

Heart Failure

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Definition: Failure of heart to pump blood forward at sufficient rate to meet metabolic demands of peripheral tissues

Epidemiology: 5.1 Million people in US, 23 million people worldwide

Left sided HF:

- Systolic Dysfunction (↑LVEDV, ↑ESV):
 - ↓Contractility: Ischemia/MI, Dilated CM, Chronic Aortic Insufficiency/MR
 - ↑Afterload: AS, HOCM, HTN crisis, Coarctation
- High Output HF (↑LVEDV, ↑SV): AV fistula, Paget's Sepsis, Beriberi, Anemia, Thyrotoxicosis
- Decreased Forward Flow: (↑LVEDV, ↑SV): MR, Aortic Insufficiency, VSD
- Diastolic Dysfunction: (normal LVEDV): LVH (HCM 2° to HTN), Ischemia
- Pericardial Disease: (normal LVEDV): R-Sided HF, Tamponade, Constriction

Pathophysiology: Decreased Cardiac Output → Activation of RAAS system + Activation of sympathetic nervous system → Systemic vasoconstriction and volume retention → ↑Venous return → maintenance of CO

Hx: Low Output: Fatigue, weakness, and exercise intolerance

Congestive: L-sided → dyspnea, orthopnea, paroxysmal nocturnal dyspnea / R-sided → Peripheral edema, RUQ discomfort, bloating, satiety

Framingham Criteria for Heart Failure (2 Major + 1 minor, Sensitivity 97%, Specificity 79%)

Major

- Paroxysmal Nocturnal Dyspnea
- Neck-Vein Distention
- Rales
- Radiographic Cardiomegaly
- Acute Pulmonary Edema
- S3 gallop
- Increased Central Venous Pressure (>16cm H2O @ RA)
- Positive Hepatojugular Reflux

Minor

- Bilateral ankle edema
- Nocturnal cough
- Dyspnea on exertion
- Hepatomegaly
- Pleural Effusion
- Decrease in Vital Capacity by 1/3
- Tachycardia (HR >120 bpm)

NYHA Classes

- I. No limitation on physical activity, No overt symptoms
- II. Comfortable at rest, but ordinary physical activity causes symptoms of heart failure (can't climb stairs)
- III. Comfortable at rest, but ADLs cause symptoms of heart failure
- IV. Presence of symptoms even at rest

Stages of HF

- A. At high risk for HF, but without structural heart disease or symptoms of HF
 - a. Patients with: HTN, Atherosclerotic disease, DM, Obesity, Metabolic syndrome, Cardiotoxin exposure, FHx of CM
- B. Structural Heart Disease without signs or symptoms of HF
 - a. Patients with: Previous MI, LV remodeling (LVH + low EF), Asx valvular disease
- C. Structural Heart Disease with prior or current symptoms of HF
 - a. Patients with: Known structural heart disease + HF signs and symptoms
- D. Refractory HF
 - a. Patients with: Recurrent hospitalizations despite max med treatments, Marked HF symptoms at rest

Diagnosis:

- CXR: Pulm. Edema, pleural effusions ± Cardiomegaly, Kerley B-lines (short horizontal lines near periphery of lung near the costophrenic angles)
- BNP/NT-proBNP: Can help exclude HF. Levels ↑ w/ Age, ↓ w/ Obesity or renal function
- Evidence of Decreased organ perfusion: ↑Cr, ↓Na, abnormal LFTs
- EKG: Evidence for CAD, LVH, Heart block
- Echo: ↓EF, ↑Chamber size → Systolic Dysfunction, hypertrophy, abnormal: MV inflow, tissue Doppler, valves, or pericardium
- PA catheterization: ↑PCWP, ↓CO, ↑SVR (low output failure)

Management of HF w/ reduced ejection fraction (HFrEF)

- **β-blockers**
 - Carvedilol (COMET/COPERNICUS): Non-selective β agonist & α-1 blocker
 - Carvedilol reduces risk of death or HF hospitalization by 31% compared to placebo in class III- IV HF with EF <35%.
 - Caution: DM's prone to hypoglycemia (masking) & bronchospastic disease
 - Metoprolol XL (MERIT-HF): β-1 selective
 - In patients with symptomatic HFrEF with EF ≤40%, long-acting metoprolol led to a 34% reduction in all-cause mortality
- **ACE-Inhibitors/ARBs**
 - Enalapril
 - (CONSENSUS) 40% reduction in mortality at 6 months with a NNT of 6
 - (SOLVD) Reduces 4-year mortality by 16% & reduces HF hospitalizations
 - Valsartan
 - (VAL-HEFT) Valsartan improved symptoms & mortality in NYHA2, no benefit with ACE-I
- **Mineralocorticoid Receptor Antagonists**
 - Eplerone:
 - (EMPHASIS-HF) Reduced the risk of death & hospitalization in patients with moderate systolic dysfunction and NYHA class II symptoms
 - (EPHESUS) Reduced the rate of mortality among patients with AMI complicated by LV dysfunction & HF symptom
 - Spironolactone (RALES):
 - Patients with HFrEF (EF<35%) and NYHA III-IV symptoms, spironolactone led to a 30% reduction in all-cause mortality
- **Special Populations**
 - African-American:
 - Isosorbide dinitrate + Hydralazine (A-HEFT) Isosorbide dinitrate plus hydralazine improves survival and reduces hospitalization among black patients with HFrEF
 - High Heart Rate (HR > 70bpm on optimal medical therapy):
 - Ivabradine (SHIFT) Resulted in a 5% absolute reduction in heart failure mortality or hospitalization at 2 years
- **Device Therapy -Cardiac Resynchronization Devices (CRT-D):**
 - Current AHA/ACC/HRS Implantation Recommendation: LVEF ≤ 35% and QRS duration ≥150 msec with LBBB morphology, NYHA Class II-IV, on GDMT
 - (MADIT-CRT): Patients with LVEF ≤ 30% and QRS duration ≥130 msec, placement of an ICD with cardiac resynchronization therapy reduces the rate of mortality or HF events when compared to ICD placement alone
 - (SCD-HEFT): ICDs reduced mortality compared to conventional therapy or amiodarone among patients with HFrEF