Adult (Age ≥ 18) Heart Failure (HF) Guideline

Assess and determine adult patient's stage of HF

Risk Factors for HF Present

Risk Factors for HF Not Present

Guideline does not apply

EVALUATION AND TREATMENT

AT RISK OF HEART FAILURE

American Heart Association (AHA) STAGE A
Asymptomatic Patients at High Risk for HF

Patient has no symptoms or structural heart disease but is defined as high risk due to the following conditions:

- Hypertension
- Diabetes mellitus
- Ischemic heart disease
- Obesity
- Metabolic syndrome
- Family history of cardiomyopathy
- Exposure to cytoxic drugs
- Obstructive sleep apnea (OSA)

Therapy for AHA STAGE A

Provide patient with maximum medical therapy:

- Hypertension (*Sanford Hypertension Guideline*)
- Diabetes (*Sanford Diabetes Guideline*)
- Lipid disorders
- Control metabolic syndrome

Provide patient education (**TABLE A / TABLE B**):

- Encourage to exercise regularly
- Smoking cessation
- Achieve normal body weight
- Avoid illicit drugs and alcohol in excess

Structural heart disease

AHA STAGE B
Asymptomatic Patients with Left Ventricular Dysfunction

Patient found to have left ventricular dysfunction from previous myocardial infarction (MI), left ventricular hypertrophy (LVH) with low ejection fraction (EF), asymptomatic valvular disease or other cause.

Therapy for AHA STAGE B

Provide patient with all measures listed under **Therapy for STAGE A**.

In appropriate patients, the use of angiotensin converting enzyme inhibitor (ACE-I)/angiotensin receptor blockers (ARB) (**TABLE C**) and/or beta-blockers (**TABLE D**) should be considered.

Screen for depression/anxiety, consider Behavioral Health referral.

HEART FAILURE

Development of symptoms of HF

AHA STAGE C
Patients with Known HF or Symptoms Suspicious of HF

Non-emergent patients with new symptoms suspicious for HF, with or without a past history of HF. This does include patients with known structural heart disease.

Therapy for AHA STAGE C

Provide patient with all measures listed under **Therapy for STAGE A**.

Refer to *Page 2* of *Sanford HF Guideline*

Refractory symptoms of HF at rest

AHA STAGE D
Refractory Symptoms of HF at Rest

Refractory HF requiring specialized interventions including patients who have marked symptoms at rest despite maximal medical therapy (i.e. those who are recurrently hospitalized or cannot be safely discharged from the hospital without specialized interventions.)

Therapy for AHA STAGE D

Refer to Cardiologist

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Adult (Age ≥ 18) Heart Failure (HF) Guideline

EVALUATION AND TREATMENT

AHA STAGE C: Assess Patient with Known HF or Symptoms Suspicious of HF

- Unrelieved shortness of breath with exertion or at rest
- Unexplained fatigue
- Orthopnea
- Paroxysmal nocturnal dyspnea
- Peripheral edema
- Decreased exercise capacity
- Weight gain of > 5lbs in one week
- Chest pain or tightness
- Palpitations
- Dizziness/lightheadedness/syncope

Patient Examination

Patient examination should include the following:

- Evaluation of jugular venous distention
- Palpation of cardiac apex and precordium
- Assessment for gallops or murmurs
- Assessment of cardiac rhythm
- Pulmonary examination for evidence of rales or effusion
- Abdominal examination for hepatomegaly or ascites
- Peripheral pulses
- Evidence of edema

Stable Patient

Obtain the following laboratory tests and diagnostic studies:

- CBC
- UA
- Serum electrolytes
- Calcium
- Magnesium
- BUN
- Cr
- Glucose/lipid profile
- Liver enzymes
- TSH
- BNP
- Chest Xray
- EKG

Unstable Patient

Patients who are clinically unstable should be immediately referred for emergency management and admitted if necessary

Echocardiogram

EF < 40%

Refer to Cardiologist

Initiate Therapies

- Initiate non-pharmacologic therapies (**TABLE A / TABLE B**)
- Initiate pharmacologic therapy beginning with ACEI/ARB (**TABLE C)** and/or beta-blocker (**TABLE D**)
- Add diuretic for evidence of volume overload (**TABLE E**)
- Consider aldosterone antagonist therapy (spironolactone) for refractory symptoms when ACEI/ARB, beta-blockers and diuretic therapy have been maximized/optimized (**TABLE F**)
- If EF< 35% after three months of maximal medical therapy, electrophysiology referral is indicated for sudden cardiac death risk evaluation and potential interventions

EF 40-49%

Initiate therapies

Stress Testing and/or Cardiology Referral IS Indicated

Initiate Therapies

- Initiate non-pharmacologic therapies (**TABLE A / TABLE B**)
- Initiate pharmacologic therapy beginning with ACEI/ARB (**TABLE C)** and/or beta-blocker (**TABLE D**)
- Add diuretic for evidence of volume overload (**TABLE E**)

Failure to Respond

Refer to Cardiologist

EF ≥ 50%

Initiate therapies

Stress Testing and/or Cardiology Referral IS Indicated

Initiate Therapies

- **Focus of treatment should be vigorous blood pressure control** (see *Sanford Hypertension Guideline*)
- Utilize ACEI/ARB (**TABLE C**), beta-blocker (**TABLE D**), or diuretic (**TABLE E**) based upon blood pressure and volume status

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Adult (Age ≥ 18) Heart Failure (HF) Guideline

TABLE A: Non-pharmacologic Management in Patients with HF

- Dietary instruction regarding sodium intake for all patients. Instruction on diabetes, dyslypidemia or severe obesity in selected patients.
- Dietary restriction of sodium 2-3g for all patients with HF. Further restriction (Na < 2g) in moderate to severe HF.
- Restriction of daily fluid intake < 2L in severe hyponatremia (< 130 mEq/L). Consider in all patients with difficult to control fluid retention despite high dose diuretics and low sodium diet.
- Recommend daily multivitamins in patients with diet restrictions; evaluation for specific vitamin/nutrient deficiencies is rarely necessary.
- Document naturoceutical products. Avoid products containing ephedra (ma huang), ephedrine, or its metabolites (increased mortality and morbidity). Avoid products with significant drug interactions with digoxin, vasodilators, beta blockers, antiarrhythmic drugs and anticoagulants.

TABLE B: Additional Therapies and Routine Health Maintenance

- CPAP in patients with sleep apnea (up to 50% of HF patients have sleep apnea)
- Supplemental oxygen not recommended in the absence of indication of underlying pulmonary disease. Evaluate for fluid retention of pulmonary disease if hypoxemic.
- Consider referral to Behavioral Health for difficulty with behavioral change and adherence
- Non-pharmacologic techniques for stress reduction
- Smoking cessation and limit alcohol to 2 drinks/day in men or 1 drink/day in women
- Pneumococcal and annual influenza vaccination
- Avoid NSAIDs

TABLE C: Angiotensin Converting Enzyme Inhibitors (ACEI)

Patient Exclusion: allergy, angioedema, intolerable cough, hyperkalemia (K ≥ 5.5) severe aortic stenosis, shock, symptomatic hypotension, bilateral renal artery stenosis, pregnancy

Initial Dose	Titration Steps	Target Dose
Captopril: 6.25 mg three times daily	Captopril: 12.5 mg or 25 mg three times daily	Captopril: 50 mg three times daily
Enalapril: 2.5 mg twice daily	Enalapril: 5 mg twice daily	Enalapril: 10 mg twice daily
Lisinopril: 2.5-5 mg daily	Lisinopril: 5 mg daily, 10 mg daily	Lisinopril: 20 mg daily
Ramipril: 2.25 mg daily	Ramipril: 5 mg daily	Ramipril: 10 mg daily
Quinapril: 10 mg daily	Quinapril: 20 mg daily, 40 mg daily	Quinapril: 80 mg daily
Fosinopril: 5-10 mg daily	Fosinopril: 20 mg daily, 40 daily	Fosinopril: 80 mg daily

Angiotensin Receptor Blockers (ARB) (if ACE intolerant)

Patient Exclusion: hypersensitivity, shock, symptomatic hypotension, hyperkalemia, bilateral renal artery stenosis, pregnancy

Initial Dose	Titration Steps	Target Dose
Candesartan: 4-8 mg daily	Candesartan: 16 mg daily	Candesartan: 32 mg daily
Losartan: 12.5-25 mg daily	Losartan: 50 mg daily, 100 mg daily	Losartan: 150 mg daily
Valsartan: 40 mg twice daily	Valsartan: 80 mg twice daily	Valsartan: 160 mg twice daily

ACEI/ARB Patient Monitoring:

- Patients who cannot achieve target dose should be maintained on highest tolerated dose
- Titration steps are generally at 2 week intervals
- Monitor Na, K, BUN/Cr at least biweekly while titrating
- Check weights frequently and monitor volume status, as diuretic requirements may be altered
- Notify provider if symptomatic hypotension (mild hypotension, SBP 80-90, may be acceptable if tolerated without significant symptoms)
- ACEI/ARB are Class D in pregnancy, but probably safe in lactating females

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TABLE D
Beta Blockers

Patient Exclusion: cardiogenic shock, unstable or decompensated HF, symptomatic bradycardia, symptomatic hypotension, 2nd/3rd degree heart block without pacemaker, severe reactive airway

Initial Dose	Titration Steps	Target Dose
Carvedilol: 3.125 mg twice daily	Carvedilol: 6.25 mg twice daily, 12.5 mg twice daily	Carvedilol: 25 mg twice daily, 50 mg twice daily if weight > 85 kg
Metoprolol (sustained release): 12.5-25 mg daily	Metoprolol (sustained release): 50 mg daily, 100 mg daily, 150 mg daily	Metoprolol (sustained release): 200 mg daily

Beta-Blocker Patient Monitoring:

- Patients who cannot achieve target dose should be maintained on highest tolerated dose
- Titration steps are generally at 2 week periods
- Daily weights: Patient should compile daily weight log and notify if weight increase 3-5 or more pounds in 1 week
- Symptoms: Notify MD if symptomatic hypotension or bradycardia develops
- Blood pressure and heart rate; if SFB < 80 mmHg or HR < 55 bpm, assess carefully for signs of hypoperfusion
- Diuretic dosage: If volume overload develops, continue beta-blocker unless the following develops:
    - Cardiogenic shock
    - Symptomatic hypotension
    - Narrow pulse pressure
    - Cold, clammy skin
    - Rising BUN, serum Cr
- Use of only approved beta blocker in HF recommended
- Mild hypotension (SBP 80-90) may be acceptable if tolerated without significant symptoms

TABLE E: Volume Overload – Loop Diuretic Dosing	
Signs: rales, JVP evaluation, positive hepato-jugular reflex, S3, sacral or lower extremity edema **Symptoms:** dyspnea on exertion, PND, orthopnea, weight gain, abdominal bloating, decreased appetite, extremity swelling	
Initial Dose	**Maximum Dose**
Furosemide: 40 mg once daily	Furosemide: 160-200 mg per day
Bumetanide: 1 mg once daily	Bumetanide: 4-8 mg per day
Torsemide: 10 mg once daily	Torsemide: 100-200 mg once daily
Diuretic Maintenance Dosing	**Action**
Weight returned to baseline (identifiable cause for weight increase, e.g. non-adherence)	Resume original dose
Weight returned to baseline, but patient failed original dose previously, or no known cause for weight increase	Continue at current increased dose
Weight returned to baseline, but required two or more diuretic titrations	Resume dose prior to last increase (down one titration level)
Symptoms improved but weight has not returned to baseline	Continue at current increased dose
Persistent symptoms with no change in weight	Continue next titration level
Persistent or worsening symptoms, and/or increase in weight, and/or history of frequent hospitalizations for volume overload	Consider adding metolazone, IV diuretic, or hospitalization. PO metaolazone may be added in resistant cases for no more than 3 days, then reassess

Volume Overload – Loop Diuretic Dosing/Patient Monitoring:

- Indicated for fluid overload (edema, ascites, dyspnea, weight gain)
- Volume status and electrolytes must be closely monitored with adjustment or when on multiple diuretics; daily chronic use of metolazone should be avoided if possible
- Increasing administration frequency to 2 or even 3 times per day will provide more diuresis with less physiologic perturbation than larger single dose
- Determine from patient subjective diuretic effect when adjusting dosage. If good response noted, increase dose frequency. If no diuretic response noted, increase dose.
- Instruct patient on maintaining sodium-restrictive diet, and limiting fluid intake < 2 L/day when serum sodium <130 mEq/L
- Daily weights
- With recent adjustment of dose, electrolytes, BUN, Cr should be monitored (weekly with each titration)
- If worsening renal function occurs, patient re-evaluation is required
- Assess volume status on every visit; watch for hypovolemia/ over diuresis

Volume Overload – Metolazone Dosing	
Initial Dose	**Maximum Dose**
Metolazone: 2.5 mg daily	Metolazone: 5 mg daily

Volume Overload – Metolazone Dosing/Patient Monitoring:

- Use only when volume overload refractory to maximal loop diuretic therapy
- May use daily initially for 3 days, but chronic daily use is discouraged. Target no more than every other day or 3 times per week.
- Metabolic derangements (hypokalemia, renal failure) may be substantial. Weekly Na, K, BUN/Cr should be monitored weekly initially, or after dosage titration, until stability assured.
- Risk of sudden volume shifts is significant. Monitor weights and blood pressure closely.

REFERENCE INFORMATION

TABLE F: Aldosterone Antagonists		
Initial Dose	**Titration Steps**	**Target Dose**
Spironolactone: 12.5 mg daily	Spironolactone: 25 mg daily	Spironolactone: 25 mg daily

Aldosterone Antagonists Dosing/Patient Monitoring:

- Given complexity of therapy/monitoring, consider cardiology consultation prior to institution of therapy
- Metabolic effects and renal impact may be significant. Na, K, BUN/Cr should be monitored at 3 days, 1 week, 1 month, then at 3 months at initation, or after dosage change.
- Therapy should be held for K > 5.2, rapidly rising Cr, or absolutely if Cr > 40
- Monitor closely for fluid and hemodynamic shifts (weights, blood pressure)

American Heart Association and American College of Cardiology's Staging System	
Stage	**Definition**
Stage A	At high risk for HF but without structural heart disease or symptoms of HF (pre-clinical)
Stage B	Structural heart disease but without signs or symptoms of HF
Stage C	Structural heart disease with prior or current symptoms of HF
Stage D	Refractory HF (heart failure) requiring specialized interventions

New York Heart Association (NYHA) Classification	
Class	**Patient Symptoms**
Class I (Mild)	No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, or dyspnea (shortness of breath).
Class II (Mild)	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnea.
Class III (Moderate)	Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitation, or dyspnea.
Class IV (Severe)	Unable to carry out any physical activity without discomfort. Symptoms of cardiac insufficiency at rest. If any physical activity is undertaken, discomfort is increased.

Clinical Pearls

- Regarding HF with preserved LV function (EF > 50%):
  - No specific treatment has been shown to produce long term mortality benefit, and primary treatment should focus on vigorous blood pressure control, with use of diuretics as needed to control signs and symptoms of volume overload.
  - Ischemic heart disease may still be causal, and stress testing is indicated.
  - In the absence of ischemic heart disease or risk factors, consider hypertrophic (restrictive) cardiomyopathy and constrictive pericarditis.
- **Maximizing dosing of ACEI/ARB and beta-blocker dosing is important for long-term benefits, irrespective of blood pressure levels, and lower blood pressures (SBP 80-90) if asymptomatic or minimally symptomatic should not deter up-titration of medication dosing.**

References

1. Pinkerman C, Sander P, Breeding JE, Brink D, Curtis R, Hayes R, Ojha A, Pandita D, Raikar S, Setterlund L, Sule O, Turner A. Institute for Clinical Systems Improvement. Heart Failure in Adults. Updated July 2013.
2. Yancy, C., Jessup, M., Bozkurt, B., et al (2013, June 5). ACCF/AHA practice guideline for the management of heart failure: A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation* (online). doi: 10.1161/CIR.0b013e31829e8776

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