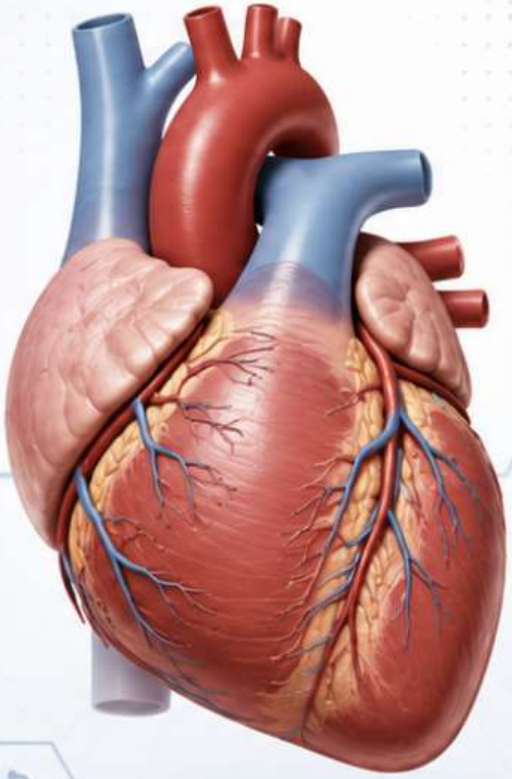
Congestive Heart Failure in Primary Care



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Outline

1. **Define** heart failure and classify its stages and phenotypes according to current guidelines.
2. **Recognise** the clinical presentation of heart failure and apply an evidence-based diagnostic approach in primary care.
3. **Initiate and optimise** guideline-directed medical therapy for HFrEF and understand the management principles of HFpEF.
4. **Identify** patients who require specialist referral for advanced therapies, device therapy, or multidisciplinary heart failure care.
5. **Implement** strategies for heart failure prevention, long-term monitoring, and management of common comorbidities in primary care.

Clinical Scenario

- Mr Greg is a 70-year-old retired man with a history of long-standing hypertension, obesity, OSA, COPD and permanent atrial fibrillation. Over the past few years, he has experienced recurrent hospital admissions for worsening heart failure and is currently functioning at **NYHA Class IV.** Review of his previous echocardiograms revealed that as early as **2010,** he had **preserved left ventricular ejection fraction, mild diastolic dysfunction (impaired relaxation),** and **left atrial enlargement,** while remaining asymptomatic and in sinus rhythm. Seven years later, he developed **symptomatic heart failure with preserved ejection fraction (HFpEF),** followed by **permanent atrial fibrillation** and **pulmonary hypertension.** His most recent echocardiogram demonstrates preserved systolic function but **severe diastolic dysfunction,** illustrating the gradual progression from **Stage B (Pre-HF)** to advanced symptomatic HFpEF.

Definition of Heart Failure

Heart failure is a **clinical syndrome** caused by structural or functional cardiac abnormalities resulting in:

- **Elevated intracardiac filling pressures**
- **Inadequate cardiac output**
- **Or both,** at rest or during exercise

Elevated filling pressures may be identified by:

- Natriuretic peptide levels
- Echocardiography
- Cardiac catheterisation

1. COMMON SYMPTOMS

Common Symptoms

- Breathlessness
- Reduced exercise tolerance
- Fatigue
- Orthopnoea
- Ankle swelling

Less Common Symptoms

- Nocturnal cough
- Wheeze
- Abdominal bloating
- Loss of appetite
- Dizziness
- Syncope

Clinical Signs

- Raised jugular venous pressure
- Pulmonary crackles
- Peripheral oedema
- Tachycardia
- Third heart sound (S3)
- Laterally displaced apex beat
- Weight gain or cachexia
- Oliguria

2. RISK FACTORS AND ASSOCIATED CONDITIONS

- Previous myocardial infarction
- Coronary artery disease
- Diabetes mellitus
- Chronic kidney disease
- Alcohol misuse
- Cardiotoxic chemotherapy
- Family history of cardiomyopathy
- Family history of sudden cardiac death

3. ACUTE AND CHRONIC PRESENTATIONS

Chronic Heart Failure

- Established diagnosis of heart failure
- Gradual onset or progression of symptoms

Decompensated Heart Failure

Characterised by worsening:

- Congestion
- Symptom burden
- Cardiac output

Acute Heart Failure

May require hospital admission because of:

- Significant congestion
- Need for intravenous diuretics
- Vasodilator or inotropic support
- High symptom burden
- Haemodynamic compromise
- Risk of clinical deterioration

Primary Care Assessment

The initial assessment should focus on:

- Heart failure symptoms and functional status
- Symptoms suggestive of myocardial ischaemia or angina
- Recent viral illness
- Neoplastic or endocrine disease
- Constitutional symptoms
- Past medical history
- Substance use history
- Family history of heart disease or sudden cardiac death
- Recent physical or emotional stressors

Clinical Priorities

- Assess symptom severity
- Identify the underlying cause
- Initiate appropriate investigations
- Commence GDMT promptly
- Arrange cardiology referral when indicated

1. CLASSIFICATION OF HEART FAILURE ACCORDING TO LEFT VENTRICULAR EJECTION FRACTION[11]

Heart failure with reduced ejection fraction

- Symptoms with or without signs of heart failure
- LVEF ≤40%

Heart failure with mildly reduced ejection fraction

- Symptoms with or without signs of heart failure
- LVEF 41–49%
- The diagnosis of other structural heart disease, such as increased left atrial size or left ventricular hypertrophy, or echocardiographic evidence of impaired left ventricular filling, makes this diagnosis more likely

Heart failure with preserved ejection fraction

- Symptoms with or without signs of heart failure
- LVEF ≥50%
- Objective evidence of cardiac structural and/or functional abnormalities consistent with the presence of left ventricular diastolic dysfunction and raised left ventricular filling pressures, including raised levels of natriuretic peptides
- A greater number of abnormalities signifies a higher likelihood of heart failure with preserved ejection fraction

Abbreviation: LVEF = left ventricular ejection fraction.

2. NEW YORK HEART ASSOCIATION FUNCTIONAL CLASSIFICATION BASED ON SEVERITY OF HEART FAILURE SYMPTOMS AND PHYSICAL ACTIVITY[1,2]

Class I

- No limitation of physical activity
- Ordinary physical activity does not cause undue breathlessness, fatigue or palpitations

Class II

- Slight limitation of physical activity
- Comfortable at rest but ordinary physical activity results in disproportionate breathlessness, fatigue or palpitations

Class III

- Marked limitation of physical activity, but remains comfortable at rest
- Less than ordinary activity is enough to result in disproportionate breathlessness, fatigue or palpitations

Class IV

- Unable to continue any physical activity without discomfort
- Symptoms at rest may be present
- If physical activity is undertaken, discomfort is increased

CAUSES OF HFrEF

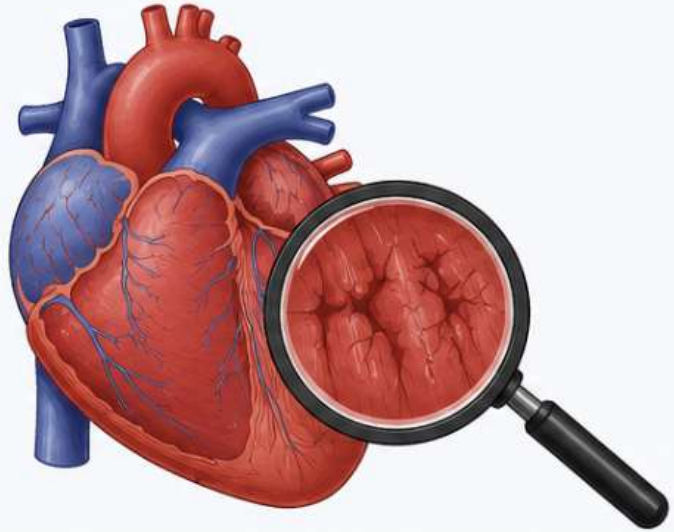
HFrEF has a diverse range of underlying causes, making identification of the aetiology essential for **appropriate treatment and prognostication.**

The most common pathological substrate is **myocardial dysfunction**, which is typically systolic, although many patients also have concomitant diastolic dysfunction.

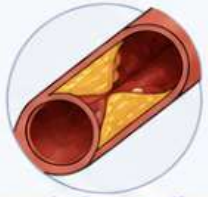
Disease involving the:

- Cardiac valves
- Pericardium
- Endocardium
- Cardiac rhythm and conduction system

may also contribute to HFrEF.



COMMON CAUSES



Ischaemic heart disease

Coronary artery disease leading to reduced blood flow and myocardial dysfunction.

Myocardial infarction

Irreversible myocardial injury and scarring resulting in systolic dysfunction.

Hypertension

Chronic pressure overload leading to left ventricular hypertrophy and dysfunction.

Valvular heart disease

Valvular abnormalities causing volume or pressure overload and ventricular dysfunction.

COMMON CAUSES OF ACUTE DECOMPENSATION

- Myocardial ischaemia or infarction
- Arrhythmias
- Infection
- Anaemia
- Thyroid disease
- Acute hypertension or Takotsubo cardiomyopathy
- Acute kidney injury
- Mechanical complications (e.g. acute valvular regurgitation or ventricular septal rupture)
- Aggravating medications
- Non-adherence to treatment

KEY MESSAGE: Even patients with mild symptoms remain at significant risk of hospitalisation and mortality. Early diagnosis, optimisation of GDMT, and regular follow-up are fundamental components of heart failure management in primary care.

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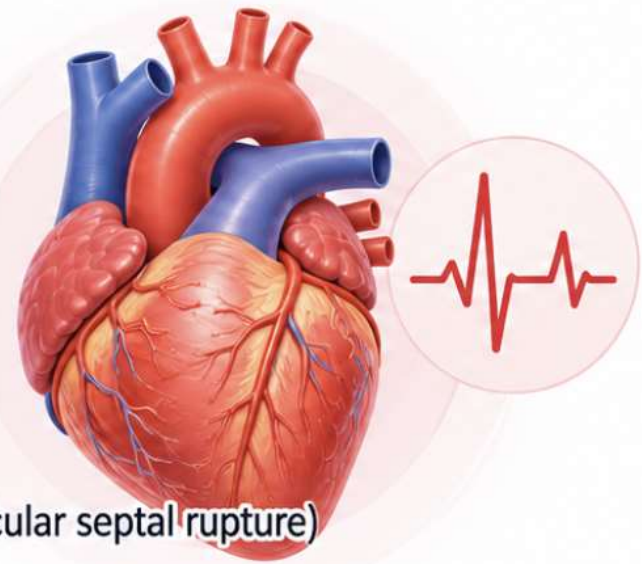

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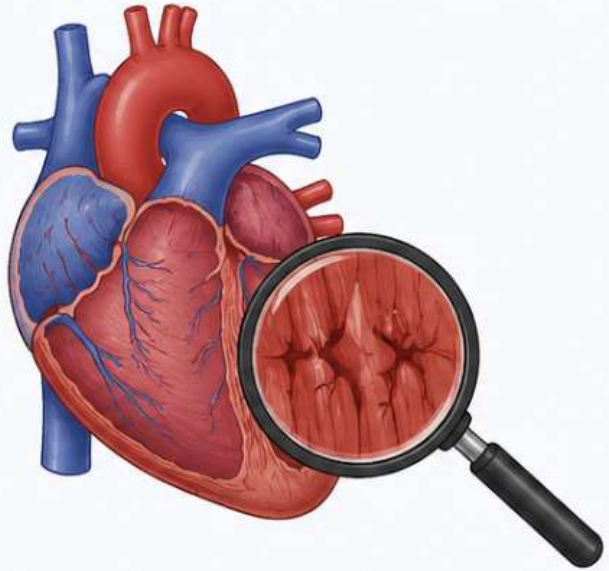

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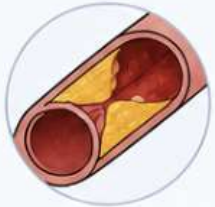

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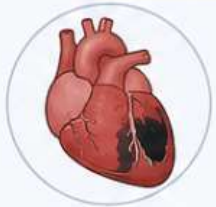


Myocardial infarction

Irreversible myocardial injury and scarring resulting in systolic dysfunction.

Hypertension

Chronic pressure overload leading to left ventricular hypertrophy and dysfunction.

Valvular heart disease

Valvular abnormalities causing volume or pressure overload and ventricular dysfunction.

KEY MESSAGE: Identifying the underlying cause of HFrEF is fundamental to guiding investigations, risk stratification, treatment selection, and prognosis.

CAUSES	PRESENTATIONS AND ASSOCIATED FEATURES	SPECIFIC INVESTIGATIONS TO CONSIDER
 **Coronary artery disease**	• Myocardial infarction • Angina • Arrhythmias (e.g. ventricular tachycardia) • Complete heart block	• Glycated haemoglobin levels • Lipid levels • Imaging stress test (stress echocardiogram, myocardial perfusion scan) • Referral to cardiology for further evaluation
 **Hypertension**	• Malignant hypertension • Acute pulmonary oedema	• 24-hour ambulatory blood pressure • Renal artery imaging • Plasma metanephrines • Renin and aldosterone levels
 **Valvular disease**	• Primary valve disease • Secondary valve disease (e.g. functional mitral regurgitation or tricuspid regurgitation)	• Echocardiography (transthoracic, transoesophageal)
 **Arrhythmias and pacing**	• Atrial tachyarrhythmias • Ventricular arrhythmias • Right ventricular pacing	• Extended rhythm monitoring (e.g. Holter or HeartBug monitors) • Device check
 **Cardiomyopathies**	• Dilated, hypertrophic, restrictive, arrhythmogenic or peripartum presentations • Stress-related • Takotsubo syndrome • Toxins: alcohol, cocaine, iron, copper	• Depends on aetiology: referral to cardiology for further investigation; toxicology; liver function tests • ECG features: high or low voltage conduction, repolarisation changes, long QTc
 **Congenital heart disease**	• Congenitally corrected or repaired transposition of the great arteries • Shunt lesions • Repaired Tetralogy of Fallot • Ebstein's anomaly	• Referral to cardiology for further investigation
 **Infective**	• Viral myocarditis • Chagas disease • HIV infection	• Serology • Referral to cardiology for further investigation
 **Drug-induced**	• Anthracyclines • Trastuzumab • Vascular endothelial growth factor inhibitors • Immune checkpoint inhibitors • Proteasome inhibitors • Rapidly accelerated fibrosarcoma/mitogen-activated protein-kinase kinase inhibitors	• Referral to cardiology for further investigation

CAUSES	PRESENTATIONS AND ASSOCIATED FEATURES	SPECIFIC INVESTIGATIONS TO CONSIDER
 **Infiltrative**	• Amyloid • Sarcoidosis • Neoplastic	• Serum electrophoresis • Serum free light chains • Bence Jones proteins • Bone scintigraphy • Serum ACE (sarcoidosis) • Referral to cardiology for further investigation
 **Storage disorders**	• Haemochromatosis • Fabry disease • Glycogen storage diseases	• Iron studies • Alpha-galactosidase A • Genetic testing • Referral to cardiology for further investigation
 **Endomyocardial disease**	• Radiotherapy • Endomyocardial fibrosis or eosinophilia • Carcinoid	• 24-hour urine 5-hydroxyindoleacetic acid • Referral to cardiology for further investigation
 **Pericardial disease**	• Calcification • Infiltrative	• Chest CT • Referral to cardiology for further investigation
 **Metabolic**	• Thyroid or endocrine disease • Nutritional disease (thiamine, vitamin B1, selenium deficiencies) • Autoimmune disease	• Thyroid function tests • Plasma metanephrines • Renin and aldosterone • Cortisol • Specific plasma nutrients • Antinuclear antibodies and antineutrophil cytoplasmic antibodies • Rheumatology review
 **Neuromuscular disease**	• Friedreich's ataxia • Muscular dystrophy	• Nerve conduction studies • Genetic tests • Creatine kinase levels • Referral to neurology

INVESTIGATIONS FOR SUSPECTED HFrEF

INITIAL PRIMARY CARE WORKUP

Laboratory Investigations

- Full blood count (FBC)
- Urea, electrolytes and creatinine (UEC)
- Liver function tests (LFTs)
- Thyroid function tests (TFTs)
- B-type natriuretic peptide (BNP) or N-terminal pro-BNP (NT-proBNP)

Clinical Pearl: In the non-acute setting, heart failure is unlikely if:

- "BNP <35 pg/mL, or"
- "NT-proBNP ≤125 pg/mL"

SPECIALIST CARDIOLOGY INVESTIGATIONS

Further investigations are guided by the suspected aetiology and disease severity and may include:

- CT coronary angiography
- Cardiac magnetic resonance imaging (MRI)
- Invasive coronary angiography
- Left and right heart catheterisation
- Cardiopulmonary exercise testing

Key Message: BNP/NT-proBNP testing, ECG, chest X-ray, and transthoracic echocardiography form the cornerstone of the initial primary care evaluation of suspected HFrEF, with specialist investigations directed by the underlying cause and severity of disease.

INITIAL INVESTIGATIONS

- 12-lead ECG
- Chest X-ray
- Transthoracic echocardiography

ECG FINDINGS SUGGESTIVE OF HEART FAILURE

- Atrial fibrillation
- ST-segment abnormalities
- Pathological Q waves
- Left ventricular hypertrophy
- Broad QRS complexes

CHEST X-RAY

May demonstrate:

- Pulmonary oedema
- Cardiomegaly
- Pulmonary congestion

Important: A normal chest X-ray does not exclude heart failure.

ADDITIONAL INVESTIGATIONS

- Twenty-four-hour ambulatory blood pressure monitoring may be considered when hypertension is suspected.

Indications for Cardiology Referral

Refer All Patients With:

- Suspected new-onset heart failure (where possible)
- Persistently reduced LVEF ≤30% despite guideline-directed medical therapy (GDMT)
- Uncertain aetiology or contributing cardiac pathology
- Chest pain or suspected myocardial ischaemia

High-Risk Features Requiring Specialist Review

- Persistent NYHA Class III–IV symptoms
- Previous inotrope use
- Elevated serum creatinine
- Atrial fibrillation
- Palpitations or syncope suspicious for ventricular arrhythmia
- Recurrent implantable cardioverter-defibrillator (ICD) shocks
- Multiple heart failure hospitalisations
- Clinical deterioration despite treatment

Key Message: Early cardiology referral facilitates accurate diagnosis, optimisation of GDMT, timely consideration of device therapy, and improved long-term outcomes in patients with HFrEF.

THE HEART FAILURE TRAJECTORY

Heart failure exists along a clinical continuum:

AT RISK OF HEART FAILURE
Patients with risk factors but no structural heart disease or symptoms.

PRE-HEART FAILURE
Structural heart changes or abnormal function but no symptoms.

SYMPTOMATIC HEART FAILURE
Development of symptoms (e.g. dyspnoea, fatigue, fluid retention) that impact quality of life.

ADVANCED HEART FAILURE
Severe symptoms at rest or with minimal exertion; frequent hospitalisations.

Early identification provides an opportunity to prevent progression to clinically significant disease.

CLINICAL COURSE AND PROGNOSIS

The trajectory of heart failure varies according to its underlying cause.

POTENTIAL FOR RECOVERY

Patients with the following conditions may demonstrate substantial improvement or recovery:

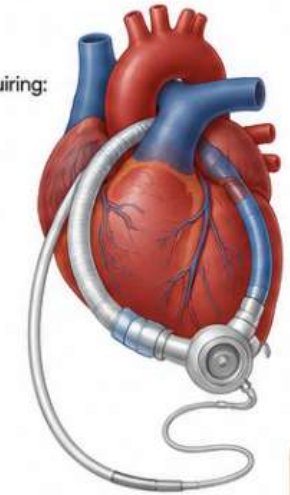
- Viral myocarditis
- Stress (Takotsubo) cardiomyopathy
- Peripartum cardiomyopathy
- Tachycardia-induced cardiomyopathy

Some patients may experience significant improvement or normalisation of LVEF following optimal GDMT and device therapy.

PROGRESSIVE DISEASE

Others may develop progressive heart failure requiring:

- Advanced heart failure therapies
- Left ventricular assist devices (LVADs)
- Cardiac transplantation



PROGNOSIS

Despite advances in therapy, heart failure remains associated with significant mortality:

Approximately **20%** mortality at one year

Approximately **53%** mortality at five years

KEY MESSAGE: Heart failure is a dynamic disease. Early diagnosis, optimisation of GDMT, and longitudinal primary care management are essential to prevent progression and improve long-term outcomes.

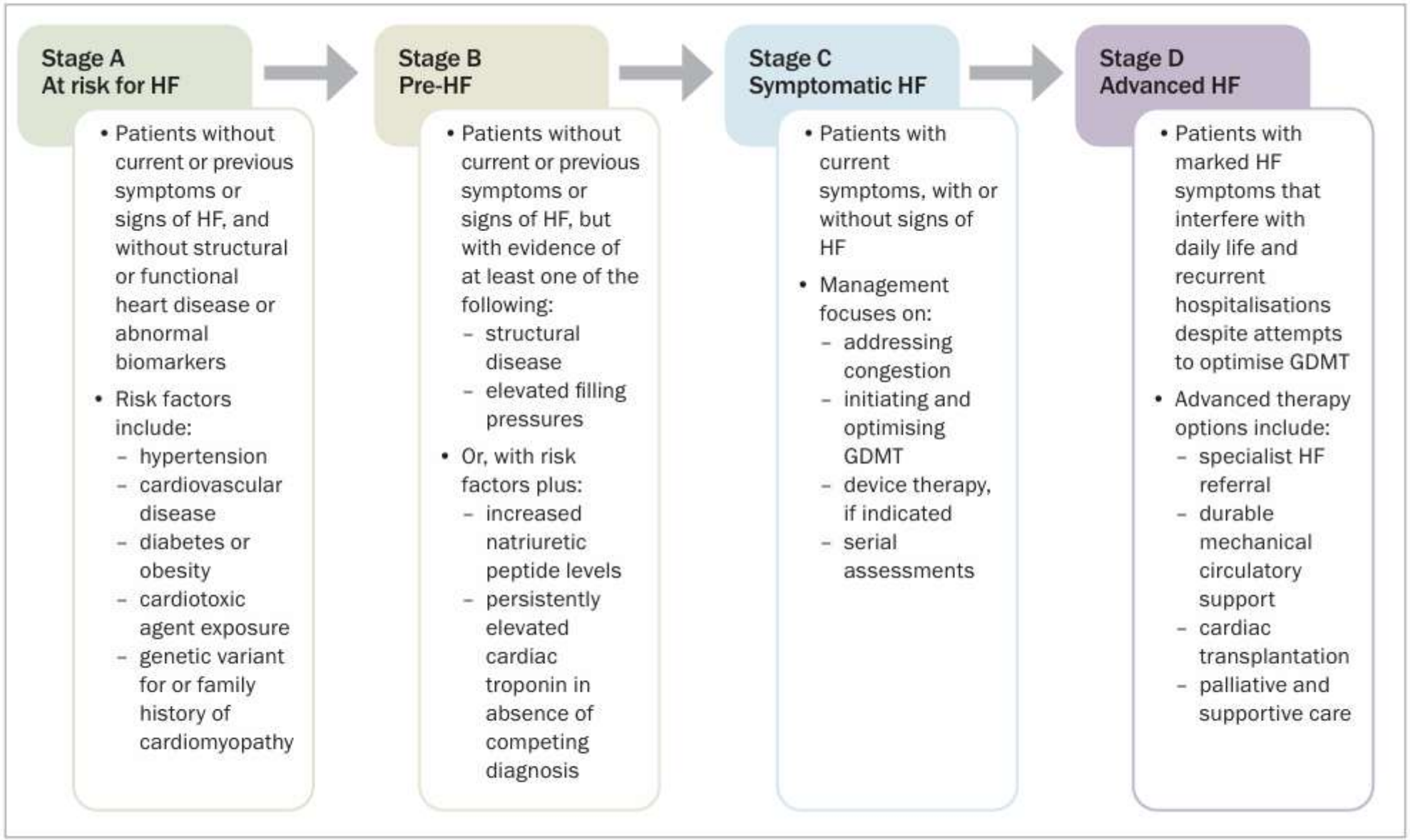


Figure. American College of Cardiology and American Heart Association stages of heart failure.[2]

Abbreviations: GDMT = guideline-directed medical therapy; HF = heart failure.

Prevention of Heart Failure

Management of Modifiable Risk Factors

For patients at risk of heart failure, primary prevention is essential to prevent disease progression.

Key strategies include:

- Optimal blood pressure control
- Good glycaemic control in patients with diabetes
- Consider SGLT2 inhibitors in patients with diabetes and high cardiovascular risk
- Regular physical activity
- Achieving and maintaining a healthy weight
- Smoking cessation
- Adherence to healthy dietary patterns, including:
  - Wholegrain diets
  - Plant-based diets
  - Mediterranean diets

Clinical Pearl: Hypertension is one of the most important modifiable risk factors for developing symptomatic heart failure.

GOALS OF GUIDELINE-DIRECTED MEDICAL THERAPY (GDMT)

Beyond relieving congestion, the aims of treatment are to:

- Reduce mortality
- Prevent recurrent heart failure hospitalisations
- Improve symptoms and functional capacity
- Improve quality of life
- Slow disease progression

TREAT THE UNDERLYING CAUSE

Management should include identifying and treating reversible causes when present, including:

- Atrial fibrillation and tachyarrhythmias
- Coronary artery disease requiring revascularisation
- Specific cardiomyopathies (e.g. transthyretin cardiac amyloidosis)

THE FOUR PILLARS OF HFrEF THERAPY

Guideline-directed medical therapy consists of four foundational therapies:

1. **ARNI (preferred) or ACE inhibitor/ARB**

2. **Evidence-based Beta Blocker**

3. **Mineralocorticoid Receptor Antagonist (MRA)**

4. **SGLT2 Inhibitor**

TREATMENT PRINCIPLES

- Initiate all four therapies as early as possible.
- Rapid up-titration is preferred when tolerated.
- Simultaneous initiation is favoured over traditional stepwise escalation.
- Continue optimisation to maximally tolerated doses.

Clinical Pearl: SGLT2 inhibitors improve outcomes in HFrEF regardless of diabetes status.

MEDICATIONS TO AVOID IN HFrEF

Avoid the following medications unless specifically recommended by a cardiologist:

- Verapamil
- Diltiazem
- Thiazolidinediones (glitazones)
- Saxagliptin
- Alogliptin
- NSAIDs
- Flecainide

MEDICATIONS THAT MAY WORSEN HEART FAILURE

Use with caution:

- Tricyclic antidepressants
- Corticosteroids
- Tyrosine kinase inhibitors
- Clozapine
- Minoxidil

KEY MESSAGE: Early initiation of the four pillars of GDMT, alongside aggressive management of modifiable risk factors and treatment of reversible causes, remains the cornerstone of preventing progression and improving survival in HFrEF.

OPTIMISING PHARMACOTHERAPY IN HFrEF

Goals of Treatment

- Initiate and rapidly optimise guideline-directed medical therapy (GDMT).
- Arrange early post-discharge assessment and close follow-up.
- Commence more than one therapy simultaneously when appropriate.
- Optimise volume status to improve symptoms.
- Address clinical, psychosocial and financial barriers to treatment adherence.

Practical Approach to GDMT

Treatment should be individualised according to:

Volume status	Comorbidities	Renal function	Electrolyte stability	Heart rate	Blood pressure

CLINICAL PEARL: It is not necessary to achieve target doses of one medication class before commencing another.

KEY TAKE-HOME POINTS

- GDMT improves survival, reduces hospitalisations, and enhances quality of life.
- Early initiation and rapid up-titration are essential.
- Treat the underlying cause and manage modifiable risk factors.
- Avoid medications that may worsen heart failure.
- Individualise therapy based on patient characteristics and monitor regularly.

Initiating the Four Pillars

1 ARNI (preferred), ACE inhibitor or ARB

- Start with a low dose and up-titrate as tolerated.

2 Evidence-based beta blocker

- Bisoprolol
- Carvedilol
- Metoprolol succinate
- Nebivolol

3 Mineralocorticoid receptor antagonist

- Spironolactone
- Eplerenone

4 SGLT2 inhibitor

- Dapagliflozin or Empagliflozin

Treatment Principles

Initiate therapies
as early as possible.

Rapid up-titration
is recommended
when tolerated.

Follow-up
every 1–2 weeks
during optimisation.

Once stable,
review every 3–6 months.

Key Message: Patients whose LVEF improves to >40% should continue GDMT indefinitely.

LVEF >40%
Continue GDMT
indefinitely

Management of Congestion

Fluid Overload Present

- Commence loop diuretics (e.g. furosemide).
- Review every 1–2 weeks to assess:
  - Symptoms
  - Weight
  - Volume status
  - Renal function
  - Electrolytes

If congestion persists:

- Consider adding a thiazide diuretic (e.g. hydrochlorothiazide) when appropriate.
- Failure of oral diuretic therapy may require hospital referral for intravenous treatment.

> **Important:** GDMT can be commenced before complete euvolaemia has been achieved.

Hydralazine and Isosorbide Dinitrate

May be considered in patients with:

- LVEF ≤35%, or
- LVEF <45% with a dilated left ventricle
- Persistent NYHA Class III–IV symptoms despite GDMT

Emerging Therapies

Digoxin

- Emerging evidence suggests reduced mortality and heart failure hospitalisation in selected patients.
- Use cautiously in:
  - Elderly patients
  - Females
  - Frail individuals
  - Patients with hypokalaemia
  - Patients in sinus rhythm

Omecamtiv Mecarbil

- Selective cardiac myosin activator.
- May reduce cardiovascular death and heart failure hospitalisation.
- Appears most beneficial in patients with severely reduced LVEF.
- Currently unavailable in Australia.

Key Message: Early initiation of the four pillars of GDMT, aggressive optimisation within the first few weeks, and close longitudinal follow-up are fundamental to improving outcomes in HFrEF.

Additional Pharmacological Options

Ivabradine

Consider in patients with:

- LVEF ≤35%
- Persistent symptoms despite optimal GDMT
- Sinus rhythm
- Resting heart rate >70 bpm despite maximally tolerated beta-blocker therapy

Dosing

- <75 years: 5 mg twice daily
- ≥75 years: 2.5 mg twice daily
- Review heart rate after 2–4 weeks and up-titrate when appropriate.

Vericiguat

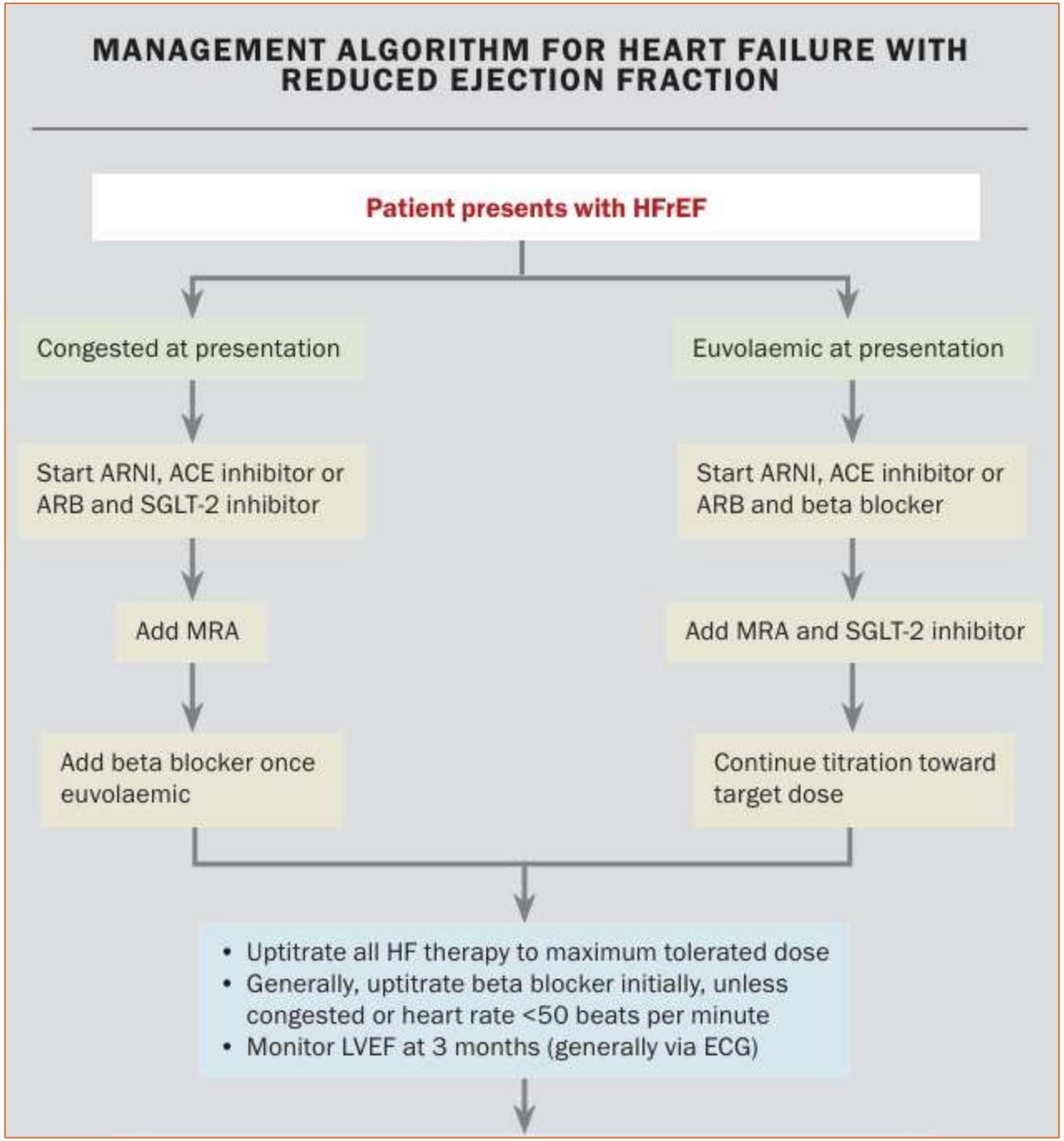
May be considered in patients with:

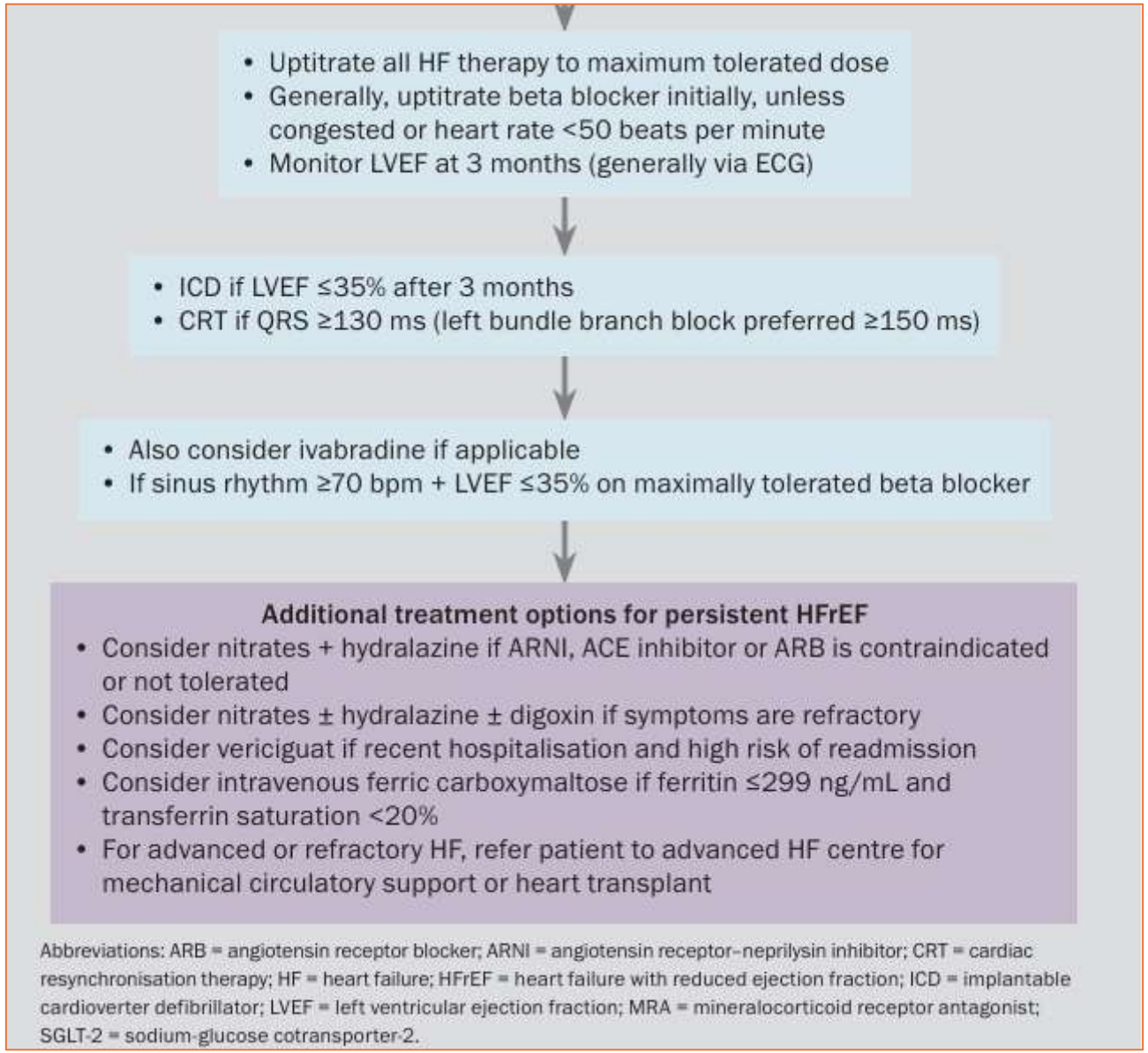
- HFrEF
- Recent heart failure decompensation
- NYHA Class II–IV symptoms despite optimal GDMT

Dosing

- Start: 2.5 mg daily
- Double every two weeks
- Target dose: 10 mg daily

MANAGEMENT ALGORITHM FOR HEART FAILURE WITH REDUCED EJECTION FRACTION




• Uptitrate all HF therapy to maximum tolerated dose
• Generally, uptitrate beta blocker initially, unless congested or heart rate <50 beats per minute
• Monitor LVEF at 3 months (generally via ECG)
• ICD if LVEF ≤35% after 3 months
• CRT if QRS ≥130 ms (left bundle branch block preferred ≥150 ms)
• Also consider ivabradine if applicable
• If sinus rhythm ≥70 bpm + LVEF ≤35% on maximally tolerated beta blocker
Additional treatment options for persistent HFrEF
• Consider nitrates + hydralazine if ARNI, ACE inhibitor or ARB is contraindicated or not tolerated
• Consider nitrates ± hydralazine ± digoxin if symptoms are refractory
• Consider vericiguat if recent hospitalisation and high risk of readmission
• Consider intravenous ferric carboxymaltose if ferritin ≤299 ng/mL and transferrin saturation <20%
• For advanced or refractory HF, refer patient to advanced HF centre for mechanical circulatory support or heart transplant
Abbreviations: ARB = angiotensin receptor blocker; ARNI = angiotensin receptor–neprilysin inhibitor; CRT = cardiac resynchronisation therapy; HF = heart failure; HFrEF = heart failure with reduced ejection fraction; ICD = implantable cardioverter defibrillator; LVEF = left ventricular ejection fraction; MRA = mineralocorticoid receptor antagonist; SGLT-2 = sodium-glucose cotransporter-2.

Precautions and Clinical Considerations

ARNI (Sacubitril/Valsartan)

- Do not commence within **36 hours** of stopping an ACE inhibitor.
- Use with caution in patients with:
  - eGFR <30 mL/min/1.73 m^2
  - Systolic blood pressure <100 mmHg
- Monitor:
  - Blood pressure
  - Renal function
  - Serum potassium

SGLT2 Inhibitors

- Use in type 1 diabetes remains **off-label** because of the risk of diabetic ketoacidosis.
- Counsel patients regarding:
  - Genital mycotic infections
  - Euglycaemic diabetic ketoacidosis
  - Sick-day management
  - Fasting and perioperative medication withholding recommendations
  - Maintaining adequate hydration

Beta Blockers

- Do not initiate during:
  - Acute decompensated heart failure
  - Significant bradyarrhythmias or conduction disease
- Beta blockers may be commenced or recommended once the patient is:
  - Clinically stable
  - Euvolaemic

Ivabradine

- Avoid in patients with:
  - Acute decompensated heart failure
  - Significant conduction disease
  - Bradyarrhythmias
- Appropriate only for patients in:
  - Sinus rhythm
  - Persistent resting heart rate >70 bpm despite maximally tolerated beta-blocker therapy

Key Message: Careful patient selection, close monitoring of renal function, electrolytes, blood pressure, and volume status are essential when initiating and optimising GDMT in patients with HFrEF.

Monitoring and Managing Complications of GDMT

Common Adverse Effects

- Symptomatic hypotension
- Bradycardia
- Dizziness
- Hypovolaemia

Managing Symptomatic Hypotension

Hypotension occurs more commonly with ARNIs.

If systolic blood pressure is <100 mmHg, consider:

- Reducing the dose of sacubitril/valsartan
- Switching to an ACE inhibitor or ARB if required
- Reducing loop diuretic doses if the patient is not clinically congested
- Reassessing volume status and other contributing medications

Clinical Pearl:
Persistent hypotension, poor medication tolerance, or worsening symptoms should prompt specialist cardiology review.

Monitoring During GDMT Optimisation

At Follow-up Visits

Assess:

- Symptoms of congestion
- Blood pressure
- Heart rate
- Volume status
- Medication tolerance

Laboratory Monitoring

Monitor:

- Serum potassium
- Renal function
- Electrolytes

Timing

- Check blood pressure, renal function and electrolytes within 1–2 weeks of:
  - Initiating an ARNI, ACE inhibitor or ARB
  - Any dose escalation
- Ongoing monitoring should be individualised according to renal function and clinical stability.

Aim: Optimise GDMT safely to improve symptoms, reduce hospitalisations, and improve survival.

Drug name	Starting dose	Target dose
ACE inhibitors		
Captopril	6.25 mg tds	50 mg tds
Enalapril	2.5 mg bd	10–20 mg bd
Lisinopril	2.5–5 mg od	25–35 mg od
Ramipril	2.5 mg bd	5 mg bd
Trandolapril	0.5 mg od	4 mg od
Angiotensin receptor–neprilysin inhibitor		
Sacubitril/valsartan	24/26 mg bd	97/103 mg bd
Beta blockers		
Bisoprolol	1.25 mg od	10 mg od
Carvedilol	3.125 mg bd	25–50 mg bd
Metoprolol (controlled-release/extended-release)	23.75 mg od	190 mg od
Nebivolol	1.25 mg od	10 mg od
Mineralocorticoid receptor antagonists		
Eplerenone	25 mg od	50 mg od
Spironolactone	25 mg od	50 mg od

Sodium-glucose cotransporter-2 inhibitors		
Dapagliflozin	10 mg od	10 mg od
Empagliflozin	10 mg od	10 mg od
Angiotensin receptor blockers		
Candesartan	4 mg od	32 mg od
Losartan	50 mg od	150 mg od
Valsartan	40 mg bd	160 mg bd
Drugs in other classes		
Hydralazine	37.5 mg tds	75 mg tds
Isosorbide dinitrate	20 mg tds	40 mg tds
Ivabradine	5 mg bd	7.5 mg bd
Vericiguat	2.5 mg od	10 mg od

Assessment of Recovery

- Repeat transthoracic echocardiography should usually be performed:
  - **3–6 months** after achieving target or maximally tolerated GDMT doses.

The Purpose of Repeat Echocardiography

- Assess improvement in LVEF
- Evaluate ventricular remodelling
- Determine eligibility for:
  - Implantable cardioverter-defibrillator (ICD)
  - Cardiac resynchronisation therapy (CRT)
  - Advanced heart failure therapies

Key Message: Close follow-up during GDMT optimisation is essential. Early identification of adverse effects, regular monitoring of renal function and electrolytes, and timely reassessment of ventricular function are fundamental to improving outcomes in HFrEF.

Non-Pharmacological Management

Iron Optimisation

- Iron deficiency is common in patients with HFrEF and contributes to:
  - Reduced exercise capacity
  - Worsening symptoms
  - Impaired quality of life

Benefits of Iron Replacement

- Improves:
  - Heart failure symptoms
  - Exercise capacity
  - Quality of life
- May reduce heart failure hospitalisations.
- No proven mortality benefit has been demonstrated to date.

Screening

Screen all patients with HFrEF every **3–6 months** with:

- Full blood count (FBC)
- Serum ferritin concentration
- Transferrin saturation (TSAT)

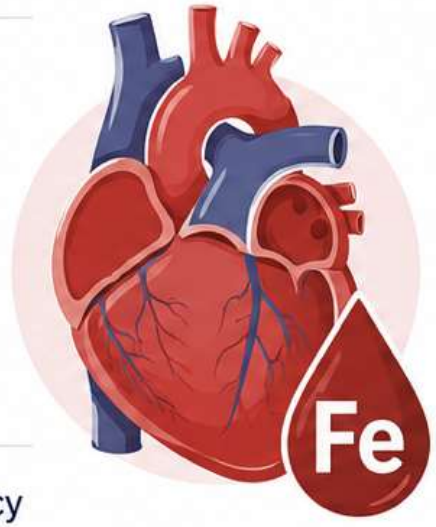
Treatment

- **Intravenous iron replacement** is recommended for symptomatic patients with HFrEF and iron deficiency.

Key Message: Regular screening for iron deficiency should form part of routine HFrEF follow-up, as appropriate iron replacement can significantly improve symptoms, functional capacity, and quality of life.

KEY POINTS

- **Iron** is an **essential micronutrient** for many cellular functions, including both haematopoietic and cellular metabolic processes.
- Iron deficiency is **common** in patients with heart failure and often occurs **independently of anaemia,** and is associated with poor clinical outcomes, including increased mortality.
- Patients with heart failure are considered **iron deficient** with:
  - Serum ferritin **<100 mcg/L**, or
  - Serum ferritin **100–300 mcg/L** combined with transferrin saturation **<20%**.
- Intravenous iron replenishment in patients with heart failure and iron deficiency **improves exercise capacity, symptoms and quality of life.** Recent evidence suggests that intravenous iron replenishment likely also **reduces heart failure hospitalisation** and is a **cost-effective** treatment.
- Oral iron supplementation **does not appear to be effective** in patients with heart failure and iron deficiency.



DIAGNOSTIC CRITERIA FOR HFpEF

All three are required:

1. **LVEF ≥50%**
2. **Elevated natriuretic peptides**
   - BNP or NT-proBNP
3. **Evidence of structural or functional cardiac abnormalities**
   - Echocardiographic findings consistent with elevated filling pressures or diastolic dysfunction.

Important: Up to 15% of patients with HFpEF may have normal BNP or NT-proBNP levels at rest.

ECHOCARDIOGRAPHIC FINDINGS SUGGESTIVE OF HFpEF

Consider HFpEF when there is:

- Preserved LVEF (≥50%)
- Left atrial enlargement
- Elevated E/e' ratio (>9)
- Increased left ventricular mass index
- Evidence of diastolic dysfunction
- Normal mitral valve function

Left atrial enlargement with preserved ejection fraction should particularly raise suspicion for HFpEF.

LIMITATIONS OF RESTING INVESTIGATIONS

- BNP/NT-proBNP may be normal at rest.
- Resting echocardiography has limited sensitivity.
- Symptoms frequently occur only during exercise.

Patients with persistent unexplained dyspnoea may require:

- Exercise stress echocardiography
- Diastolic stress testing
- Invasive haemodynamic assessment

INTERPRETATION OF H_2FPEF SCORE

Score	Interpretation
0–1	HFpEF unlikely
2–5	Intermediate probability
≥6	HFpEF highly likely

CLINICAL USE

The H_2FPEF score:

- Improves diagnostic accuracy.
- Identifies patients requiring further testing.
- Helps determine the need for:
  - Exercise stress echocardiography
  - Diastolic stress testing
  - Invasive haemodynamic assessment.

H_2FPEF SCORE

Variable	Criteria	Points
Heavy	BMI >30 kg/m²	**2**
Hypertensive	≥2 antihypertensive medications	**1**
Atrial Fibrillation	Paroxysmal or persistent AF	**3**
Pulmonary Hypertension	PASP >35 mmHg	**1**
Elderly	Age >60 years	**1**
Filling Pressure	E/e' >9	**1**

Maximum score = 9

Box – Principles of management in patients with heart failure with preserved ejection fraction

Avoid tachycardia

For patients with atrial fibrillation, use digoxin or beta blockers

Blood pressure control

ACE inhibitors, angiotensin receptor antagonists (sartans) or mineralocorticoid receptor antagonists may be of the greatest benefit

Comorbidities

Optimise cardiac and noncardiac conditions, particularly atrial fibrillation, obesity and diabetes mellitus

Diuretics

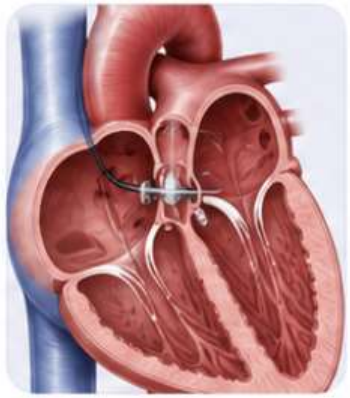
Use loop diuretics to relieve congestion, with close monitoring of renal function

Exercise training

Improves exercise capacity and quality of life

Devices

The lack of benefit from drug therapies is likely due to the myriad of pathways activated in HFpEF, with the only definite uniting pathology being elevated left ventricular filling pressures. Consequently, devices targeting this pathway have been tested in trials over the past few years.



Interatrial septal device

A transcatheter interatrial left to right shunt has been shown to offset the high left atrium pressure that develops in HFpEF.[64–66] One-year observational outcomes have shown the safety of this device, with increased exercise tolerance, quality of life, and a trend toward decreased hospitalisations and heart failure symptoms.[67,68] A trial is under way.[69]

Implantable pulmonary arterial pressure monitoring

Continuous monitoring of haemodynamics through an implanted device allows for assessment of diastolic left ventricular pressures, and early appropriate administration of diuretics. The CHAMPION trial demonstrated reduced hospitalisations with this device by alerting physicians to high pulmonary pressures and directing subsequent changes to medicines.[70,71] This device is available for clinical use, however it is currently limited by availability and cost.

SGLT2 Inhibitors in HFpEF

- **Foundational therapy for HFpEF,** regardless of diabetes status.
- **Reduce heart failure hospitalisations** and improve quality of life.
- **Standard dose:** Empagliflozin 10 mg daily or Dapagliflozin 10 mg daily (no dose titration required).
- **Can be safely initiated:**
  - In stable outpatients.
  - During hospitalisation for acute decompensated heart failure once clinically stable.
  - Before discharge to improve long-term adherence.

Beneficial across a broad range of patients, including those with:

- Diabetes mellitus
- Chronic kidney disease
- Obesity
- Atrial fibrillation
- Previous heart failure hospitalisation.

Monitor:

- Blood pressure
- Renal function (eGFR and creatinine)
- Volume status and symptoms.

Clinical Pearl: Early initiation of SGLT2 inhibitors has rapid clinical benefits and should be considered a cornerstone of HFpEF management alongside optimisation of comorbidities and congestion control.

Long-Term Management and Prognosis

Long-Term Care Goals

- Optimise and maintain GDMT.
- Improve quality of life and functional capacity.
- Reduce hospitalisations and mortality.
- Promote self-management and treatment adherence.
- Integrate psychosocial and palliative care support when appropriate.

Follow-Up and Models of Care

- Once clinically stable and receiving optimal GDMT, review patients every **3–6 months.**
- Consider:
  - Cardiac rehabilitation programs
  - Heart failure disease management services
  - Telehealth and virtual care services, particularly in rural and remote settings.

Heart Failure Disease Management Programs

Multidisciplinary programs involving:

- Heart failure nurses
- Allied health professionals
- General practitioners
- Cardiologists

have been shown to:

- Reduce hospitalisations
- Reduce mortality
- Improve patient outcomes

Supporting Self-Management

Patients should be encouraged to:

- Monitor symptoms and body weight
- Maintain medication adherence
- Engage in regular physical activity when appropriate
- Adopt healthy dietary practices
- Recognise symptoms of deterioration early

Technology May Assist With

- Activity monitoring
- Weight management
- Medication reminders
- Communication with the heart failure team
- Tracking dietary and lifestyle behaviours.

Addressing Barriers to Care

Potential barriers include:

- Limited access to medications and healthcare services
- Mental health disorders
- Cognitive impairment
- Polypharmacy
- Homelessness
- Social disadvantage and geographical remoteness

Practical Primary Care Strategies

- Simplify medication regimens when possible.
- Develop individualised care plans and treatment goals.
- Provide culturally appropriate patient education.
- Address mental health concerns.
- Arrange pharmacist medication reviews when appropriate.
- Consider home-based nursing support.

Palliative Care and Goals of Care

Patients who are unsuitable for advanced heart failure therapies should have:

- Early goals-of-care discussions
- Advance care planning
- Appropriate palliative care referral when indicated

Palliative care may:

- Improve symptom control
- Enhance quality of life
- Provide psychological and spiritual support
- Reduce distressing symptoms in advanced disease

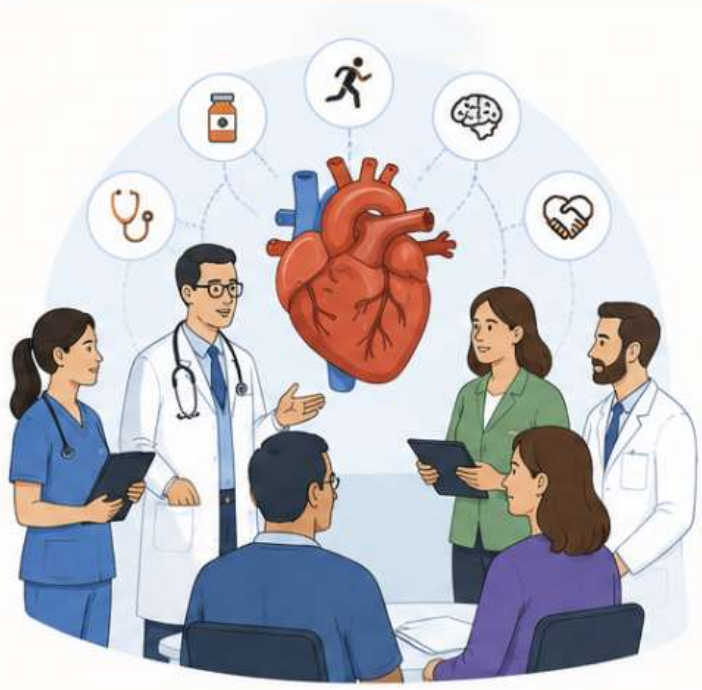
Clinical Pearl: Guideline-directed medical therapy should generally be continued in advanced heart failure unless it contributes to patient discomfort or is no longer consistent with the individual's goals of care.

Key Message: Long-term management of HFrEF extends beyond pharmacotherapy. Regular follow-up, multidisciplinary care, patient empowerment, and timely integration of psychosocial and palliative care are essential to improving outcomes and quality of life.

1. MULTIDISCIPLINARY HEART FAILURE CARE

Heart failure management is best delivered through a **multidisciplinary team**, which may include:

- Heart failure nurses
- Cardiologists or specialist physicians
- General practitioners
- Pharmacists
- Physiotherapists
- Occupational therapists
- Exercise physiologists
- Dietitians
- Psychologists
- Palliative care physicians



BENEFITS:

- Improved survival
- Reduced hospital readmissions
- Greatest benefit in **high-risk patients**, particularly following recent hospitalisation

If face-to-face services are unavailable, **telemonitoring** or **telephone support programs** are effective alternatives.

2. NURSE-LED MEDICATION TITRATION

Nurse-led medication titration helps:

- Increase achievement of **target doses** of guideline-directed therapy
- Reduce heart failure **rehospitalisation**
- Improve **survival**

3. EXERCISE TRAINING

Regular **low- to moderate-intensity continuous exercise** is recommended, particularly in patients with **HFrEF**, to:

- Improve **quality of life**
- Reduce heart failure **hospitalisations**

These multidisciplinary and supportive care strategies improve outcomes and help people with heart failure **live longer and better**.

Device Therapy in HFrEF

Implantable Cardioverter-Defibrillator (ICD)

Primary Prevention

Consider ICD therapy in patients with:

- Symptomatic ischaemic cardiomyopathy (NYHA Class II–III)
- LVEF ≤35%
- Persistent LV dysfunction despite ≥3 months of optimal GDMT
- Expected survival >12 months

Secondary Prevention

ICD therapy is indicated in patients with:

- Previous ventricular arrhythmias associated with haemodynamic instability
- Survivors of sudden cardiac arrest when appropriate

Clinical Pearl: Evidence for ICD therapy is strongest in ischaemic cardiomyopathy, although selected patients with non-ischaemic cardiomyopathy may also benefit.

Cardiac Resynchronisation Therapy (CRT)

CRT improves symptoms and reduces morbidity in selected patients with HFrEF and electrical dyssynchrony.

Consider CRT in Patients With:

- Symptomatic HFrEF
- LVEF ≤35%
- Sinus rhythm
- Left bundle branch block (LBBB)
- QRS duration 130–149 ms
- Persistent symptoms despite optimal GDMT

Strongest Benefit

Patients with:

- LVEF ≤35%
- Sinus rhythm
- QRS duration ≥150 ms
- Left bundle branch block morphology

CRT Upgrades

Consider upgrading to CRT in patients who:

- Have a permanent pacemaker or ICD
- Develop worsening heart failure symptoms despite GDMT
- Have a significant burden of right ventricular pacing

Patients Requiring Ventricular Pacing

CRT is preferred over right ventricular pacing in patients with:

- HFrEF
- High-degree atrioventricular block requiring ventricular pacing

Clinical Pearl: Right ventricular pacing may worsen cardiac dyssynchrony and heart failure symptoms. CRT should be considered when long-term ventricular pacing is anticipated.

Key Message: Device therapy should be considered after optimisation of GDMT. Repeat echocardiography at 3–6 months is essential to identify patients who may benefit from ICD or CRT and improve long-term outcomes in HFrEF.

Management of Valvular Heart Disease

- Significant valvular heart disease is associated with poor outcomes in patients with HFrEF.
- Early identification and specialist referral are essential.

Aortic Stenosis

Consider:

- Surgical aortic valve replacement (SAVR), or
- Transcatheter aortic valve implantation (TAVI)

in patients with:

- HFrEF
- Severe high-gradient aortic stenosis

Benefits include:

- Improved symptoms
- Reduced mortality

Mitral Regurgitation

Primary (Degenerative) Mitral Regurgitation

- Surgical repair or replacement is first-line treatment for severe primary MR resulting in HFrEF.

Functional Mitral Regurgitation

- Consider transcatheter edge-to-edge repair (TEER) in selected patients who:
  - Remain symptomatic despite optimal GDMT
  - Are unsuitable for surgery
  - Do not require coronary revascularisation

Clinical Pearl: Decisions regarding valve intervention should be made collaboratively with a multidisciplinary structural heart team.

Referral for Advanced Heart Failure Therapies

Consider referral in patients with:

- Advanced heart failure refractory to optimal GDMT
- Persistent symptoms despite device therapy when indicated
- Progressive clinical deterioration

Advanced Therapies Include

- Left ventricular assist devices (LVADs)
- Heart transplantation
- Mechanical circulatory support when appropriate

Candidates for Mechanical Support Should Have

- Good treatment adherence
- Appropriate capacity for device management
- Adequate psychological and social support

Heart Transplantation

Heart transplantation should be considered in patients with:

- Advanced heart failure
- Refractory symptoms despite optimal medical and device therapy
- No absolute contraindications

Key Message: Early referral for specialist assessment is essential in patients with severe valvular disease or advanced heart failure. Primary care remains central to coordinating care, supporting treatment adherence, and providing ongoing psychosocial support throughout the patient's heart failure journey.

2. SUGGESTED QUALITY OF CARE MEASURES FOR PATIENTS WITH HEART FAILURE

Newly diagnosed HF

- What proportion have had an ECG?
- What proportion have had an echocardiogram?

All patients with HF

- What proportion have had an ECG within 12 months?
- What proportion have had an echocardiogram within two years?
- What proportion have an advanced healthcare directive?
- What proportion have been screened for depression?
- What proportion have had a care plan and care plan review?
- What proportion have had a home medication review?

HF with a reduced LVEF (HFrEF)

- What proportion receive a prescription for an ACE inhibitor, ARB or ARNI?
- What proportion receive a prescription for a beta blocker?
- What proportion receive a prescription for an MRA?
- What proportion have achieved the target or maximum tolerated dose of an ACE inhibitor, ARB or ARNI by 6 months following commencement?
- What proportion have achieved the target or maximum tolerated dose of a beta blocker by 6 months following commencement?
- What proportion with an LVEF of 35% or less despite medical therapy have been referred for consideration of cardiac resynchronisation or implantable cardioverter defibrillator therapy?

Atrial fibrillation

- What proportion receive a prescription for an anticoagulant?

Following HF hospitalisation

- What proportion have been reviewed within 2 weeks?
- What proportion have a written discharge summary and HF action plan?
- What proportion have been referred to a multidisciplinary HF disease management or multidisciplinary telemonitoring/telephone support program?
- What proportion have been referred to an exercise training program?
- What is the 30-day and 6-month mortality rate?
- What is the 30-day and 6-month rehospitalisation rate?

Abbreviations: ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ARNI = angiotensin receptor neprilysin inhibitor; ECG = electrocardiogram; HF = heart failure; LVEF = left ventricular ejection fraction; MRA = mineralocorticoid receptor antagonist.

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Thank You

Questions

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