

## An Overview of Current Perspectives of Heart Failure

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### Abstract

### Review Article

Heart failure is a clinical syndrome caused by structural or functional abnormalities of myocardium resulting in the inability of the heart to meet the oxygen demands of the body. In the developed countries approximately 1-2% of the adult population and globally more than 26 million people affected by Heart failure. It is estimated that about 5.7 million adults within the United States are diagnosed with heart failure. In all deaths, across the nation one in nine deaths enclosed failure as a contributive cause. Annually more than 870,000 new cases of heart failure are diagnosed, and it's calculatable that by the year 2030 bigger than eight million individuals can be diagnosed with the disease. The burden of HF in India appears high, and estimates of prevalence range from 1.3 million to 4.6 million, with an annual incidence of 491 to 600–1.8 million. The most commonly reported signs and symptoms are breathlessness, fluid retention, and paroxysmal nocturnal dyspnoea (PND). Other symptoms such as a poor appetite and low energy levels can be related to heart failure but they are also associated with other conditions. The diagnosis of Heart Failure is performed by using various parameters like blood test, chest x-ray, ECG, Echocardiography. The objectives of pharmacotherapy for heart failure are to prevent complications and reduce morbidity. Drugs used for management of heart failure are Angiotensin-converting enzyme, Beta-blockers, Angiotensin receptor blocker, Mineralocorticoid receptor antagonist, Angiotensin receptor neprilysin inhibitor, diuretics and others. In this review we are providing latest news on heart failure, signs and symptoms, different assessment tools, current practices regarding the management of heart failure.

**Keywords:** Heart failure, Echocardiography, Angiotensin-converting enzyme, Beta-blockers.

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### INTRODUCTION

Heart failure is a clinical syndrome caused by structural or functional abnormalities of myocardium resulting in the inability of the heart to meet the oxygen demands of the body. The most common cause for Heart failure is reduced left ventricular myocardial function but it also occur due to the dysfunction of the myocardium, pericardium, endocardium, heart valves or great vessels alone or in combination [1,2]. In the developed countries approximately 1-2% of the adult population and globally more than 26 million people affected by Heart failure [3]. Signs and symptoms of

heart failure include tachycardia and manifestations of venous congestion and low cardiac output. Breathlessness is a cardinal symptom of left ventricular (LV) failure that may manifest with progressively increasing severity [4].

### Classification

The New York Heart Association (NYHA) Classified Heart failure based on the relationship between symptoms and the amount of effort required to provoke them [5].

**Table-1: Classification of Heart failure by New York Heart Association (NYHA)**

Class	Patient Symptoms
Class I	No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea (shortness of breath).
Class II	Slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea (shortness of breath).
Class III	Marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes fatigue, palpitation, or dyspnea.
Class IV	Unable to carry on any physical activity without discomfort. Symptoms of heart failure at rest. If any physical activity is undertaken, discomfort increases.

The American College of Cardiology/American Heart Association (ACC/AHA) heart failure guidelines staging heart failure into four stages which

are complement the NYHA classification to reflect the progression of disease[6].

**Table-2: Staging of Heart failure by The American College of Cardiology/American Heart Association (ACC/AHA)**

Stage	Description of Stage
Stage A	Patients are at high risk for heart failure but have no structural heart disease or symptoms of heart failure
Stage B	Patients have structural heart disease but have no symptoms of heart failure
Stage C	Patients have structural heart disease and have symptoms of heart failure
Stage D	Patients have refractory heart failure requiring specialized interventions

### Type of heart failure

Heart failure can occur in either the left side (left ventricle) or right side (right ventricle) of heart. It's also possible for both sides of heart to fail at the same time.

#### Left-sided heart failure

The left ventricle of the heart does most of the heart's pumping work and it is larger than the right ventricle. The heart's pumping action moves oxygen-rich blood as it travels from the lungs to the left atrium, then on to the left ventricle, which pumps it to the rest of the body. When left-sided coronary failure happens, the heart ventricle (lower chamber) of the center should work more durable to pump a similar quantity of blood.

There are two types of left-sided heart failure.

- **Heart failure with reduced ejection fraction (HFrEF):** It is also called systolic failure. It occurs when left ventricle loses its ability to contract normally. The heart can't pump with enough force to push enough blood into circulation.
- **Heart failure with preserved ejection fraction (HFpEF):** It is also called diastolic failure. It occurs when left ventricle loses its ability to relax normally because the muscle stiff. The heart can't properly fill with blood during the resting period between each beat [5,7].

#### Right-sided heart failure

It is occur on the right side, or right ventricle, of the heart. It usually occurs from the left-sided heart failure, but it can also be also occurs due to the damage of the right ventricle from a heart attack. When the left ventricle fails, increased fluid pressure is forced back through the lungs, damaging the heart's right side. Due to the loss of pumping power of right-side the blood backs up in the veins and it often causing swelling in the body, such as in the ankles and legs.

#### Congestive heart failure

Symptoms CHF may be a variety which needs seeking timely medical attention. As blood effuse of the guts slows, blood returning to the guts through the veins backs up, inflicting congestion within the body's tissues. Usually swelling (edema) results. Most frequently there is swelling within the legs and ankles; however it will

happen in different components of the body, too. Sometimes fluid collects within the lungs and interferes with respiratory, inflicting shortness of breath, particularly once someone is lying down. This will be referred to as pulmonic dropsy and if left untreated can cause metastasis distress. Heart failure additionally affects the kidneys' ability to lose Na and water. This maintained water additionally will increase swelling within the body's tissues (edema)[5].

### EPIDEMIOLOGY

It is estimated that about 5.7 million adults within the United States are diagnosed with heart failure. In all deaths, across the nation one in nine deaths enclosed failure as a contributive cause. Annually more than 870,000 new cases of heart failure are diagnosed, and it's calculatetable that by the year 2030 bigger than eight million individuals can be diagnosed with the disease. Before 75 years older, rates are markedly higher in black populations than in whites. What's most alarming with this illness is that the rate of these patients with heart failure dies at intervals 5 years of developing the disease [8-1].

The incidence and prevalence estimates of heart failure (HF) are unreliable in India because of the lack of surveillance systems to adequately capture these data. The burden of HF in India appears high, and estimates of prevalence range from 1.3 million to 4.6 million, with an annual incidence of 491 to 600–1.8 million [12].

### SIGNS AND SYMPTOMS

The most commonly reported signs and symptoms are breathlessness, fluid retention, and paroxysmal nocturnal dyspnoea (PND). Other symptoms such as a poor appetite and low energy levels can be related to heart failure but they are also associated with other conditions.

The symptoms of heart failure may include:

- Shortness of breath (dyspnea) when you exert yourself or when you lie down
- Fatigue and weakness
- Swelling (edema) in your legs, ankles and feet
- Rapid or irregular heartbeat
- Reduced ability to exercise

- Persistent cough or wheezing with white or pink blood-tinged phlegm
- Increased need to urinate at night
- Swelling of your abdomen (ascites)
- Very rapid weight gain from fluid retention
- Lack of appetite and nausea
- Difficulty concentrating or decreased alertness
- Sudden, severe shortness of breath and coughing up pink, foamy mucus
- Chest pain if your heart failure is caused by a heart attack

## AETIOLOGY

In western developed countries, coronary artery disease, either alone or in combination with hypertension, seems to be the most common cause of heart failure [13]. HF has an estimated 17 primary aetiologies, as determined by the Global Burden of Disease Study [14]. More than two-thirds of all cases of HF can be attributed to four underlying conditions: ischemic heart disease, chronic obstructive pulmonary disease, hypertensive heart disease, and rheumatic heart disease [15]. There are some Causes of heart failure are Coronary artery disease, Myocardial infarction, Ischaemia, Hypertension, Cardiomyopathy, Dilated (congestive) Hypertrophic/ obstructive, Restrictive—for example, amyloidosis, sarcoidosis, haemochromatosis. Obliterative, Valvar and congenital heart disease, Mitral valve disease, Aortic valve disease, Atrial septal defect, ventricular septal defect, Arrhythmias, Tachycardia, Bradycardia (complete heart block, the sick sinus syndrome), Loss of atrial transport—for example, atrial fibrillation, Alcohol and drugs, Alcohol, Cardiac depressant drugs ( $\beta$  blockers, calcium antagonists).

“High output” failure, Anaemia, thyrotoxicosis, arteriovenous fistulae, Paget's disease, pericardial disease, Constrictive pericarditis, pericardial effusion, Primary right heart failure, Pulmonary hypertension—for example, pulmonary embolism [12, 14, 16, 17].

## DIAGNOSIS

The diagnosis of Heart Failure is performed by using various parameters

### Laboratory assessment

Laboratory testing can help identify alternative and potentially reversible causes of heart failure. Laboratory tests including complete blood count, B-type natriuretic peptide level, Calcium and magnesium levels, glucose, blood urea nitrogen, serum creatinine, fasting lipid profile, liver function test, thyroid-stimulating hormone and urinalysis [1, 18].

Natriuretic peptides are useful biomarkers in patients with heart failure. The ventricles of heart release BNP and N- terminal pro-BNP (NT-pro BNP) when volume and pressure overloaded [19].

### Chest X-ray

Chest X-rays may useful in evaluating heart size, pulmonary congestion and to detect alternative cardio-pulmonary diseases that may cause or contribute to the patient's symptoms. Chest X-ray can be valuable to rule out other pathology that may be responsible for symptoms, such as breathlessness. Chest X-ray may show features of heart failure such as an increased cardiothoracic ratio, lung interstitial oedema or bilateral pleural effusions [1,19,20].

### Electrocardiography

Electrocardiography (ECG) is a useful parameters for diagnose the patients with suspected heart failure. ECG can use for identification of changes such as left bundle branch block, left ventricular hypertrophy, acute or previous myocardial infarction, or atrial fibrillation and may advice for further investigation by echocardiography, stress testing, or cardiology consultation. Minor abnormalities on ECG make systolic heart failure and presence of other findings such as atrial fibrillation, new T-wave changes, or any abnormality has a small effect on the diagnostic probability of heart failure[19,20].

### Echocardiography

The best quality level for heart failure diagnosis, among the cardiovascular imaging devices, is echocardiography. This is because of its safety, accuracy, cost-adequacy and accessibility [19]. Echocardiography is the most broadly acknowledged and accessible strategy for recognizing systolic dysfunction and ought to be performed after the underlying assessment to affirm the nearness of heart failure. Two - dimensional echocardiography with Doppler flow studies can evaluate left ventricular ejection fraction (LVEF), left ventricular size, wall thickness, valve function and the pericardium. Echocardiography can help with diagnosing diastolic heart failure if elevated left atrial pressure, impaired left ventricular relaxation and decreased compliance are present[20, 21].

### Drugs used for management of heart failure

The objectives of pharmacotherapy for heart failure are to prevent complications and reduce morbidity. Drugs used for management of heart failure according to the “ESC Guidelines-2016” Are listed below [22].

**Table-3: Drugs used for management of heart failure according to the “ESC Guidelines-2016”**

Class of drug	Drug name	Starting dose (mg)	Target dose (mg)
Angiotensin-converting enzyme	Captopril	6.26 <i>t.i.d.</i>	50 <i>t.i.d.</i>
	Enalapril	2.5 <i>b.i.d.</i>	20 <i>b.i.d.</i>
	Lisinopril	2.5-5.0 <i>o.d.</i>	20-35 <i>o.d.</i>
	Ramipril	2.5 <i>o.d.</i>	10 <i>o.d.</i>
	Trandolapril	0.5 <i>o.d.</i>	4 <i>o.d.</i>
Beta-blockers	Bisoprolol	1.25 <i>o.d.</i>	10 <i>o.d.</i>
	Carvedilol	3.125 <i>b.i.d.</i>	25 <i>b.i.d.</i>
	Metoprolol succinate	12.5-25 <i>o.d.</i>	200 <i>o.d.</i>
	Nebivolol	1.25 <i>o.d.</i>	10 <i>o.d.</i>
Angiotensin receptor blocker	Candesartan	4-8 <i>o.d.</i>	32 <i>o.d.</i>
	Valsartan	40 <i>b.i.d.</i>	160 <i>b.i.d.</i>
	Losartan	50 <i>o.d.</i>	150 <i>o.d.</i>
Mineralocorticoid receptor antagonist	Eplerenone	25 <i>o.d.</i>	50 <i>o.d.</i>
	Spironolactone	25 <i>o.d.</i>	50 <i>o.d.</i>
Angiotensin receptor neprilysin inhibitor	Sacubitril/Valsartan	49/51 <i>b.i.d.</i>	97/103 <i>b.i.d.</i>
If-channel blocker	Ivabradine	5 <i>b.i.d.</i>	7.5 <i>b.i.d.</i>
Loop diuretics	Furosemide	20-40	40-240
	Bumetanide	0.5-1.0	1-5
	Torsemide	5-10	10-20
Thiazide diuretics	Bendroflumethiazide	2.5	2.5-10
	Hydrochlorothiazide	25	12.5-100
	Metolazone	2.5	2.5-10
	Indapamide	2.5	2.5-5
Potassium-sparing diuretics	Spironolactone/ Eplerenone	12.5-25	50
	Amiloride	2.5	5
	Triamterene	25	50

Other drug which are used for the treatment of heart failure are Digoxin, digitalis glycosides, n-3 polyunsaturated fatty acids, anticoagulant and antiplatelet which having less certain benefits in symptomatic patients with heart failure.

## CONCLUSION

Heart failure is a clinical syndrome caused by structural or functional abnormalities of myocardium resulting in the inability of the heart to meet the oxygen demands of the body. Annually more than 870,000 new cases of heart failure are diagnosed. In this review we are providing latest information on heart failure, signs and symptoms, different assessment tools, current practices regarding the management of heart failure.

## REFERENCES

- Inamdar AA, Inamdar AC. Heart failure: diagnosis, management and utilization. *Journal of clinical medicine*. 2016 Jun 29; 5(7):62.
- Brown PF, Thambyrajah J. A review of the current management of acute and chronic heart failure in the context of ischemic heart disease. *Continuing Cardiology Education*. 2017 Mar; 3(1):30-6.
- Ambrosy AP, Fonarow GC, Butler J, Chioncel O, Greene SJ, Vaduganathan M, Nodari S, Lam CS, Sato N, Shah AN, Gheorghiade M. The global health and economic burden of hospitalizations for heart failure: lessons learned from hospitalized heart failure registries. *Journal of the American College of Cardiology*. 2014; 63(12):1123-33.
- Dassanayaka S, Jones SP. Recent developments in heart failure. *Circulation research*. 2015 Sep 11; 117(7): e58-63.
- American Heart Association. Classes of heart failure. Available at [http://www.heart.org/HEARTORG/Conditions/HeartFailure/AboutHeartFailure/Classes-of-Heart-Failure\\_UCM\\_306328\\_Article.jsp#.WUcGf-vyuHs](http://www.heart.org/HEARTORG/Conditions/HeartFailure/AboutHeartFailure/Classes-of-Heart-Failure_UCM_306328_Article.jsp#.WUcGf-vyuHs). Updated: May 8, 2017; Accessed: May 10, 2018.
- Yancy CW, Jessup M, Bozkurt B. American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. 2013 ACCF/AHA 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*. 2013 Oct 15. 128(16):e240-327.
- Gerber Y, Weston SA, Redfield MM, Chamberlain AM, Manemann SM, Jiang R, Killian JM, Roger VL. A contemporary appraisal of the heart failure epidemic in Olmsted County, Minnesota, 2000 to 2010. *JAMA internal medicine*. 2015 Jun 1; 175(6):996-1004.
- Go AS, Mozaffarian D, Roger VL. Heart disease and stroke statistics- 2014 update: a report from the

- American Heart Association. *Circulation*. 2014; 129(3): e28–292.
9. Prevention CF. Centers for Disease Control and Prevention. Division for Heart Disease and Stroke Prevention; 2016. Available at: <https://www.cdc.gov/DHDSP>. August 28, 2016.
  10. Roger VL. Epidemiology of heart failure. *Circulation research*. 2013 Aug 30; 113(6):646-59.
  11. Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JG, Coats AJ, Falk V, González-Juanatey JR, Harjola VP, Jankowska EA, Jessup M. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *KardiologiaPolska (Polish Heart Journal)*. 2016;74(10):1037-147.
  12. Narayanan G, Prabhakaran D. Integrating mental health into cardiovascular disease research in India. *National medical journal of India*. 2012 Jan 1;25(5):274-80.
  13. McMurray JJ, Stewart S. Epidemiology, aetiology, and prognosis of heart failure. *Heart*. 2000 May 1;83(5):596-602.
  14. Hawkins NM, Petrie MC, Jhund PS, Chalmers GW, Dunn FG, McMurray JJ. Heart failure and chronic obstructive pulmonary disease: diagnostic pitfalls and epidemiology. *European journal of heart failure*. 2009 Feb;11(2):130-9.
  15. Ziaieian B, Fonarow GC. Epidemiology and aetiology of heart failure. *Nature Reviews Cardiology*. 2016 Jun;13(6):368.
  16. Lip GY, Gibbs CR, Beevers DG. Aetiology. *Bmj*. 2000 Jan 8;320(7227):104-7.
  17. Ziaieian B, Fonarow GC. Epidemiology and aetiology of heart failure. *Nature Reviews Cardiology*. 2016 Jun;13(6):368.
  18. Vitale C, Spoletini I. Clinical Diagnosis in Heart Failure. *International Cardiovascular Forum Journal* 10; 2017.
  19. Spoletini I, Vitale C. Clinical Diagnosis in Heart Failure. In *International Cardiovascular Forum Journal*. 2017; 3(10).
  20. Taylor AL, Ziesche S, Yancy C, Carson P, D'Agostino Jr R, Ferdinand K, Taylor M, Adams K, Sabolinski M, Worcel M, Cohn JN. Combination of isosorbide dinitrate and hydralazine in blacks with heart failure. *New England Journal of Medicine*. 2004 Nov 11; 351(20):2049-57.
  21. Redfield MM, Jacobsen SJ, Burnett JC Jr., Mahoney DW, Bailey KR, Rodeheffer RJ. Burden of systolic and diastolic ventricular dysfunction in the community: appreciating the scope of the heart failure epidemic. *JAMA* 2003; 289 (2):194-202.
  22. Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JG, Coats AJ, Falk V, González-Juanatey JR, Harjola VP, Jankowska EA, Jessup M. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. *European journal of heart failure*. 2016 Aug; 18(8):891-975.