MOUNT CARMEL Health Partners

Heart Failure Clinical Guideline

Definition: Heart failure (HF) is a complex clinical syndrome resulting from a structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood.

Causes: The most common causes of heart failure ***after 40 years of age*** are: Atherosclerosis, HTN, Diseases of the heart valves, Lung disease, general heart muscle damage from viruses or toxins.

At Risk for Heart Failure | **Heart Failure**

Stage A
At high risk for developing heart failure but has no structural disorder

Patients with:
- Hypertension
- Atherosclerotic disease
- Diabetes mellitus
- Obesity
- Metabolic syndrome

Or
- With family history of cardiomypathy
- Cardiotoxin use (e.g., cocaine,chemotherapy)

Therapy

Goals
- Heart healthy lifestyle
- Prevent vascular, coronary disease
- Prevent LV Structural abnormalities

Drugs (pages 3-4)
- ACEI or ARB as appropriate patients for vascular disease or DM
- Statins as appropriate

Testing
- BNP or NT-pro BNP screening

Stage B
Structural heart disease but without symptoms of heart failure

Patients with:
- Previous MI
- LV remodeling including LV and low EF
- Asymptomatic valvular disease

Therapy

Goals
- Prevent HF symptoms
- Prevent further cardiac remodeling

Drugs (pages 3-4)
- ACEI or ARB as appropriate
- Beta blockers as appropriate

In selected patients
- ICD
- Revascularization or valvular surgery as appropriate

Testing
- BNP or NT-pro BNP screening

Stage C
Structural heart disease with prior or current symptoms of heart failure

Patients with:
- Known structural heart disease
- HF signs and symptoms
  - Shortness of breath
  - Fatigue
  - Reduced exercise tolerance

HFpEF

Therapy

Goals
- Control symptoms
- Improve HRQOL
- Prevent hospitalization
- Prevent mortality

Strategies
- Identification of comorbidities

Treatment
- Diuresis to relieve symptoms
- Follow guideline driven indications for comorbidities, e.g., HTN, AF, CAD, DM
- Revascularization or valvular surgery as appropriate

Testing
- BNP or NT-pro BNP screening

HFrEF

Therapy

Goals
- Control symptoms
- Patient education
- Prevent hospitalization
- Prevent mortality

Drugs for routine use (pages 3-4)
- Diuretics for fluid retention
- ACEI or ARB or ARNI
- Beta blockers
- Aldosterone antagonists
- Inotropes
- Ivabradine

(see page 4)

Drugs for use in selected patients
- Hydralazine/isosorbide dinitrate
- ACEI and ARB
- Digitalis

In selected patients
- CRT
- ICD
- Revascularization or valvular surgery as appropriate

Testing
- BNP or NT-pro BNP screening

Stage D
(Refractory HF)
End-stage disease requiring specialized interventions

Patients with:
- Marked symptoms at rest despite maximal medical therapy
- Recurrent hospitalizations despite GDMT

Therapy

Goals
- Control symptoms
- Improve HRQOL
- Reduce hospital readmissions
- Establish patient's end-of-life goals

Options
- Advanced care measures
- Heart transplant
- Temporary or permanent MCS
- Experimental surgery or drugs
- Palliative care and hospice
- ICD deactivation

Testing
- BNP or NT-pro BNP screening

Evaluation

Treatment

Stages in the development of HF and recommended therapy by stage. ACEI indicates angiotensin-converting enzyme inhibitor; AF, atrial fibrillation; ARB, angiotensin-receptor blocker; CAD, coronary artery disease; CRT, cardiac resynchronization therapy; DM, diabetes mellitus; EF, ejection fraction; GDMT, guideline-directed medical therapy; HF, heart failure; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; HRQOL, health-related quality of life; HTN, hypertension; ICD, implantable cardioverter-defibrillator; LV, left ventricular; LVH, left ventricular hypertrophy; MCS, mechanical circulatory support; and MI, myocardial infarction. Adapted from Hunt et al.3Yancy CW et al., ACCF/AHA Guideline for the Management of Heart Failure, Circulation, 10/15/13.

NYHA Classification Table

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

Step One: History

1. Complete a thorough history and access current symptoms such as:
   - Dyspnea
   - Fatigue
   - Decreased exercise tolerance
   - Fluid retention
   - Chest pain
   - Disturbed breathing while sleeping
   - Orthopnea

2. A complete medical history is vital in identifying disorders that may accelerate the progression of HF, which include:
   - Hypertension
   - Diabetes
   - Valvular heart disease
   - Coronary or peripheral vascular disease
   - Arrhythmia

3. Complete a thorough family history that includes the identification of:
   a) Familial disposition to atherosclerotic disease:
      - Myocardial infarction
      - Stroke
      - Peripheral arterial disease
   b) Relatives with:
      - Sudden cardiac death
      - Conduction system disease (need pacemaker)
      - Arrhythmias
      - Cardiomyopathy (unexplained HF)
      - Skeletal myopathies

4. Complete a thorough review of social history:
   - Tobacco use
   - Alcohol consumption
   - Illicit drug use

5. Complete a thorough review of medications and document current medications and allergies.

Step Two: Physical Examination

1. Assessment of functional status:
   - Inquire about the type, severity, and duration of symptoms that occur during activities of daily living
   - Ask patient to describe activities that he or she would like to do but can no longer perform

2. At each visit, check:
   - Vital signs with orthostatic blood pressure changes
   - Weight, calculation of body mass index (BMI)

3. Document the presence or absence of the following:
   a) **Auscultation of the heart**:
      - Tachycardia
      - Third heart sound, S3 gallop
      - Murmur
   b) **Auscultation of the lungs**:
      - Wheezing
      - Rales
   c) **Neck**:
      - Degree of jugular venous distension
   d) **Extremities**:
      - Peripheral edema not due to venous insufficiency
      - Pulses

Step Three: Diagnostic Tests

1. It is necessary to identify the following:
   - Appropriate treatment
   - Prognosis
   - Etiologic factors
   - Cardiac dysfunction

2. Patients with HF should have a measurement of their left ventricular systolic function/ ejection fraction (LVEF): two-dimensional echocardiogram coupled with Doppler flow studies

3. Other testing to determine the severity of cardiac abnormality includes:
   - Chest radiograph
   - Electrocardiogram
   - Coronary arteriography
   - Exercise testing
   - Stress testing

Laboratory Tests

Laboratory testing may reveal disorders or conditions that can lead to or exacerbate HF. The initial evaluation of a patient with HF should include:

- Complete blood count
- Urinalysis
- Serum electrolytes (including magnesium and calcium)
- Fasting lipid profile (total cholesterol, LDL, HDL, and triglycerides)
- Thyroid function tests (especially thyroid-stimulating hormone)
- Fasting complete metabolic panel (including renal and hepatic function)
- Glycohemoglobin
- BNP or NT-pro BNP - can be helpful but should not be used in isolation

The diagnosis of heart failure is a clinical diagnosis based upon patient history, the physical examination, and diagnostic studies.

Step Four: Pharmacological Therapy

Routine medications used in combination include:

- Angiotensin-converting enzyme inhibitor or angiotensin receptor blocker or angiotesnsin receptor-neprilysin inhibitor
- Beta-blocker
- Diuretic
- Digoxin, spironolactone, hydralazine, isosorbide and ivabradine may also be added

Medication to Avoid in Heart Failure Patients

- Verapamil
- Nifedipine
- Non steroidal anti-inflammatory drugs (NSAIDs)
- Trimethoprim-sulfamethoxazole
- Diltiazem
- Cilostazol
- Piogliazone
- Terfendaine

Angiotensin-Converting Enzyme Inhibitor (ACEI)

- Recommended in all patients with heart failure with reduced ejection fraction
- Can be used interchangeably.
- Initiate at low doses and gradually increase as lower doses are tolerated; titrate to a specific goal as long as the patient can tolerate it.
- Renal function and serum potassium should be assessed after initiation, within 1 to 2 weeks, and at any dosage change.
- Contraindications for ACEI:
  - Life-threatening adverse reactions: angioedema, anuric renal failure
  - Pregnancy
- ACEI should still be used for patients with the following conditions but with caution:
  - Low systemic blood pressure (systolic blood pressure less than 90 mmHg)
  - Acutely increased serum levels of creatinine (greater than 3 mg/dL)
  - Bilateral renal stenosis

Angiotensin Receptor Blocker (ARB)

- Candesartan and valsartan are indicated for HF.
- Losartan also commonly used.
- Recommended for patients with symptoms of HF and left ventricular ejection fraction (LVEF) of ≤ 40% who are unable to tolerate ACEI as the first-line therapy; recommended for patients that cannot tolerate an ACEI due to cough.
- Blood pressure, renal function, and potassium should be reassessed within 1 to 2 weeks after initiation and monitored closely thereafter.
- Titration is achieved by doubling the doses.
- ARBs have all the same considerations listed for ACEIs.

Angiotensin Receptor— Neprilsyin Inhibitor (ARNI)

- Currently available as valsrtan/sacubitril.
- Recommended in patients with heart failure with reduced ejection fraction NYHA class II or III.
- Not to be administered concomitantly with ACEI or within 36 hours of switching to or from ACEI.
- Not to be administered if history of angioedema.
- ARNIs also have same considerations as ARBs.
- Use pro-BNP for testing.

Beta-Blocker

- Carvedilol, metoprolol succinate (**not** metoprolol **tartrate**), and bisoprolol are indicated for HF.
- Act to inhibit the adverse effects of the sympathetic nervous system in patients with HF.
- Recommend for all patients with stable HF due to reduced LVEF, unless there is a contraindication.
- As soon as LV dysfunction is diagnosed, beta-blocker initiation should begin.
- Patients with current or recent history of fluid retention should **not** be prescribed beta-blockers without a diuretic because diuretics are needed to maintain sodium and fluid balance and prevent the exacerbation of fluid retention that can accompany the initiation of beta-blocker therapy.
- Patients should have no or minimal evidence of fluid overload or volume depletion and should **not** have required recent treatment with an intravenous positive inotropic agent.
- May be considered in patients with reactive airway disease or symptomatic bradycardia, but should be used with great caution or not at all in patients with persistent symptoms of either condition.
- Titration to goal dose as patient tolerates.

Diuretics

- Loop diuretics used: furosemide, torsemide, bumetanide, ethacrynic acid (only for patients with sulfa allergies).
- Work to increase urinary sodium excretion and decrease physical signs of fluid retention in patients with HF.
- Should be used for all patients with evidence of fluid retention unless contraindicated.
- Produce symptomatic benefits more rapidly than any other drug for HF.
- Appropriate use of diuretics is a key element for the treatment of HF.

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Step Four: Pharmacological Therapy *(continued)*

Digitalis Glycosides

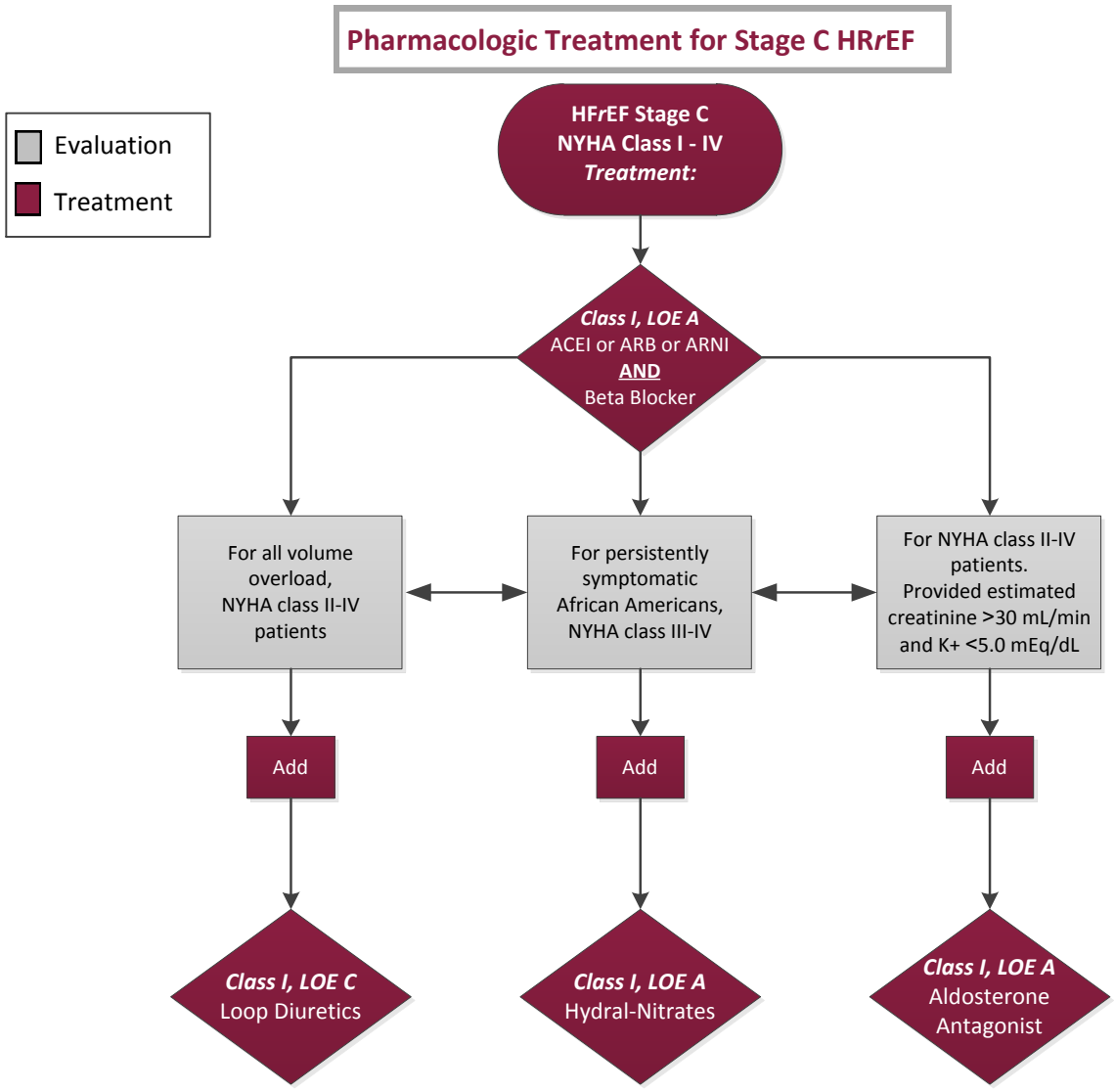
- May be considered in patients with persistent and/or severe symptoms that have not responded symptomatically to treatment with diuretics, ACEI, ARB, and beta-blockers.
- Routinely prescribed in patients with HF and chronic atrial fibrillation.
- Is not indicated as primary therapy for stabilization of patients with an acute exacerbation of HF.
- Should not be used with patients who have significant sinus or atrioventricular block unless the block has been treated with a permanent pacemaker.
- Use caution in patients who are taking drugs associated with depression of sinus atrioventricular nodal functions.
- Use caution in patients post-myocardial infarction or not at all, especially if ischemia is present.
- If patient is 70 years of age or older, low doses (not greater than 0.125 mg daily or every other day) should be used.

Hydralazine and Isosorbide Dinitrate

- A significant benefit has been shown by the addition of hydralazine and Isosorbide Dinitrate to standard therapy with an ACEI and/or beta-blocker in the African American population.
- Used for patients with more severe symptoms of HF and ACEI or ARB intolerance, hypotension, or renal insufficiency.
- Can be used for patients with reduced LVEF who are already taking an ACEI and a beta-blocker and who have persistent symptoms.

Aldosterone Antagonist (Spironolactone)

- Use cautiously at a low dose for patients with moderate to severe HF symptoms and recent decompensation of LF dysfunction early after MI.
- Should not be administered to patients with a baseline serum potassium of 5 mEq/L; patients should have no history of hyperkalemia.
- Not recommended in patient with serum creatinine > 2.5 or creatinine clearance less than 30 mL/min.
- Potassium levels and renal function should be checked in 3 days and at 1 week after initiating therapy and at least monthly for the first three months.
- Combination of an ACEI, an ARB, and an aldosterone antagonist should be considered for NYHA Class II-IV . (Class I - Level A recommendation: creatinine clearance greater than 30 and potassium less than 5 mEq/L.
- Aldosterone antagonists (selective) are weak diuretics that reduce mortality and risk of sudden death by blocking the effects of aldosterone. Recommended in NYHA Class II - VI patients with LVEF less than 35% or following an acute myocardial infarction and LVEF less than 40% (both Class I indications).



Step Five: Patient Engagement

Medications

- Explain the importance of compliance and benefits
- Explain possible side effects
- Avoid use of NSAIDs because they cause fluid retention

Diet and Weight

- Sodium restriction (2000mg/day) and fluid restriction (2 L/day)
- Weigh self daily and notify the physician of changes (2 lbs./day or 5lbs./wk.)
- Weight reduction if needed

Follow-up Visits

Patients who remain symptomatic despite basic medical therapy may benefit from care directed by consulting physicians who have special expertise and training in the care of patients with HF. A collaborative model between the primary care physician and the specialist can provide optimal care of the patient.

- Consider referral to cardiologist/heart failure specialist
- Consider referral to Mount Carmel Heart Failure Center
- Ask about symptoms of dyspnea, fatigue, and orthopnea
- Assess current activity level
- Review medications and compliance
- Blood pressure measurement (goal BP <130/80)
- Assess lab work with each visit (CBC, BMP)
- Assess for volume overload:
  - Weight
  - Peripheral edema
  - Rales
  - S3 or S4 gallop
  - Jugular venous pressure
  - Ascites
  - Hepatomegaly

Patient Education

- Explanation of the disease
- Signs and symptoms of recurrent HF
- Treatment plan
- When to make follow-up appointments
- When to call the physician with symptoms
- Changes in the ability to perform activities

General

- Smoking cessation
- Decreasing or limiting alcohol intake
- Sleep disorders evaluation and therapy to improve LVEF and functional status (Stage C, IIb-B).
- Early education of the patient and family regarding the expected course of illness and final treatment options, which should include end of life considerations, advanced directives, living wills, and the role of both palliative and hospice care.

Exercise

- Exercise training (30 minutes, five days/week) should be considered for all stable outpatients.

Vaccinations

- Influenza recommended yearly
- Pneumococcal recommended for anyone with heart failure; should be received once before age 65 and again when person turns 65 (but must be five years after the first administration)

Step Six: Implantable Cardioverter-Defibrillator

- Consider referral to cardiologist.
- Recommended for patients with:
  - Ischemic heart disease who are at least 40 days post-MI, LVEF less than or equal to 35%, NYHA functional class 2 or 3 symptoms while undergoing chronic optimal medical therapy, and have a reasonable life expectancy.
  - Current or prior symptoms of HF and reduced LVEF who have a history of cardiac arrest, ventricular fibrillation or hemodynamically destabilizing ventricular tachycardia.
  - Cardiac resynchronization therapy is effective in patients with heart failure and prolonged QRS duration.
  - Nonischemic cardiomyopathy with LVEF less than or equal to 30%, NYHA functional class 2 or 3 symptoms while undergoing chronic optimal medical therapy, and have a reasonable life expectancy.

Reducing Readmissions from the Emergency Department

- Discharge low-risk patients
- Risk Stratification for appropriate treatment
    - Patients with significant comorbidities that would prevent discharge, such as diabetes or superimposed pneumonia
- Appropriate utilization of observation
- For patients stable enough to discharge, arrange post-ED visit follow-up

Comorbidities in Heart Failure Patients

Anemia

- In NYHA class II and III HF and iron deficiency, intravenous iron replacement may be reasonable to improve functional status and quality of life.
- Erythropoietin - stimulating agent should not be given due to no evidence of therapeutic benefit.

Sleep Disorder

- Patients with cardiovascular disease and obstructive sleep apnea, CPAP maybe reasonable to improve sleep quality and daytime sleepiness.
- Patients with NYHA class II - IV HF r EF and central sleep apnea adaptive servo-ventilation causes harm.

Heart Failure ICD– 10 Codes

Diagnosis Code	Description
I50	Heart failure
I50.1	Left ventricular failure
I50.2	Systolic heart failure
I50.20	Unspecified systolic heart failure
I50.21	Acute systolic heart failure
I50.22	Chronic systolic heart failure
I50.23	Acute on chronic systolic heart failure
I50.3	Diastolic heart failure
I50.30	Unspecified diastolic heart failure
I50.31	Acute diastolic heart failure
I50.32	Chronic diastolic heart failure
I50.33	Acute on chronic diastolic heart failure
I50.4	Combined systolic and diastolic heart failure
I50.41	Acute combined systolic and diastolic heart failure
I50.42	Chronic systolic and diastolic heart failure
I50.43	Acute on chronic systolic and diastolic heart failure
I50.9	Heart failure, unspecified

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This clinical guideline outlines the recommendations of Mount Carmel Health Partners for this medical condition and is based upon the referenced best practices. It is not intended to serve as a substitute for professional medical judgment in the diagnosis and treatment of a particular patient. Decisions regarding care are subject to individual consideration and should be made by the patient and treating physician in concert.

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