

**REVIEW ARTICLE****TREATMENT OF HEART FAILURE  
UNDER CURRENT GUIDELINES***MOHAMMAD ISHAQ\*, QAISER JAMAL\*\****INTRODUCTION**

Throughout the last decade, the therapeutic approach to heart failure has undergone considerable change. Current treatment not only concerns symptomatic improvement, but also focuses increasingly on preventing the transition of asymptomatic cardiac dysfunction to symptomatic heart failure, modulating progression of heart failure and reducing mortality. As this is likely to be a slow process, the effect of novel preventive therapies may only become apparent after a time, in contrast to the often more rapid effects of pure symptomatic treatment. Thus short and long-term objectives with individualized therapies should be identified. Important treatment targets include cardiac remodeling, neuroendocrine and cytokine activation, fluid retention and myocardial dysfunction. Accordingly, heart failure being a complex syndrome, the therapeutic approach may need several strategies in combination which target different mechanisms.

However, as the therapeutic approaches to heart failure are multiple, including general measures, pharmacological therapy, mechanical devices and surgical interventions, they will not always be applicable in each patient. Adverse effects and interaction between different forms of treatment may preclude their use in some. Rapid deterioration of the clinical condition require identification of the appropriate therapeutic approach.

**AIMS OF TREATMENT**

The aims of heart failure treatment are those of the treatment of any disease in general and consists of several components (Table: 1)

**TABLE - 1****Aims of treatment:**

1. Prevention:
  - (a) Prevention and/or controlling of diseases leading to cardiac dysfunction and heart failure
  - (b) Prevention of progression to heart failure once cardiac dysfunction is established
2. Morbidity:
  - Maintenance or improvement in quality of life
3. Mortality.
  - Increase duration of life.

**PREVENTION OF HEART FAILURE**

The prevention of heart failure should always be a primary objective. Many potential causes of myocardial damage can be treated and the extent of myocardial damage reduced. Examples include modification of risk factors for coronary heart disease, treatment of ischaemia, early triage of acute myocardial infarction, prevention of reinfarction, accurate identification and aggressive treatment of hypertension, and some causes of specific heart muscle disease, and timely correction of valve disorders and congenital heart disease.

When myocardial dysfunction is already present, the first objective is to eliminate the underlying cause of ventricular dysfunction if possible (e.g. ischaemia, toxic substances, alcohol, drugs, thyroid disease). The second objective of therapy is to modulate the progression from asymptomatic left ventricular dysfunction to symptomatic heart failure.

**TREATMENT OF CHRONIC HEART FAILURE**

The therapeutic approach in chronic heart failure due to systolic cardiac dysfunction consists of general advise and other non-pharmacological measures, pharmacological therapy, mechanical devices and surgery. The currently available types of treatment are outlined in Table- 2<sup>(1)</sup>

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**TABLE - 2**  
**TREATMENT OPTIONS-GENERAL ADVICE**  
**AND MEASURES, EXERCISE TRAINING,**  
**PHAMACOLOGICAL THERAPY, DEVICES**  
**AND SURGERY**

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<b>I</b>	<b>Non -pharmacological treatment</b>
	* General advice and measures
	* Exercise and exercise training
<b>II</b>	<b>Pharmacological therapy</b>
	* Angiotensin-converting (ACE) inhibitors
	* Diuretics
	* Beta-adrenoceptor antagonists
	* Aldosterone receptor antagonists,
	* Angiotensin receptor antagonists
	* Cardiac glycosides
	* Vasodilator agents (nitrates/hydralazine)
	* Positive inotropic agents
<b>III</b>	<b>Devices and surgery</b>
	* Revascularization (Mechanical).
	* Pacemakers
	* Implantable cardioverter defibrillators (ICD)
	* Heart transplantation, ventricular assist devices, and artificial heart.

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### **NON PHARMACOLOGICAL TREATMENT: GENERAL ADVICE & MEASURES:**

#### **EDUCATING PATIENTS AND FAMILY:**

Patients with chronic heart failure and their close relatives should receive general advice (Table -3)

#### **WEIGHT CONTROL:**

Patients are advised to weigh themselves on a regular basis (at least twice a week) and, in case of a sudden unexpected weight gain of more than 2kg in 3 days, should alert a health care provider to adjust their diuretic dose accordingly.

#### **DIETARY MEASURES**

##### **SODIUM:**

Controlling the amount of salt in the diet is a problem which is more relevant in advanced heart failure than early mild failure. Salt substitutes must be used with caution, as they may contain potassium. Used in large quantities in combination with an ACE inhibitor, they may lead to hyperkalemia <sup>(2)</sup>.

**TABLE - 3**  
**LIST OF SUBJECTS TO DISCUSS WITH A HEART**  
**FAILURE PATIENT AND HIS FAMILY**

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<b>General advice</b>
* Explain what heart failure is and why symptoms occur
* Causes of heart failure
* How to recognize symptoms
* What to do if symptoms occur
* Self-weighing
* Rationale of treatments
* Importance of adhering to pharmacological and non-pharmacological prescriptions.
* Refrain from smoking
* Prognosis
<b>Drug counseling</b>
* Effects
* Dose and time of administration
* Side effects and adverse effects
* Signs of intoxication
* What to do in case of skipped doses
* Self- management
<b>Rest and exercise</b>
* Rest
* Work
* Daily physical activity
* Sexual activity
* Rehabilitation
<b>Vaccinations</b>
<b>Travel</b>
<b>Dietary and social habits</b>
* Control sodium intake when necessary, e.g. some patient with severe heart failure
* Avoid excessive fluids in severe CHF
* Avoid excessive alcohol intake
* Stop smoking

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#### **FLUIDS:**

Fluid intake must be reduced in patients with advanced heart failure, with or without hyponatremia. The exact amount of fluid restriction remains unclear. In practice, a fluid restriction of 1.5 - 2 liters is advised in advanced heart failure.

#### **ALCOHOL:**

Moderate alcohol intake is permitted. Alcohol consumption must be prohibited in suspected cases of alcoholic cardiomyopathy.

#### **OBESITY:**

Treatment of chronic heart failure should include weight reduction in the overweight or obese. The subject is overweight if his/her body mass index lies between 25 and 30 and obese if it is >30.<sup>(3)</sup>

**ABNORMAL WEIGHT LOSS:**

Clinical or subclinical malnutrition is present in about 50% of patients with severe chronic heart failure (4). The wasting of total body fat and lean body mass that accompanies weight loss is called cardiac cachexia which is an important predictor of reduced survival.

**SMOKING:**

Smoking should always be discouraged. The use of smoking cessation aids should be actively encouraged, and may include nicotine replacement therapies.

**TRAVELING:**

High altitudes and traveling to very hot or humid places should be discouraged. In general, short air flights are preferable to long journeys. In patients with severe heart failure, long air flight can cause problems (eg. Dehydration, excessive limb oedema, deep venous thrombosis).

**SEXUAL ACTIVITY:**

It is not possible to dictate guidelines about sexual activity. Recommendations are given to reassure the not severely compromise, but frightened patient & to reassure the partner who is often even more frightened, and perhaps refer the couple for specialist counseling. Advise if appropriate, the use of sublingual nitrates before sex and discourage major emotional excitement. Patients in NYHA class II are at intermediate risk and class III-IV at high risk of cardiac decompensation triggered by sexual activity(5).

**DRUGS TO AVOID:**

Desired effects and side effects of all drugs should be explained. The following drugs should be used with caution when co-prescribed with any form of heart failure treatment, or avoided(6).

- 1) Non-steroidal antiinflammatory drugs (NSAIDS)
- 2) Class I antiarrhythmics
- 3) Calcium antagonists verapamil, diltiazem, first generation dihydropyridine derivatives
- 4) Tricyclic antidepressants

- 5) Corticosteroids
- 6) Lithium

**REST AND EXERCISE:****REST:**

Rest should not be encouraged in stable chronic heart failure. When there is acute heart failure or destabilization of chronic heart failure, physical rest or bed rest is necessary.

**EXERCISE:**

If in a stable condition, the patient should be encouraged to carry out daily physical and leisure time activities that do not induce symptoms, to prevent muscle de-conditioning.

**PHARMACOLOGICAL THERAPY****ANGIOTENSIN - CONVERTING ENZYME (ACE) INHIBITORS:**

- \* ACE inhibitors are recommended as first line therapy in patients with a reduced left ventricular systolic function expressed as a subnormal ejection fraction.
- \* ACE Inhibitors are shown to be effective in large controlled trials in heart failure.

**ACE INHIBITORS IN ASYMPTOMATIC LEFT VENTRICULAR DYSFUNCTION:**

Asymptomatic patients with a documented left ventricular systolic dysfunction benefit from long term ACE inhibitor therapy. The consistency of data from the SOLVD, AVE and TRACE studies have shown that asymptomatic patients, with left ventricular dysfunction receiving ACE inhibitor will reduce progression to symptomatic heart failure and hospitalization for cardiac decompensation.

**ACE INHIBITORS IN SYMPTOMATIC HEART FAILURE:**

All patients with symptomatic heart failure due to systolic left ventricular dysfunction should receive an ACE inhibition therapy. ACE inhibition significantly improves survival and symptoms. and reduces incidence of hospitalization in patients with moderate to severe heart failure and left ventricular systolic

dysfunction. In the absence of fluid retention, ACE inhibitors should be given alone, while in patients with fluid retention together with diuretics.

A recent meta-analysis of 12763 patients with left ventricular dysfunction and / or, heart failure from five large controlled trials, including three that included patients early after myocardial infarction, showed that ACE inhibition significantly reduces mortality, fewer admissions for hearts failure and reinfarction; independent of age, sex and baseline use of diuretics, aspirin and beta- blockade. Benefit was apparent over a range of left ventricular dysfunction at baseline<sup>(7)</sup>.

**TABLE - 4**  
**DOSES OF ACE INHIBITORS SHOWN TO BE EFFECTIVE IN LARGE, CONTROLLED TRIALS OF HEART FAILURE OR LEFT VENTRICULAR DYSFUNCTION<sup>(1)</sup>.**

Studies of Mortality			
	Drug	Target dose	Mean daily dose
<i>Studies in chronic heart failure</i>			
Consensus Trial Study			
Group 1978 <sup>(8)</sup>	Enalapril	20 ring bid	18.4 ring
Cohn et al (V-HeFT II, 1991) <sup>(9)</sup>	Enalapril	10 mg bid	15.0 ring
The SOLVD Investigators, 1991, <sup>(10)</sup>	Enalapril	1,0 mg bid	16.6 mg
ATLAS <sup>(11)</sup>	Lisinopril	High dose:	32.5-35mg daily
		Low dose	2.5 - 5 mg daily
<i>Studies after MI-L V dysfunction with or without HF</i>			
Pfeffer et al (SAVE, 1992) <sup>(12)</sup>			
	Captopril	50 mg t.i.d	(not available)
AIRE <sup>(13)</sup>	Ramipril	5 m bid	(not available)
TRACE	Trandolapril	4 mg daily	(not available)

Important adverse effects associated, with ACE inhibitors are hypotension, syncope, renal insufficiency hyperkalaemia and angioedema. Although cough may often be due to heart failure or concomitant diseases, e.g. respiratory disease, dry cough is a known side effect of ACE inhibitors. Persistent cough may lead to discontinuation of ACE inhibitor therapy.

Serum creatinine might increase by 10 - 15% in patient with severe heart failure, irrespective of baseline serum creatinine<sup>(14)</sup>. The risk of hypotension and renal dysfunction increases in patients with severe heart failure, those treated with high doses of diuretics, elderly patients and patients with renal

dysfunction or hyponatremia. Serum potassium levels >5.5mmol is a contraindication to ACE inhibitors.

Absolute contraindications for initiation of ACE inhibitor treatment are bilateral renal artery stenosis and angioedema during previous ACE inhibitor therapy.

**TABLE - 5**  
**RECOMMENDED ACE INHIBITOR MAINTENANCE DOES RANGES<sup>(1)</sup>**

Drug	Initiating dose	Maintenance dose
Benazepril	2.5 mg	5 - 10 mg bid.
Captopril	6.25 mg t.i.d.	25 - 20 mg t.i.d.
Enalapril	2.5 mg daily	10 mg bid.
Lisinopril	2.5 mg daily	5 - 20 mg daily
Quinapril	2.5 - 51 mg daily	5 - 10 mg daily
Perindopril	2 mg daily	4 mg daily
Rampipid	1.25 2.5 mg daily	2.5 - 5 mg b.i.d.
Cilazapril	0.5 mg daily	1 2. 5 mg daily
Fosinopril	10 mg daily	20 mg daily
Trandolapril	1 mg daily	4 mg daily

## MONITORING:

Regular monitoring of renal function is recommended: (1) before, 1 - 2 weeks after each dose increment, at 3 months, and at 6 monthly intervals; (2) when treatment is changed, which may affect renal function: (3) in patient with past or present renal dysfunction or electrolyte disturbances, more frequent measurements should be made.

Care should be taken in patients with a low systolic blood pressure. Patients with a systolic level below 100 mmHg should have therapy initiated under a specialist care. Low blood pressures (< 90 mmHg) during ACE inhibitor treatment are acceptable if the patient is asymptomatic.

## DIURETICS: LOOP DIURETICS, THIAZIDES AND METOLAZONE

\* Diuretics are essential for systematic treatment when fluid overload is present and manifest as pulmonary congestion or peripheral edema; Although there are no controlled randomized trials that have assessed the effect on survival with these agents. The use of diuretics results in repaid improvement of dyspnoea and increase exercise tolerance.

**TABLE 6**  
**DIURETICS (ORAL)**  
**DOSAGES AND SIDE EFFECTS<sup>(1)</sup>**

Maximum recommended	Initial dose (mg) daily dose (mg)		Major side effects
Loop diuretics			
Furosemide	20-40	250-500	Hypokalemia, hypomagnesemia, hyponatremia
Bumetanide	0.5-1.0	5-10	Hyperuricemia, glucose intolerance,
Torsemide	5-10	100-200	Acid base disturbance
Hydrochlorothizide	2.5	50-75	Hypokalemia, hypomagnesemia, Hyponatremia
Metolazone	2.5	10	Hyperuricemia, glucose intolerance,
Indapamide	2.5	2.5	Acid-base disturbance
Potassium sparing diuretic	+ACEI - ACEI	+ACEI -ACEI	
Amiloride	2.5 6	20 40	Hyperkalemia, rash
Triamterence	2.5 50	100 200	Hyperkalemia
Spironolactone	2.5 50	50 100-200	Hyperkalemia, gynecomastia

\* Diuretics should always be administered in combination with ACE inhibitors if possible.

#### **POTASSIUM SPARING DIURETICS:**

\* Potassium-sparing diuretics should only be combined with ACE if hypokalemia persists in severe heart failure despite the combination of ACE inhibition diuretics.

\* Potassium supplements are less effective in this situation.

Most patients on diuretics for heart failure will also be treated with an ACE inhibitor. Until recently the combination of potassium sparing diuretics and ACE inhibitors was regarded as potentially dangerous. One small controlled study suggested that the administration of spironolactone at dosages that result in diuresis and naturesis i.e. 50mg, to patient who are not responding to loop diuretics and ACE inhibition may result in rapid weight reduction without hyperkalemia, however at present potassium sparing diuretics such as triamterence, amiloride and relatively high dosages of spironolactone should only be considered if there is persisting diuretic-induced

hypokalemia despite concomitant ACE inhibitor therapy, or in severe heart failure, despite concomitant ACE inhibition plus low-dose spironolactone.

#### **BETA – ADRENOCEPTOR ANTAGONISTS:**

\* Beta-blocking agents are recommended for the treatment of all patient with stable, mild, moderate. and severe heart failure from ischaemic , or non-ischaemic cardiomyopathies and reduced left ventricular ejection fraction, in NYHA class II to IV, on standard treatment, including diuretics and ACE inhibitors, unless there is a contraindication.

\* In patients with left ventricular systolic dysfunction with or without symptomatic heart failure, following an acute myocardial infarction long-term beta-blockade is recommended in addition to ACE inhibition to reduce mortality.

The first recommendation is based on data obtained from large and small studies including, over 15000 patients, the second on the recently published CAPRICORN study with carvedilol. In several large, randomized placebo-controlled mortality trials carvedilol, bisoprolol and metoprolol have been associated with a long-term reduction in total mortality, cardiovascular mortality, sudden death and death due to progression of heart failure in patients in functional class II-IV.

**TABLE 7**  
**INITIATING DOSE, TARGET AND TITRATION**  
**SCHEME OF BETA-BLOCKING AGENTS AS USED IN**  
**RECENT TRIALS**

Beta-blocker	First does (mg)	Increments (M Day)	Target dose (me. pay)	Titration
Bisoprolol	1.25	2.5, 3.75, 5, 7.5, 10	10	weeks-month
Metoprolol tartrate	5	10, 15, 30, 50, 75, 100	150	weeks-month
Metoprolol succinate CR	12.5/25	25, 50, 100, 200	200	weeks-month
Carvedilol	3.125	6.25, 12.5, 25, 50	50	weeks-month

**ALDOSTERONE RECEPTOR ANTAGONIST- SPIRONOLACTONE:**

\* Aldosterone antagonism, is recommended in advanced heart failure (NYHA III-IV) in addition to ACE inhibition and diuretics to improve survival and morbidity.

The rales mortality trial showed that low dose spironolactone (12.5 - 50 mg) on top of an ACE inhibitor and a loop diuretic markedly and progressively improved survival of patients in advanced (NYHA class III or IV) heart failure, irrespective of its etiology.

**TABLE 8  
ADMINISTRATION AND DOSING CONSIDERATIONS  
WITH SPIRONOLACTONE<sup>(1)</sup>**

- 1 Consider whether a patient is in severe heart failure (NYHA II-IV) despite ACE inhibition/diuretics
- 2 Check serum potassium (<5.0 mmol. l<sup>-1</sup>) and creatinine (<250umol. l<sup>-1</sup>)
- 3 Add 25 mg spironolactone daily.
- 4 Check serum potassium and creatinine after 4-6 days.
- 5 If at any time serum potassium >5.5<mmol. l<sup>-1</sup> reduced dose by 50%. Stop if serum potassium > 5.5mmol. l<sup>-1</sup>
- 6 If after 1 month symptoms persevere and normokalemia exists, increase to 50 mg daily. Check serum potassium / creatinine after 1 week.

**ANGIOTENSIN II RECEPTOR ANTAGONISTS:**

- \* Angiotensin II receptor antagonists (ARBs) could be considered in patients who do not tolerate ACE inhibitors for symptomatic treatment.
- \* However, it is unclear whether ARBs are as effective as ACE inhibitors for mortality reduction. More evidence and research is needed.
- \* In combination with ACE inhibition ARBs may improve heart failure symptoms and reduce hospitalizations for worsening heart failure.

**TABLE - 9  
CURRENTLY AVAILABLE ANGIOTENSIN II  
RECEPTOR BLOCKERS<sup>(1)</sup>**

Drugs	Daily dose (mg)
Losartan	50-100
Valsartan	80-320
Irbesartan	150-300
Candesartan	4-16
Telmisartan	40-80
Eprosartan	400-800

**CARDIAC GLYCOSIDE:**

- \* Cardiac glycosides are indicated in atrial fibrillation and any degree of symptomatic heart failure, whether or not left ventricular dysfunction is the cause in order to slow ventricular rate, thereby improving ventricular function and symptoms.
- \* A combination of digoxin and beta-blockade appears superior to either agent alone.
- \* In sinus rhythm, digoxin is recommended to improve the clinical status of patients with persisting heart failure symptoms due to left ventricular systolic dysfunction despite ACE inhibitor and diuretic treatment.

**DIGOXIN:**

The usual daily dose of oral digoxin is 0.25 - 0.375mg if serum creatinine is in the normal range (in the elderly 0.625-0.125 mg, occasionally 0.25 mg). No loading dose is needed when treating chronic conditions.

**VASODILATOR AGENTS IN CHF:**

- \* There is no specific role for vasodilators in the treatment of heart failure, although they may be used as adjunctive therapy for angina or concomitant hypertension.
- \* In case of intolerance to ACE inhibitors ARBs are preferred to the combination of hydralazine and nitrates.

**CALCIUM ANTAGONISTS:**

In general, calcium antagonists are not recommended

for the treatment of heart failure due to systolic dysfunction. Diltiazem and verapamil type calcium antagonists in particular are not recommended in heart failure due to systolic dysfunction, and are contraindicated in addition to beta-blockade. As long-term safety data with felodipine and amlodipine indicate a neutral effect on survival, they may be considered as additional therapy for concomitant arterial hypertension or angina keeping a watch on any deterioration.

#### POSITIVE INOTROPIC THERAPY:

- \* Inotropic agents are commonly used to limit severe episodes of heart failure or as a bridge to heart transplantation in end-stage heart failure. However, treatment related complications may occur and their effect on prognosis is not well recognized.
- \* Repeated or prolonged treatment with oral inotropic agents increases mortality.
- \* Currently, insufficient data are available to recommend dopaminergic agents for heart failure treatment.

#### POSITIVE INOTROPIC AGENTS:

Intravenous inotropic therapy is used to correct the hemodynamic disturbances in severe episodes of worsening heart failure. The agent most often used in this setting is dobutamine. However, its use has been insufficiently documented in controlled trials and the effects of dobutamine on prognosis are not well characterized. Problems related to the use of dobutamine are tachyphylaxis, increase in heart rate and often an inadequate vasodilatory effect.

#### ANTITHROMBOTIC AGENTS:

There is little evidence to show that antithrombotic therapy modifies the risk of death, or vascular events in patients with heart failure other than in the setting of atrial fibrillation when anticoagulation is firmly indicated, and in prior myocardial infarction when either aspirin or oral anticoagulants are used for secondary prophylaxis.

#### ANTIARRHYTHMIC AGENTS:

In general, there is no indication for the use of antiarrhythmic agents in heart failure. Indications for

antiarrhythmic drug therapy in the individual patient include atrial fibrillation (rarely flutter) and non-sustained or sustained ventricular tachycardia.

#### HEART TRANSPLANTATION, VENTRICULAR ASSIST DEVICES AND ARTIFICIAL HEART:

##### HEART TRANSPLANTATION:

Heart transplantation is an accepted mode of treatment for end-stage heart failure. Although controlled trials have never been conducted, it is considered to significantly increase survival, exercise capacity, return to work-and quality of life compared to conventional treatment, provided proper selection criteria are applied.

##### VENTRICULAR ASSIST DEVICES AND ARTIFICIAL HEART:

Current indications for ventricular assist devices and artificial heart include bridging to transplantation, transient myocarditis and in some cases for permanent hemodynamic support.

#### CHOICE AND TIMING OF PHARMACOLOGICAL THERAPY:

This is a crucial and basic issue. The choice of pharmacological therapy in the various stages of heart

**TABLE 10**  
**CHRONIC HEART FAILURE - CHOICE OF**  
**PHARMACOLOGICAL THERAPY<sup>(1)</sup>**

LV systolic dysfunction	ACE Inhibitor	Diuretic	Beta-blocker	Aldosterone antagonists
Asymptomatic LV dysfunction	Indicated	Non indicated	Post MI	not indicated
Symptomatic HF (NYHA II)	Indicated	Non if fluid retention	indicated	not indicated
Worsening HF (NYHA II-IV)	Indicated.	Combination of diuretics	indicated (under specialist care)	Indicated
End-stage HF (NYHA IV)	Indicated,	combination of diuretics	indicated (under specialist care)	Indicated

failure due to systolic dysfunction is displayed in tables. Before initiating therapy, the correct diagnosis needs to be established

**TABLE - 11**  
**CHRONIC HEART FAILURE- CHOICE OF PHARMACOLOGICAL THERAPY<sup>(1)</sup>**

LV systolic dysfunction	Angiotensin II receptor antagonists	Vasodilator Cardiac glycosides	Hydralazine/Isosorbide dinitrate	Potassium sparing diuretic
Asymptomatic L.V. dysfunction Symptomatic HF (NYHA II)	Not indicated if ACE inhibitors are not tolerated and not On beta-blockade	With atrial fibrillation (a) When atrial fibrillation (b) when improved From more severe HF In sinus rhythm	Not Indicated If ACE inhibitors and angiotensin II antagonists are not tolerated	Not indicated if persisting hyperkalemia
Worsening HF (NYHA III/IV)	If ACE inhibitors are Not tolerated and not On beta-blockade	Indicated	If ACE inhibitors and angiotensin II antagonists are not tolerated	If persisting hypokalemia
End-stage HF (NYHA IV)	if ACE inhibitors are Not tolerated and not On beta-blockade	Indicated	If ACE inhibitors and angiotensin II antagonist & are not tolerated	If persisting hypokalaemia

HF=heart failure; LV=left ventricular;

**TABLE 12**

**MOST FREQUENT CAUSES OF WORSENING HEART FAILURE<sup>(1)</sup>**

**Non-cardiac**

- \* Non-compliance to the prescribed regimen
- \* Recently co-prescribed drugs (antiarrhythmics other than amiodarone, beta-blockers, non-steroidal anti-inflammatory drugs, verapamil, diltiazem)
- \* Alcohol abuse Renal dysfunction (excessive use of diuretics)
- \* Infections
- \* Pulmonary embolism
- \* Thyroid dysfunction
- \* Anaemia

**Cardiac**

- \* Atrial fibrillation
- \* Other supraventricular or ventricular arrhythmias
- \* Bradycardia
- \* Appearance or worsening of mitral or tricuspid regurgitation
- \* Myocardial ischaemia (frequently symptomless), including myocardial infarction
- \* Excessive preload reduction (diuretics & ACE inhibitors)

MI= myocardial infarction

**CONCLUSION**

Chronic Heart Failure is a common and major medical condition. The patient population of the spectrum of chronic heart failure has increased over the past few decades and it is expected to rise in the coming decades. This is primarily due to improved survival after myocardial infarction & pharmacological & mechanical advances.

Quality of life has been the focus of chronic heart failure treatment over the past two decades beside prolonged survival primarily due to the better understanding of patho-physiological process involved & the advent of newer Pharmacological agents, interventional procedures & mechanical devices. More progress is expected in the years to come & further improvement in quality of life will remain the focus of research.



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