

## Section #. Chronic Heart Failure

### Definition:

- HF is a complex clinical syndrome, initiate by an abnormal cardiac function which causes insufficient tissue metabolic demands and decreased exercise capacity.
- This results in an activation of multiple neurohormonal pathways which leads to cardiac and systemic maladaptation. This characteristic mal adaptation is the hallmark of chronic HF.

### Epidemiology:

- 1-2 % of population, 10% in elderly >65 yo. 6 million Americans, only 2,500 heart txp/yr
- 50% have HF rEF
- High mortality and morbidity, poor QoL
- Number one reason for hospitalization in the United States
- Number one expense for medicare
- Risk factor: HTN, CAD/MI, valvular disease, DM, DL

### Type:

- There are many ways to classify HF.

HFrEF vs. HFpEF	Low output vs. High output HF
Ischemic vs. Non-ischemic	LV vs. RV failure
Stage A, B, C, D (see below)	Backward vs. Forward failure
NYHA functional class I, II, III, IV	Dilated vs. Hypertrophic vs. Restrictive cardiomyopathy

- Etiology, Staging, FnClass and EF usually dictate management of chronic HF.

### Etiology:

- 60% ischemic: Secondary to CAD/MI (eg. patient with HTN, DM, smoke and Q wave on ECG)
- 40% non-ischemic: Familial (genetics), myocarditis, infection (viral, HIV, chagas), toxin (etOH, chemoRx - doxorubicin or trastuzumab), infiltrative (amyloid, sarcoid, hemochromatosis), valvular, rheumatologic(sarcoid, lupus), endocrine (hypothyroid), malnutrition (Zn, Se def), others (peripartum, tachycardia-induced, stress-induced, etc. (NEJM 2000;342:1077).
- With best investigation, 50% of non-ischemic cardiomyopathy are idiopathic.
- Look for treatable cause

### Signs and Symptoms:

- SOB, DOE, displace PMI, S3 (95% Sp), S4, MR murmur, Cheyne-Stokes respiratory
- Congestion (WET): bendopnea, edema, orthopnea, PND, Elevated JVP, (+) HJR (80 % Se 90% Sp), rales, pleural eff, hepatomegaly, ascitis, abnormal BP response to valsalva
- Hypoperfusion (COLD): Narrow pulse pressure (PPP <25%), poor mentation, pulses alternans, decreased urine, cool & pale extremities,

### Investigation:

- TTE: evaluate cardiac function and remodeling (LVEDd). EF is important for choosing the treatment and prognosis. May suggest causes (RWMAs, LVH, valvular) and hemodynamics (SV, RVSP, E/e', IVC, diastolic function).
- CXR: Cardiomegaly, pulmonary edema, effusion.
- BNP: Released from ventricle in response to stretch and pressure, lower in HFpEF and obesity. Help Dx, prognosis, follow up?
- PA catheter: Directly, objectively measure hemodynamics
- CPX: objectively measure of exercise capacity/ functional class. VO2 is a prognostic marker.

- Work up for suspected causes
  - Study for CAD, consider coronary angiogram, stress test, coronary imaging
  - Recommend routine CBC, UA, CMP, Ca, Mg, lipid profile, LFT, TSH, CXR, EKG
  - Consider cardiac MRI, EMB, iron, ferritin, sleep apnea, HIV, ANA, amyloidosis, or pheochromocytoma.

### ACCF/AHA Heart Failure Staging: (Yancy et al. JACC 2013)

	Stage A	Stage B	Stage C	Stage D
Description	At risk but no abnormal structural heart (HTH, DM, CAD, toxins, FH)	Abnormal structure without symptoms	Abnormal structure with symptoms	Refractory HF, symptoms despite maximum medical Rx
Patho-physiology	<b>Cellular:</b> - Myocyte hypertrophy, apoptosis, altered gene expression, energy starvation. - Interstitial fibrosis.	<b>Δ Chamber geometry:</b> LVH, systolic dysfunction, diastolic dysfunction, dilate, Dysynchrony, RWMAs, MR	<b>Systemic mal-adaptation:</b> Sympathetic, RAAS, BNP, endothelin, vessopressin inflammation.	<b>End stage:</b> Multiorgan failure, cardiorenal, pulm HTN, RV failure, sleep apnea, afib,
Rx	Risk control ACEI/ARB in atherosclerosis, DM, HTN with CV risk. ACEI/BB in chomoRx	ACEI/ARB and BB in post MI	- For HFrEF ACEI/ARB, BB, Ald block, HDZ/ISDN, digoxin, CRT, ICD - For HFpEF BP, fluid, rhythm control	1. meds 2. OHT 3. VAD 4. Home inotrope 5. Palliative care

### Prognosis:

- Morbidity and mortality after the onset of symptomatic HF is very high.
- Stage C = 25% mortality at 1 yr. 50% mortality in 5 years.
- Stage D = 25%, 6% survival rate in 6 m and 1 y (COSI. J Card Fail 2003).
- Seattle Heart Failure Model: <http://depts.washington.edu/shfm/>
- Low peak VO2 < 10-14 ml/kg/min 1 –year survival rate = 25-50% (Circ 1991;83:778)
- Early referral prior to transition to stage D.

### HF with preserved EF (HFpEF):

- Clinical syndrome of HF with “normal” or near-normal LVEF (> 50%). Abnormal LV filling pattern (abnormal active relaxation and/or poor passive compliance/distensibility) results in elevated filling pressure (LAP), especially during tachycardia.
- Inhomogeneous group of pathologies and patients but should not include patient with isolated RV failure, PAH, MS.
- Setting: Old, women with hypertension, obesity, Afib, CAD.
- 30-50% of patient with HF has normal EF.
- Echo: Normal EF, LVH, restrictive, LAE. TTE may suggest abnormal diastolic function.