Heart Failure

- Incidence 10/1000 after age 65 years
- 75% have antecedent HTN
- At age 40, lifetime risk of developing CHF is 1:5; at age 80, 20% for men & women despite much shorter life expectancy
  - Mortality after CHF hospitalization
    - 30 days 10.4%
    - 1 year 22%
    - 5 years 42.3%
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.
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

ABNORMAL MITRAL VALVE

Narrowing of mitral valve (mitral valve stenosis)
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
Testing

• Single most useful test = 2D echo with doppler looking for:
  – LVEF – normal or reduced
  – Structural LV abnormalities such as LVH
  – Other structural abnormalities such as valve disorder, pericardial disorder or RV problems
12 lead EKG
CXR

Low sensitivity & specificity

Labs
BMP

TSH - ↑ or ↓ can be primary cause of CHF
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
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
Factors Precipitating Hospitalization for CHF

- Noncompliance w Rx/Na\(^+\) or fluid restriction
- Acute MI
- Afib
- Recent starting of Θ inotrope such as verapamil / nifedipine / diltiazim 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/Illlicits
- Endocrine 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
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
- 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
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 ≤ 2.5 mg/dL
  - Women ≤ 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
Beta Blockers

- For all stable pts with current or prior Sx of LHF and ↓ EF unless C/I, using 1 of 3 Rx proven to reduce mortality:
  - 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
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
CRT – Cardiac Resynchronization Therapy

- Cardiac dyssynchrony = QRS duration ≥ 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
  – BPI / 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)
• 5-84, 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 ≥ 45%) LV systolic function
  - Evidence of abnormal LV relaxation, filling, diastolic distensibility 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/Aldosterone 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.