



National University  
Heart Centre  
Singapore



# Understanding Heart Failure

# What is heart failure?

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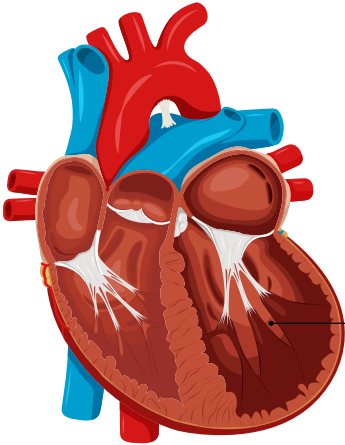


Heart failure is a clinical syndrome characterised by symptoms of shortness of breath, fluid retention and difficulty performing physical activities that require effort. These symptoms are caused by abnormalities in the heart function. It is also commonly called 'congestive cardiac failure' or 'congestive heart failure'.

Heart failure is a serious, chronic condition which can result in persistent symptoms affecting quality of life, recurrent hospital admissions for worsening of disease, as well as premature death.

# There are two main types of heart failure:

## Heart Failure with reduced Ejection Fraction (HFrEF)

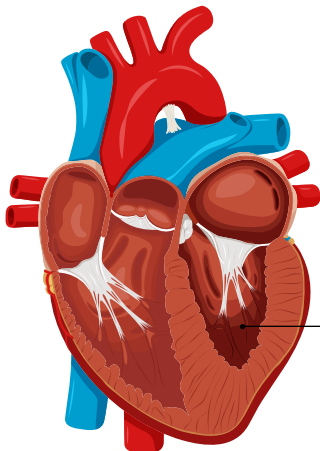


The heart's size is typically enlarged, and contraction is weak. Heart attack is a common cause of this condition. Pumping capability and efficiency of the left ventricle is abnormal, reducing the amount of blood pumped out.

### Enlarged left ventricle

Larger, weak left heart chamber

## Heart Failure with preserved Ejection Fraction (HFpEF)



The heart muscles are thick and stiff, resulting in impaired ability of the heart to relax adequately. This causes pressure in the heart and lungs to increase, causing symptoms of heart failure. HFpEF is seen more commonly in the elderly.

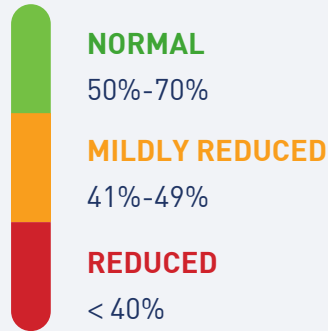
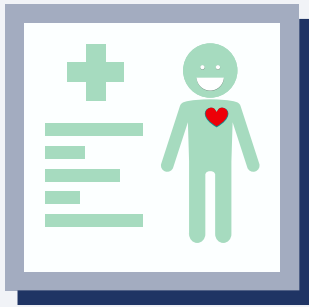
### Smaller left ventricle

Thickened heart muscles

# What does “Ejection Fraction” mean, and how is it measured?

The heart’s ejection fraction is the percentage of blood in the left ventricle (lower left chamber) that is being pumped out of the heart into the aorta (main blood vessel of the body) with each heart beat.

Measuring your ejection fraction helps your doctor tailor your heart failure therapy to your needs.



## **NORMAL** Ejection Fraction

~50%-70% of the blood is pumped out during each contraction



## **MILDLY REDUCED** Ejection Fraction

~41%-49% is pumped out during each contraction



## **REDUCED** Ejection Fraction

~40% is pumped out during each contraction

# What happens when my heart does not function properly?

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When your heart is not able to circulate blood around your body effectively, the following things can happen:

## 1. Your brain, muscles and organs receive less oxygen

## 2. Excess fluid is retained within your body, because:

- Blood returning to the heart stagnates, causing fluid to build up in the tissues
- The kidneys become less able to get rid of excess fluid through the urine

## Heart failure increases the risk of developing:

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- **Recurrent symptoms of shortness of breath, requiring hospital admission**
- **Heart valve or heart rhythm problems**
- **Pulmonary (lung) hypertension**  
(i.e., high pressure in the blood vessels leading from your heart to your lungs)
- **Worsening kidney/liver function**
- **Sudden cardiac arrest**  
(i.e., the heart suddenly stops pumping)



# What are the causes of heart failure?

Common causes of heart failure include:

- Coronary artery disease
- Acute myocardial infarction (heart attack)
- Hypertension
- Diabetes mellitus
- Heart valve disorders
- Electrical rhythm disturbances in the heart
- Cardiomyopathies (heart muscle disease)
- Alcohol and other substance abuse
- Congenital heart conditions
- Previous chemotherapy (cancer treatment)
- Heart muscle infection/inflammation (myocarditis)



# What are the common symptoms of heart failure?

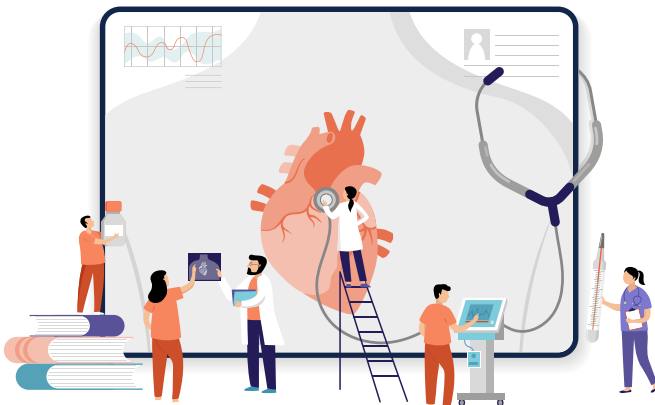
- Shortness of breath (on exertion or during rest)
- Difficulty in breathing when lying flat
- Waking up breathless at night
- Chronic fatigue
- Reduced stamina to handle usual activities
- Swelling of ankles / legs / abdomen
- Unexplained fainting spells



# How is heart failure diagnosed?

Heart failure is a clinical syndrome diagnosed through integrating various medical data and information, including:

- Patient symptoms
- Clinical examination
- Blood tests
- Electrocardiogram (ECG)
- Chest radiography
- Specialised cardiac imaging such as:
  - Echocardiogram
  - Cardiovascular Magnetic Resonance Imaging (Cardiac MRI)
- Invasive investigations such as:
  - Coronary angiogram
  - Right heart study
  - Endomyocardial biopsy



# How is heart failure treated?

Heart failure is a chronic condition that requires long-term treatment and follow-up. The Heart Failure Programme at NUHCS provides a multi-disciplinary approach to the chronic management of heart failure, which will include:



## Lifestyle modifications



- Smoking / alcohol cessation

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- Fluid and salt restriction

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- Regular monitoring of body weight/ blood pressure

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- Exercise as recommended by the heart failure team

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- Cardiac rehabilitation programme enrolment



# Procedures

- Restore blood flow to the heart muscles via coronary angioplasty (stenting) or Coronary Artery Bypass Graft (CABG) surgery
- Repair or replacement of dysfunctional heart valves
- Implantable electronic devices (defibrillators/ pacemakers) in patients who qualify
- Patients with severe heart failure will be evaluated for suitability for mechanical heart pump or heart transplantation



# Medical therapy



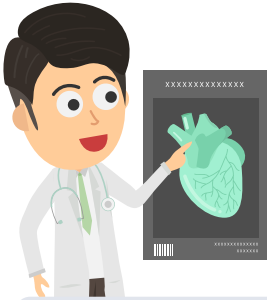
Control of risk factors (high blood pressure, diabetes mellitus)



Starting on medications which has been shown to reduce mortality and improve symptoms in heart failure patients

Suitable patients will be followed up in our specialised heart failure clinic, helmed by a team of multi-disciplinary experts aiming to provide an all-rounded management of heart failure for our patients, so as to improve their recovery process.

By receiving the right treatment, the signs and symptoms of heart failure can be effectively controlled to slow down its progression.



There are **four main classes** of medications that form the basis of heart failure treatment:

**1. ARN-I, ACE inhibitors & ARBs**

**2. SGLT2 Inhibitors**

**3. Beta Blockers**

**4. MRAs**

On the following pages, you will find more information on these medications that help to:



**SLOW** your heart and improve its ability to pump blood

**RELAX** your blood vessels and improve blood flow

**REDUCE** excess fluid in your body

**REDUCE** your risk of heart complications

ARN-I	ACE inhibitors	ARBs
<input type="checkbox"/> Sacubitril/ Valsartan	<input type="checkbox"/> Captopril <input type="checkbox"/> Enalapril <input type="checkbox"/> Lisinopril <input type="checkbox"/> Perindopril <input type="checkbox"/> Ramipril	<input type="checkbox"/> Candesartan <input type="checkbox"/> Losartan <input type="checkbox"/> Valsartan

### What is it?



- ARN-I, ACE inhibitors and ARBs are 3 types of drugs used to treat high blood pressure and protect the heart from further weakening.
- These drugs help relax the blood vessels, lowering your blood pressure and making it easier for your heart to pump blood around your body.

### Side effects



Side effects of these drugs can include:

- Dizziness.
- High potassium in the blood (causing dizziness, muscle weakness or fast heartbeats).
- Dry cough (ACE inhibitors).
- Rare: Swelling of the hands, face, tongue/throat, or difficulty breathing/swallowing.

### Management of side effects



- Rise slowly from a sitting or lying position, to minimise dizziness.
- Inform your doctor if you have persistent dry cough or severe dizziness.
- Seek medical attention immediately if you experience any unexpected swelling or other rare effects.

**ACE Inhibitor:** Angiotensin-Converting Enzyme Inhibitor

**ARN-I:** Angiotensin Receptor/Nepriylsin Inhibitor

**ARB:** Angiotensin II Receptor Blocker.

## SGLT2 inhibitors

□ Dapagliflozin

□ Empagliflozin

### What is an SGLT2 Inhibitor?



- SGLT2 inhibitors improve heart and kidney function. They can also help control blood sugar in patients with Type 2 diabetes.
- These medicines can help patients to live longer, and reduce the risk of hospital admission.

### Side effects



- People who take SGLT2 inhibitors generally tolerate them well, with no major side effects.
- **Common side effects might include:**
  - Slight weight loss.
  - Passing more urine.
  - Urinary tract/genital infections; symptoms can include:
    - Pain or burning sensation when passing urine.
    - Blood in the urine.
    - Pain, redness, irritation, or swelling of genitals.
    - Unpleasant odour or discharge from genitals.
  - Rare: Severe nausea and vomiting, severe abdominal pain, confusion and excessive lethargy.

### Management of side effects



- Observe good personal hygiene to avoid genital and urinary tract infections.
- Omit SGLT2 inhibitors when feeling unwell or unable to eat (fasting for procedures). Resume SGLT2 inhibitors when one recovers from illness and is able to take orally.
- Seek medical attention immediately if you suspect you have a urinary tract or genital infection, or any of the rare side effects listed above.

**SGLT2 Inhibitor:** Sodium-Glucose coTransporter-2 Inhibitor

## Beta blockers

- Bisoprolol
- Carvedilol

- Nebivolol

### What are Beta Blockers?



- Beta blockers help control your heart rate to reduce the strain on your heart, improving the pumping ability of the heart.
- These medicines can reduce future hospital admissions and help patients live longer.

### Side effects



- **Some common side effects of beta blockers include:**
  - Low heart rate.
  - Dizziness.
  - Fatigue.
  - Cold hands/feet.
  - Shortness of breath.
  - Erectile dysfunction (impotence) in men.
- Inform your doctor if you experience any of these symptoms, particularly if you have shortness of breath, fainting or recurring episodes of low blood sugar.

### Management of side effects



- Rise slowly from a sitting or lying position to minimise dizziness.
- Symptoms such as tiredness, cold hands and feet may resolve over time.
- Inform your doctor if breathlessness or persistent giddiness occur.

## MRAs

□ Spironolactone

□ Eplerenone

### What is an MRA?



- MRAs block the activity of the hormone aldosterone in your body.
- This brings about heart protection benefits and helps to remove excess fluids from the body.
- MRAs can help people live longer, exercise more than they could before, spend less time in hospital, and have improved symptoms.

### Side effects



- Like other diuretics, MRAs will make you pass urine more often.
- **Side effects might include:**
  - Dizziness, diarrhoea.
  - Breast tenderness.
  - Erection problems in men.
  - Menstrual changes in women.
  - High potassium in the blood.

### Management of side effects



- Inform your doctor if you have severe dizziness, or if any of the above side effects occur.

**MRA** = mineral ocorticoid antagonist

## Other treatments might include:

Drugs that can:	Examples:
<ul style="list-style-type: none"><li>Remove excess water from the body (Note: effects of these medications last for around 6-8 hours. Take the last dose in the afternoon to avoid frequent urination at night)</li></ul>	<ul style="list-style-type: none"><li>Frusemide</li><li>Bumetanide</li><li>Metolazone</li><li>Tolvaptan</li></ul>
<ul style="list-style-type: none"><li>Promote nitric oxide mediated blood vessel relaxation</li></ul>	<ul style="list-style-type: none"><li>Vericiguat</li></ul>
<ul style="list-style-type: none"><li>Relax the blood vessels</li></ul>	<ul style="list-style-type: none"><li>Hydralazine</li><li>Isosorbide dinitrate/isosorbide mononitrate</li></ul>
<ul style="list-style-type: none"><li>Treat irregular heart rate/flutter</li></ul>	<ul style="list-style-type: none"><li>Digoxin</li></ul>
<ul style="list-style-type: none"><li>Slow down the heart rate</li></ul>	<ul style="list-style-type: none"><li>Ivabradine</li></ul>
<ul style="list-style-type: none"><li>Correct any iron deficiency</li></ul>	<ul style="list-style-type: none"><li>Intravenous (IV) iron</li></ul>
<ul style="list-style-type: none"><li>Reduce high potassium levels in the blood</li></ul>	<ul style="list-style-type: none"><li>Sodium zirconium cyclosilicate</li></ul>

It is crucial to consult your doctor if you have any side effects from your prescribed treatments or if you feel unwell. Your doctor will assist in finding the best treatment combination for your needs.

# Tips for taking your medications

- ✓ Learn about your medications, their benefits and side effects.
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- ✓ Set daily reminders to take your medicines or incorporate taking your medication as prescribed into your daily routine (e.g. after brushing your teeth in the morning).
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- ✓ Ask your doctor or pharmacist on what to do if you accidentally miss a dosage, and follow their instructions accordingly.
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- ✓ Remember that your treatment will be lifelong. You should not modify your treatment schedule without medical supervision.
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- ✓ Consult your doctor before taking any supplements or herbal/ traditional formulations. These formulations can reduce the effectiveness of your medicines or cause side effects.



# What can I do to stay well?



There are many lifestyle choices you can make to stay healthy and prevent your heart from getting weaker. A healthy lifestyle reduces the risk of complications that could lead to hospitalisation.

✔ Quit smoking.



✔ Limit your alcohol intake.



✔ Eat a healthy diet that is low in salt, sugar, cholesterol, and saturated fat.



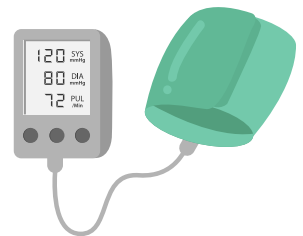
✔ Manage your stress levels.

✔ Maintain a healthy body weight. Monitor your weight daily to check for fluid retention.

✔ Monitor your blood pressure regularly and record it in a booklet.

✔ Remain active and exercise regularly.

✔ Limit your fluid and salt intake as instructed by your doctor (e.g. 1L to 1.2L of fluids/day).



✔ Avoid falling ill. Get vaccinated against COVID-19, influenza, and pneumonia to reduce the risk of infections, and their complications.

✔ Learn about heart failure and become involved in your own care.

# How should I monitor my progress?

It is important to understand that your heart failure symptoms can go through cycles of worsening and improvement. When your symptoms worsen, it becomes crucial for you to know when and where to seek immediate help.

## Heart failure action plan

### You are doing well when you experience:

- NO shortness of breath
- NO weight gain
- NO feet, ankle and leg swelling or stomach bloating
- NO chest pain



### What should I do?

- Your symptoms are under control
- Keep up the good work
- Continue to weigh yourself daily
- Continue to follow medical instructions

### Consult your case manager or doctor within 24 hours if you experience:

- Increased breathing difficulty with activity
- Noticeable leg swelling or stomach bloating
- Sudden weight gain of more than 1kg per day for 3 days
- Persistent night cough
- Heart palpitations



### What should I do?

- Call your case manager during office hours; or
- Consult doctor within 24 hours

### Seek medical attention immediately if you experience:

- Shortness of breath especially if accompanied with cold sweats
- Chest discomfort
- Dizziness
- Fainting (this is very serious)



### What should I do?

- Call 995 immediately
- Go to the nearest Emergency Department immediately or
- See a doctor immediately

# Advance care planning

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As someone living with heart failure, it is crucial to have conversations with your doctors, family, and decision makers about your future care strategies.

“Advance care planning” involves discussing and documenting your future care plan based on your personal values, goals, beliefs, and wishes.

Take time to consider your preferences for medical care in case you become seriously ill and are unable to communicate. It is important to choose a trusted substitute decision maker who can make decisions on your behalf when needed.

Ensure that your wishes are known and complete any necessary paperwork to ensure they are honored.

## Follow NUHCS:

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## National University Heart Centre, Singapore (NUHCS)

- NUHCS at National University Hospital (NUH), Kent Ridge - Main Operations  
Main Building Zone F  
Operating Hours: 8:00am - 5:30pm (Monday - Friday)  
Closed on Weekends & Public Holidays
- NUHCS Heart Clinic @ Ng Teng Fong General Hospital (NTFGH)  
Tower A - Specialist Outpatient Clinics Level 3, Clinic A34  
Operating Hours: 8:00am - 5:30pm (Monday - Friday)  
8:30am - 12:30pm (Saturday)  
Closed on Sundays & Public Holidays
- NUHCS Heart Clinic @ Alexandra Hospital (AH)  
Operating Hours: 8:30 am - 5:30 pm (Monday - Friday)  
Closed on Weekends & Public Holidays
- NUHCS Heart Clinic @ Jurong Medical Centre (JMC)  
Operating Hours: 8:30 am - 5:30 pm (Monday - Friday)  
Closed on Weekends & Public Holidays



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