    - 1 year 30%
    - 5 years 50%

CHF – Mortality

- (2006) underlying cause of 60,000 deaths mentioned in >282,000 death certificates (1 in 8 deaths)
- 5 year survival lower in men (41%) vs. women (55%)
- Estimated direct & indirect cause of CHF in U.S. for 2010 = $39.2 Billion

CHF - Definition

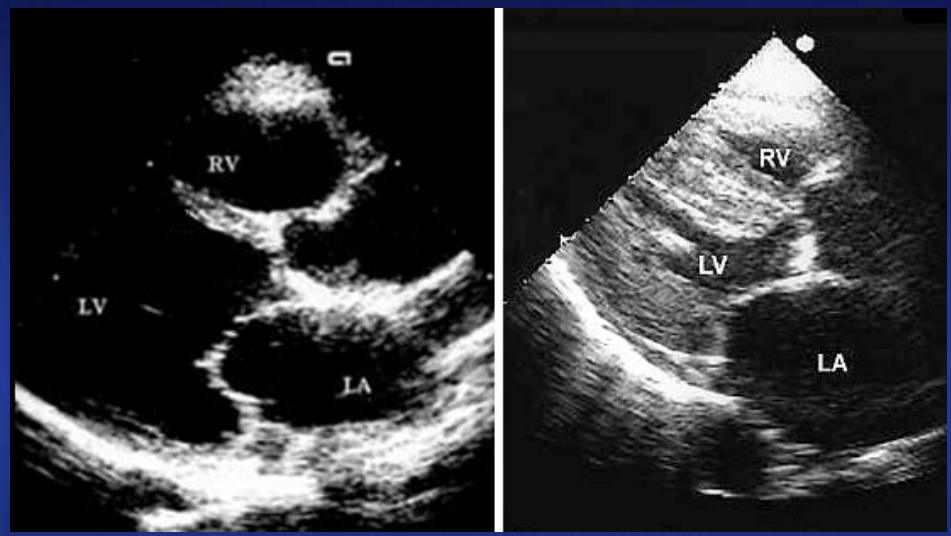


A clinical syndrome characterized by symptoms & signs of increased tissue/organ water and decreased tissue/organ perfusion

- Most patients with clinically evident HF have treatable causes
- Factors that increase HF are:
  - Age, HTN, DM, CAD, family history of cardiomyopathy and cardiotoxins
- Modifiable causes are:
  - HTN – 66% of patients
  - DM – 33% of patients, 2-5% risk of developing CM – more common in diastolic dysfunction
  - CAD – 60% of patients – mostly systolic dysfunction

Diagnostic Testing

- Dx based on
  - Hx
  - PE
  - Lab
  - Imaging



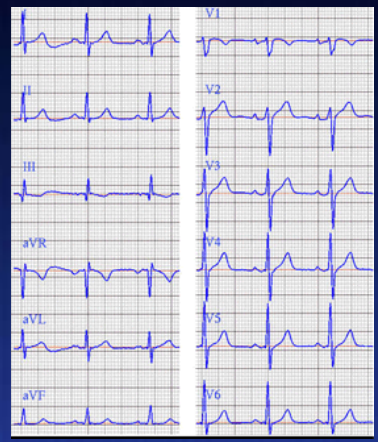
- Most patients present in E.R. with significant dyspnea or fluid overload

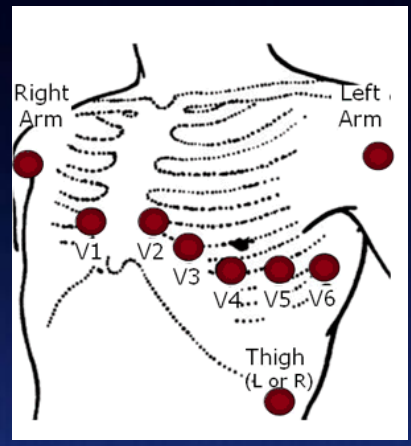
- Then we determine etiology of CHF

Testing

12 lead EKG

CXR





Labs: lipid profile, U/A, CMP, CBC, MG+

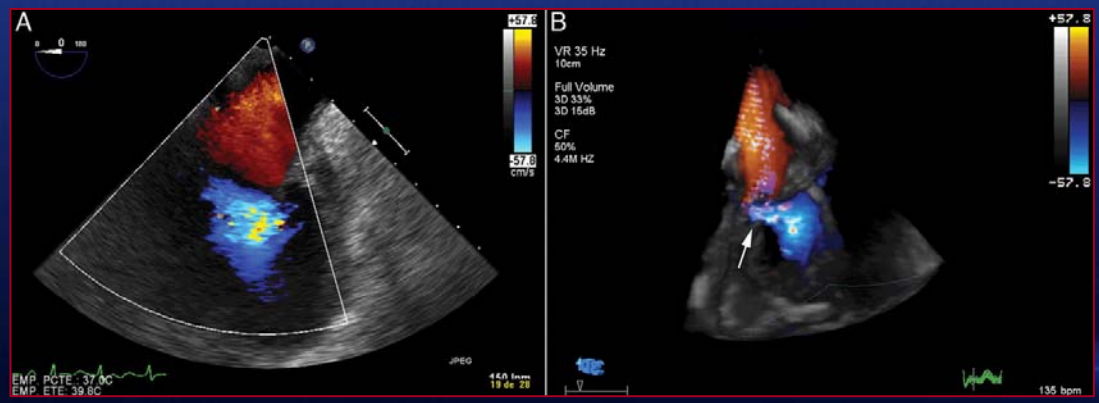
Cardiac enzymes, drug screen, ETOH

TSH - ↑ or ↓ can be primary cause of CHF

BNP level - to determine if dyspnea from CHF or other causes

Testing

- Single most useful test = 2D echo with doppler looking for:
  - LVEF – normal or reduced
  - Structural LV abnormalities such as LVH or wall motion abnormalitites
  - Other structural abnormalities such as valve disorder, pericardial disorder or RV problems



Labs

Naturetic peptides (BNP)

- Synthesized & released from heart
- ↑ BNP – associated with low LVEF, LVH, elevated LV filling pressure, acute MI, ischemia, pulm embolus, COPD
- BNP is sensitive to age / gender / wt / renal function

Labs

Naturetic peptides (BNP)

- Elevated levels support abnormal LV function or hemodynamics causing Sx of CHF
- BNP levels lower with NI LVEF
- Levels parallel clinical CHF severity & decrease with aggressive CHF Rx

<100 – normal

100- 400 – moderate

>400 - severe

Further Work-Up After Stabilization

- PA catheter
- Nuclear stress test
- R + L Heart cardiac catheterization

Treatment

- Moderate sodium restriction
- Fluid restriction
- Daily weights
- Influenza / pneumococcal vaccine
- No heavy labor
- Encourage physical activity except with acute exacerbation

Diuretics

- For patients with concurrent or prior Cx of CHF & ↓ LVEF who have evidence of fluid retention
- Interferes with sodium retention by inhibiting reabsorption of sodium at specific sites in renal tubule
- Loop diuretics (bumetanide, furosemide, torsemide) increase sodium excretion up to 20-25%; maintain efficacy unless renal function severely impaired

Diuretics

- Thiazide diuretics – increase fractional sodium excretion 5-10% of filtered load, lose effectiveness if CRCL < 40 ml/min
- Metolazone (Zaroxolyn)
- Produce symptomatic benefits more rapidly than any other Rx for CHF
- Maintain diuresis until fluid overload is eliminated even if hypotension or azotemia develop if pt is asymptomatic
- Monitor electrolytes

ACE-I

- For all Pts with current or prior Sx of CHF and ↓ EF unless C/I
- Target RAAS by reducing formation of angiotensin, which causes blood vessel constriction and increase in BP
- Favorable effects on survival

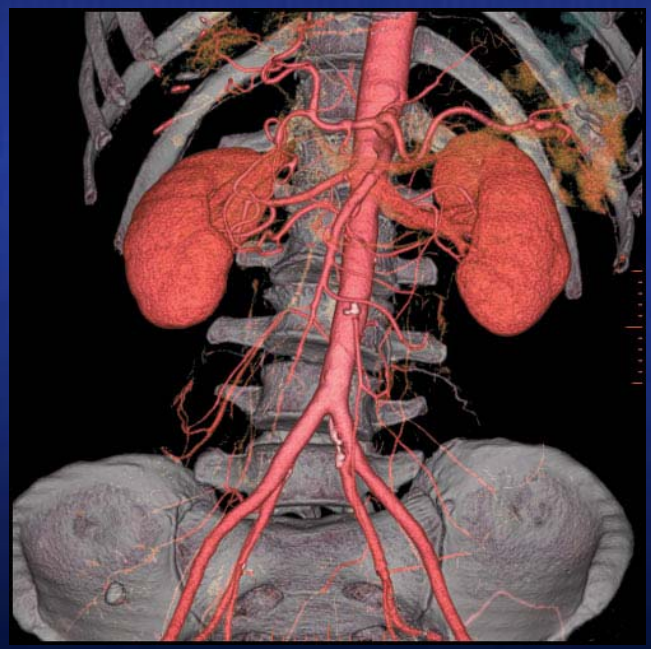
ACE-I

- No difference among available ACE-I on effect on symptoms or survival
- Adverse effects –
  - Hypotension
  - worsening renal function
  - Cough (5-50%)
  - Angioedema (<1%)

ARB

- For pts with current or prior Sx of CHF & ↓ EF who are ACE-I intolerant
- Works on RAAS to block action of angiotensin's effects on blood vessels
- Angioedema much less likely

- If impaired renal function is >2.0 or TK - >5.0 then consider combination of hydrolazive & nitrates



Aldosterone Antagonists

- For selected pts with moderately to severe symptoms of CHF and ↓ LVEF who can be monitored for renal function & potassium concentration
- Ideal creatinine:
  - Men $\leq$ 2.5 mg/dL
  - Women $\leq$ 2.0 mg/dL
  - K^+ < 5.0 mEq/L

Aldosterone Antagonists

- Targets RAAS by helping reduce salt & fluid; reduce blood volume
- Risk of hyperkalemia, worsening of renal function

2 Agents Used

- Spironolactone (Aldactone)
  - ↓ mortality by 30% and hospitalizations by 30% on stage III and IV
  - Eplerenone (Inspra) used in post MI and ↓ mortality

Beta Blockers

- For all stable pts with current or prior Sx of LHF and ↓ EF.
- The following 3 beta blockers have been proven to decrease mortality and are indicated for use in CHF:
  - Bisoprolol
  - Carvedilol
  - Sr metoprolol succinate

Beta Blockers

- Slows heart rate, lowers BP, helps counteract heart's tendency to compensate for cardiomyopathy by pumping faster
- Risks of Tx
  - Fluid retention
  - Worsening CHF
  - Bradycardia
  - Heart block
  - Fatigue
  - Hypotension

Digitalis

- Can be beneficial in pts with current or prior symptoms of CHF & ↓ LVEF to decrease hospitalizations for CHF
- Causes heart to beat more strongly by increasing force of contractions by inhibiting Na^+/K^+ AtPase
- Risks of Tx
  - Cardiac arrhythmias
  - GI symptoms (nausea, vomiting)
  - Neurological problems (visual disturbances, confusion)

CHF & Supraventricular Arrhythmias

- 10-30% of pts with chronic CHF have atrial fibrillation – poor long term prognosis
- Afib exerts effects by:
  - Loss of atrial enhancement of ventricular filling may compromise cardiac output
  - Elevating heart rate – increased demand, decreased coronary perfusion d/t shortening of ventricular filling time

CHF & Supraventricular Arrhythmias

- Afib exerts effects by:
  - Rapid ventricular response – causes reduction of cardiac contraction & relaxation
  - Stasis of blood in atria can cause pulmonary and systemic emboli

Other Tx that can be used

- Continuous loop diuretics
- Dobutamine or milrinone - + inotropic agents
- Nesitiride (Natrecor)
- Ultrafiltration

Transition to Outpatient Management

A. ACE or ARB
B. Beta blockers
C. Counseling (smoke, exercise)
D. Dieting education, devices
E. Euvolemia
F. F/U appointment

Management of Chronic CHF

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NYHA Classification

(S)	I	Sx with strenuous activity
(O)	II	Sx with ordinary activity
(M)	III	Sx with most activity
(A)	IV	Sx with any activity/rest

Stages of CHF

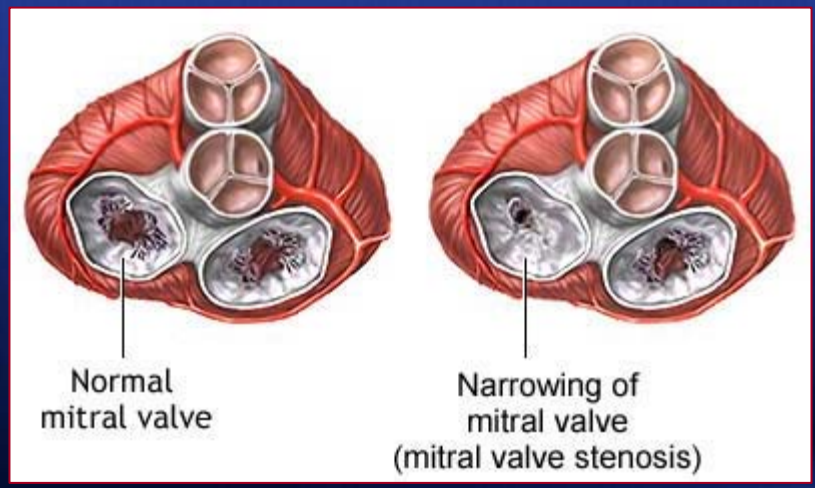
A - No symptoms
Predisposed to CHF, such as due to
- CAD/HTN or DM
- LVEF normal
- No LVH

B - No symptoms
LVH present
Reduced LVEF

Stages of CHF

C - Current or past symptoms with underlying structural heart disease

D - Refractory CHF needing special advanced Tx



Assessment of Functional Capacity

- Inquire about type, severity & duration of symptoms occurring during activities of daily living; inquire about specific tasks
- What tasks can patient no longer perform?
- Measurement of distance patient can walk in 6 minutes

Assessment of Volume Status

- Body weight @ each visit
- JVD → most reliable sign of volume overload
- Peripheral edema
- Rates generally reflect rapidity of CHF onset, not degree of volume overload

Factors Precipitating Hospitalization for CHF

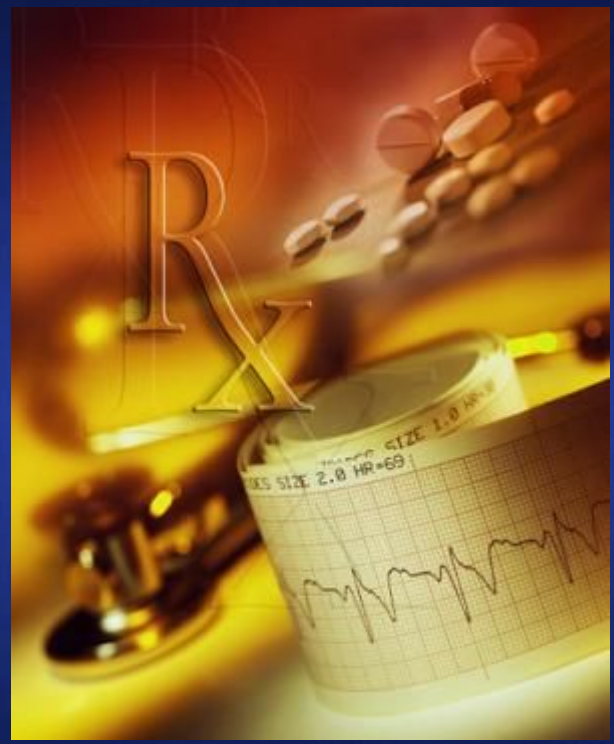
- Noncompliance w Rx/Na^+ or fluid restriction
- Acute MI
- Afib
- Recent starting of Θ inotrope such as verapamil / nifedipine / diltiazem or beta blocker

Factors Precipitating Hospitalization for CHF

- Pulm embolus
- NSAIDS → cause sodium retention / peripheral vasoconstriction / decrease efficacy & enhance toxicity of diuretics & ACE-I
- ETOH/Illicits
- Enodcrine abnormalities (Dm, thyroid)
- Concurrent infection (pneumonia)

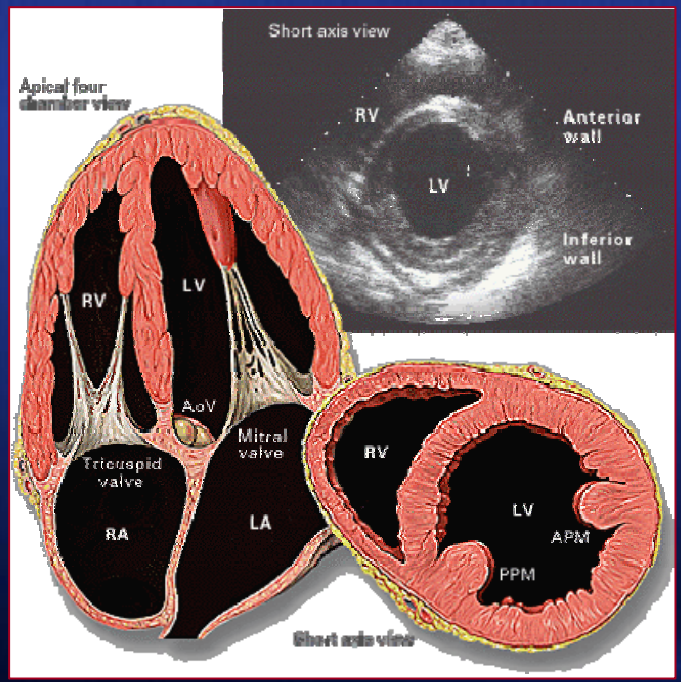
CHF Prognosis Worsened With:

- Low LVEF
- Worsening NYHA status
- Degree of hyponatremia
- Low hematocrit
- Wide QRS on EKG
- Chronic hypotension
- Resting tachycardia
- Renal insufficiency
- Intolerance to conventional Tx
- Refractory volume overload



ICD

- For 2° prevention in pts with current or prior Sx of CHF and ↓ EF with Hx of cardiac arrest, VF or hemodynamically destabilizing VT



ICD

- For 1° prevention of SCD to reduce total mortality in patients with ischemic dilated cardiomyopathy or ischemic heart Dz at least 40 days post-MI, LVEF ≤ 35% & NYHA II-III Sx while on chronic, optimal med Tx and who have reasonable expectation of survival with good functional status > 1 year
- Or after 9 months for dilated cardiomyopathy

CRT – Cardiac Resynchronization Therapy

- Cardiac dyssynchrony = QRS duration $\geq$ 0.12 sec
- These patients should receive CRT, with or without ICD, unless contraindicated if they also have LVEF 35%, sinus rhythm, NYHA III or ambulatory NYHA IV Sx despite optimum Rx

CRT – Cardiac Resynchronization Therapy

- About 1/3 of patients affected
- Dyssynchrony causes suboptimal ventricular filling, prolonged duration of mitral regurgitation and paradoxical septal motion; associated with increased mortality.

CRT – Cardiac Resynchronization Therapy

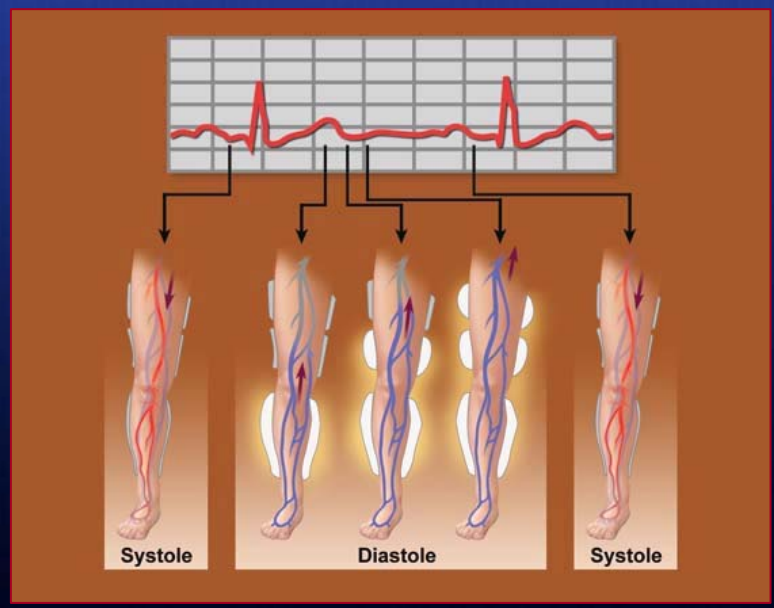
- Electrical activation of R&L ventricles in synchronized manner with biventricular pacing enhances ventricular contractions and reduces degree of mitral regurgitation, improves cardiac function and hemodynamics

CRT – Cardiac Resynchronization Therapy

- CRT & optimal medical Tx shows improvement in quality of life, functional class, exercise capacity, 6-minute walk and LVEF
- 32% reduction of hospitalization for CHF, 25% reduction of all cause mortality within 3 months
- Based on studies on patients in NSR, not afib

EECP

- Enhanced external counterpulsation
- Uses 3 sets of inflating pneumatic cuffs attached to pts legs that rapidly inflate and deflate
- Applied to calves, lower thigh, upper-thigh; timed to heart beat



EECP

- 1-hour sessions for 35 days
- Improves blood pressure, blood flow, exercise capacity and duration, NYHA class & quality of life

Diastolic CHF

- CHF with normal LVEF & abnormal diastolic function
- Prevalent among elderly females with HTN, Dm or both, often with CAD and afib
- Have slowed ventricular relaxation ↑ LV filling pressure
- No valvular disease (aortic stenosis or mitral regurg)

Diastolic CHF

- Principles of Rx
  - BP / HR / blood volume / myocardial ischemia control
  - Treat other Dz like CAD / HTN / aortic stenosis
  - Diuretics to control pulmonary congestion
  - Class IIB – beta blockers, ACE-I / ARB / CCB – may minimize Sx
  - Digoxin – not well established

Diastolic CHF

Morbidity / Mortality

- 15-20 million CHF pts (1/3 – 1/2 of CHF patients)
- 5-8%, annual mortality vs. 10-15% for systolic CHF; age matched controls – 1%
- 1 year readmission rates 50%

Dx of 1° Diastolic CHF

- Simultaneously requires –
  - Presence of signs or symptoms of CHF
  - Presence of normal or mildly abnormal (LVEF $\geq$ 45%) LV systolic function
  - Evidence of abnormal LV relaxation, filling, diastolic distensibling or diastolic stiffness
  - Dx cannot be made at bedside

Diastolic CHF

Treatment

- Goal: ↓ diastolic pressure
- Reduce pulmonary congestion by decreasing LV volume, maintaining synchronous atrial contraction and increasing duration of diastole by ↓ HR

Diastolic CHF

Treatment

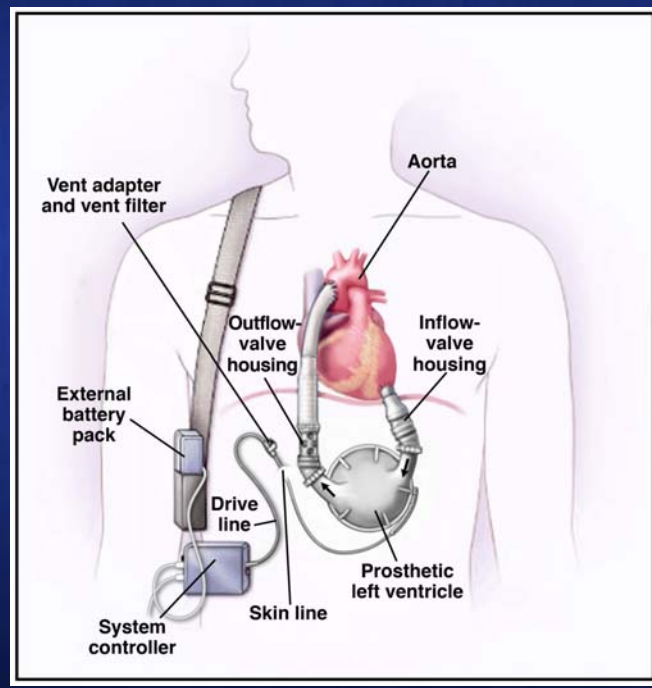
- Decrease total blood volume by fluid and salt restriction, and use of diuretics (usually at lower doses than for systolic CHF)
- Decrease central blood volume with nitrates
- Blunt neurohormonal activation with ACE-I/ARBS/AIdosterone antagonists
- Start with low doses to avoid hypotension
- Trials underway for future Tx

Heart Transplant

- End stage CHF
- LVAD LV assist device – surgically implanted, bridge to transplant
- Survival rates
  - 88% 1st year post transplant
  - 72% @ 5 years
  - 50% @ 10 years
  - 16% @ 20 years
- About 2,000 heart transplants performed yearly in U.S.

LVAD *(left ventricular assist device)*

- Take oxygenated blood from LA or LV go through pump and return to aorta
- Short or long term use
- Bridge to transplantation (short term)
- Destination therapy – long term treatment with lower mortality. However a number of patients (50%) still died at 1 year.



Heart Transplantation

- Successful since 1980's with immunosuppression treatment
- >2000 transplants a year
- Survival: 1 yr- 85%, 5 yr- 70%, 10 yrs- 50%
- Selection is important:
  - Optimal medical treatment
  - Survival < 1 year
  - Good compliance and F/U

Heart Transplantation

- Contrainidications
  - Severe HTN
  - Infection
  - COPD
  - PVD or CVD
  - Psychiatric Dx
  - Liver disease
  - Age >70
  - DM end organ Dx
  - Malignancy with ↓ L/E