Assess and determine adult patient's stage of HF

Risk Factors for HF Present

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 cytotoxic drugs
  - Obstructive sleep apnea (OSA)

Structural heart disease

Risk Factors for HF Not Present

Guideline does not apply

Therapy for AHA STAGE A

- Provide patient with maximum medical therapy:
  - Hypertension (Hypertension Guideline)
  - Diabetes (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

Therapy for AHA STAGE B

- 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.

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

Screen for depression/anxiety, consider Behavioral Health referral.

Therapy for AHA STAGE C

- 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.

Refer to Page 2 of HF Guideline

Therapy for AHA STAGE D

- 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.)

Refer to Cardiologist

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

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

Obtain the following laboratory tests and diagnostic studies:

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

Stable Patient

EF < 40%
Refer to Cardiologist

EF 40-49%
Initiate therapies

EF ≥ 50%
Initiate therapies

Unstable Patient

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

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 H)
- If EF < 35% after three months of maximal medical therapy, electrophysiology referral is indicated for sudden cardiac death risk evaluation and potential interventions
- If EF remains < 40% and still symptoms worsen, recommend changing ACEI/ARB to ARNI (Entresto)
- For comments regarding ivabradine (Corlanor), see “Clinical Pearls” section

Initiate Therapies

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

Stress Testing and/or Cardiology Referral IS Indicated

Failure to Respond
Refer to Cardiologist

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TABLE A: Non-pharmacologic Management in Patients with HF

- Dietary instruction regarding sodium intake for all patients. Instruction on diabetes, dyslipidemia or severe obesity in selected patients.
- Dietary restriction of sodium 2-3g for all patients with 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 hypoxic.
- 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) (First Line)

<table>
<thead>
<tr>
<th>Initial Dose</th>
<th>Titration Steps</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captopril: 6.25 mg three times daily</td>
<td>Captopril: 12.5 mg or 25 mg three times daily</td>
<td>Captopril: 50 mg three times daily</td>
</tr>
<tr>
<td>Enalapril: 2.5 mg twice daily</td>
<td>Enalapril: 5 mg twice daily</td>
<td>Enalapril: 10-20 mg twice daily</td>
</tr>
<tr>
<td>Lisinopril: 2.5-5 mg daily</td>
<td>Lisinopril: 5 mg daily, 10 mg daily</td>
<td>Lisinopril: 20-40 mg daily</td>
</tr>
<tr>
<td>Ramipril: 2.25 mg daily</td>
<td>Ramipril: 5 mg daily</td>
<td>Ramipril: 10 mg daily</td>
</tr>
<tr>
<td>Quinapril: 5 mg twice daily</td>
<td>Quinapril: 10 mg twice daily</td>
<td>Quinapril: 20 mg twice daily</td>
</tr>
<tr>
<td>Fosinopril: 5-10 mg daily</td>
<td>Fosinopril: 20 mg daily, 40 mg daily</td>
<td>Fosinopril: 20-40 mg daily</td>
</tr>
</tbody>
</table>

Angiotensin Receptor Blockers (ARB) (if ACE intolerant) (Second Line)

<table>
<thead>
<tr>
<th>Initial Dose</th>
<th>Titration Steps</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candesartan: 4-8 mg daily</td>
<td>Candesartan: 16 mg daily</td>
<td>Candesartan: 32 mg daily</td>
</tr>
<tr>
<td>Losartan: 25 -50 mg daily</td>
<td>Losartan: 50 mg daily, 100 mg daily</td>
<td>Losartan: 150 mg daily</td>
</tr>
<tr>
<td>Valsartan: 20 - 40 mg twice daily</td>
<td>Valsartan: 80 mg twice daily</td>
<td>Valsartan: 160 mg twice daily</td>
</tr>
</tbody>
</table>

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/SCr at least biweekly while titrating
- ACEI inhibitor therapy should not be discontinued unless serum SCr level rises above 30% over baseline during the first two months after initiation of therapy or hyperkalemia develops
- 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
Adult (Age ≥ 18) Heart Failure (HF) Guideline

**TABLE E**

**Beta Blockers**

<table>
<thead>
<tr>
<th>Initial Dose</th>
<th>Titration Steps</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carvedilol: 3.125 mg twice daily</td>
<td>Carvedilol: 6.25 mg twice daily, 12.5 mg twice daily</td>
<td>Carvedilol: 25 mg twice daily, 50 mg twice daily if weight &gt; 85 kg</td>
</tr>
<tr>
<td>Metoprolol (sustained release): 12.5-25 mg daily</td>
<td>Metoprolol (sustained release): 50 mg daily, 100 mg daily, 150 mg daily</td>
<td>Metoprolol (sustained release): 200 mg daily</td>
</tr>
</tbody>
</table>

**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 provider
- Normal pulse pressure
- Blood pressure and heart rate; if SBP < 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
  - Cold, clammy skin
  - Rising BUN, serum SCr

- Use of only approved beta blockers in HF recommended
- Mild hypotension (SBP 80-90) may be acceptable if tolerated without significant symptoms

**TABLE F**

**Vasodilators**

- Vasodilators are used in combination with ACEI/ARB/ARNI or single therapy in patients with chronic kidney disease.
- The combination of hydralazine and isosorbide dinitrate is recommended to reduce morbidity and mortality for African American patients with a NYHA III to IV HF and EF < 40% despite optimal therapy with ACEI and beta blockers
- A combination of hydralazine and isosorbide dinitrate can be useful to reduce morbidity or mortality in patients with current or prior heart failure with reduced EF who cannot be given an ACEI or ARB because of drug intolerance, hypotension, or renal insufficiency

<table>
<thead>
<tr>
<th>Initial Dose</th>
<th>Titration Steps</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydralazine 25 mg TID</td>
<td>50-75 mg TID</td>
<td>75 mg TID</td>
</tr>
<tr>
<td>Isosorbide Dinitrate 10 mg TID</td>
<td>20-30 mg TID</td>
<td>40 mg TID</td>
</tr>
</tbody>
</table>

**Vasodilator patient monitoring:**
- Titration every 2 weeks
- BP Monitoring

This guideline is not intended to replace a provider's judgment, but rather to support the decision-making process, which must be individualized for each patient's circumstances.
**TABLE G: 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

<table>
<thead>
<tr>
<th>Initial Dose</th>
<th>Maximum Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furosemide: 40 mg once daily</td>
<td>Furosemide: 160-200 mg per day</td>
</tr>
<tr>
<td>Bumetanide: 1 mg once daily</td>
<td>Bumetanide: 4-8 mg per day</td>
</tr>
<tr>
<td>Torsemide: 10 mg once daily</td>
<td>Torsemide: 100-200 mg once daily</td>
</tr>
</tbody>
</table>

**Diuretic Maintenance Dosing**

| 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 metolazone 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, SCr 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**

<table>
<thead>
<tr>
<th>Initial Dose</th>
<th>Maximum Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metolazone: 2.5 mg daily</td>
<td>Metolazone: 5 mg daily</td>
</tr>
</tbody>
</table>

**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/SCr 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.
### TABLE H: Aldosterone Antagonists

<table>
<thead>
<tr>
<th>Initial Dose</th>
<th>Titration Steps</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spironolactone: 12.5 mg daily</td>
<td>Spironolactone: 25 mg daily</td>
<td>Spironolactone: 25 mg daily</td>
</tr>
<tr>
<td>Eplerenone: 25 mg daily</td>
<td>Eplerenone: 50 mg daily</td>
<td>Eplerenone: 50 mg daily</td>
</tr>
</tbody>
</table>

#### 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/SCr should be monitored at 3 days, 1 week, 1 month, then at 3 months at initiation, or after dosage change.
- Therapy should be held for K > 5.0, rapidly rising SCr, or absolutely if SCr > 2.0 in women, 2.5 in men or eGFR < 30.
- Monitor closely for fluid and hemodynamic shifts (weights, blood pressure).

### New York Heart Association (NYHA) Classification

<table>
<thead>
<tr>
<th>Class</th>
<th>Patient Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I (Mild)</td>
<td>No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitiation, or dyspnea (shortness of breath).</td>
</tr>
<tr>
<td>Class II (Mild)</td>
<td>Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitiation, or dyspnea.</td>
</tr>
<tr>
<td>Class III (Moderate)</td>
<td>Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitiation, or dyspnea.</td>
</tr>
<tr>
<td>Class IV (Severe)</td>
<td>Unable to carry out any physical activity without discomfort. Symptoms of cardiac insufficiency at rest. If any physical activity is undertaken, discomfort is increased.</td>
</tr>
</tbody>
</table>

### CLINICAL PEARLS

- 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-titrating of medication dosing.
- Ivabradine (Corlanor)
  - Ivabradine may be considered to reduce HF hospitalization for NYHA class II-III patients with EF ≤ 35% who are taking maximum tolerated dose of beta blocker, are in sinus rhythm, with HR ≥ 70 bpm.
- 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.

### REFERENCES


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