Congestive Heart Failure (CHF): Causes,Signs and Treatment Guidelines

Congestive Heart Failure (CHF), also referred to as Congestive Cardiac Failure (CCF), is a clinical syndrome resulting from structural or functional cardiac disorders impairing the ventricle's ability to fill or eject blood adequately. It may affect the left, right, or both ventricles.

Pathophysiology

CHF arises when cardiac output is insufficient to meet metabolic demands, or when adequate output is only achieved at elevated filling pressures, leading to congestion. It results from:

- **Systolic dysfunction:** Impaired ventricular contraction (reduced ejection fraction <40%).
- **Diastolic dysfunction:** Impaired ventricular relaxation/filling (EF ?50%).

The body initiates compensatory mechanisms:

- **Frank-Starling mechanism**
- **Neurohormonal activation** (? Sympathetic NS, RAAS, ADH, endothelins)
- **Myocardial remodeling:** Ventricular hypertrophy or dilation

Over time, these mechanisms worsen myocardial stress, increase afterload, and cause fluid retention.

Classification

1. Based on Ejection Fraction (ACC/AHA & ESC):

- **HFrEF:** EF <40% (Systolic failure)
- **HFmrEF:** EF 41–49%
- **HFpEF:** EF ?50% (Diastolic failure)

2. By laterality:

- **Left-sided HF:** Pulmonary congestion dominates
- **Right-sided HF:** Systemic congestion dominates
- **Biventricular HF:** Both systems are affected

3. By temporal profile:

- **Acute HF:** Sudden onset, usually with precipitant
- **Chronic HF:** Progressive, longstanding

Left Ventricular Failure

Pathophysiology:

- ? Cardiac output
- ? Pulmonary venous pressure ? fluid extravasation into alveoli

Clinical Features:

- Dyspnea (initially exertional, later at rest)
- Orthopnea
- Paroxysmal nocturnal dyspnea (PND)
- Fatigue, weakness
- Pulmonary rales, S3 gallop
- Displaced apical impulse
- Signs of hypoperfusion (cool extremities, oliguria)

Right Ventricular Failure

Pathophysiology:

- ? Systemic venous pressure
- Fluid shifts into dependent tissues

Clinical Features:

- Peripheral pitting edema
- Hepatomegaly, RUQ discomfort
- Ascites
- Jugular venous distension (JVD)
- Positive hepatojugular reflux

Common Precipitating Factors

- Myocardial infarction, ischemia
- Uncontrolled hypertension
- Arrhythmias (esp. atrial fibrillation)
- Infection (e.g. pneumonia)
- Excessive fluid or salt intake
- Non-adherence to medications
- Pulmonary embolism
- Anemia
- Thyrotoxicosis
- Renal failure

Signs and Symptoms

System	Findings
Respiratory	Dyspnea, orthopnea, PND, rales, cough, pulmonary edema
Cardiac	Tachycardia, S3, displaced apical impulse, hypotension
Neurologic	Confusion, agitation (in severe LVF)

System	Findings
Abdominal	Hepatomegaly, ascites, anorexia, nausea
Peripheral	Edema, JVD, cold extremities

Diagnostic Evaluation

1. Clinical

- Comprehensive history and physical examination

2. Imaging and Labs

- **Chest X-ray:** Cardiomegaly, pulmonary congestion
- **ECG:** Ischemia, arrhythmias
- **Echocardiogram:** Confirms diagnosis, assesses EF, wall motion, valvular disease
- **BNP/NT-proBNP:** Elevated in HF, helps differentiate dyspnea causes
- **Cardiac enzymes:** Rule out myocardial infarction
- **CBC, LFTs, renal panel, TSH, glucose, lipids**

New York Heart Association (NYHA) Functional Classification

Class	Description
I	No limitation of physical activity
II	Slight limitation, symptoms with ordinary activity
III	Marked limitation, symptoms with less than ordinary activity
IV	Symptoms at rest, unable to carry out any physical activity without discomfort

Management Overview

Goals:

- Alleviate symptoms
- Improve quality of life
- Prevent hospitalizations
- Reduce mortality

Non-pharmacological:

- Sodium restriction <2g/day
- Fluid restriction (in severe cases)
- Weight monitoring
- Exercise training (in stable patients)
- Smoking/alcohol cessation

Pharmacologic Treatment (HFrEF):

- **ACE inhibitors or ARBs** (first-line)
- **Beta-blockers** (e.g. carvedilol, bisoprolol, metoprolol succinate)
- **Mineralocorticoid receptor antagonists** (e.g. spironolactone)
- **Loop diuretics** for volume overload
- **SGLT2 inhibitors** (e.g. dapagliflozin)
- **ARNI (sacubitril/valsartan)** in place of ACEI/ARB in eligible patients
- **Ivabradine** in select cases with HR >70 bpm on max beta-blockers
- **Hydralazine + isosorbide dinitrate** in black patients or ACEI intolerance

Treatment of HFpEF (diastolic failure):

- No proven mortality benefit agents
- Control of hypertension and comorbidities
- Diuretics to relieve symptoms of volume overload

Monitoring and Follow-up

- Daily weight tracking
- Monitor renal function and electrolytes
- Periodic assessment of EF
- Evaluate response to therapy
- Education on medication adherence and lifestyle

Prognosis

Prognosis depends on etiology, EF, NYHA class, and presence of comorbidities. Median survival is 5 years after diagnosis. Frequent hospitalizations signal a poor outcome.