

Heart Failure

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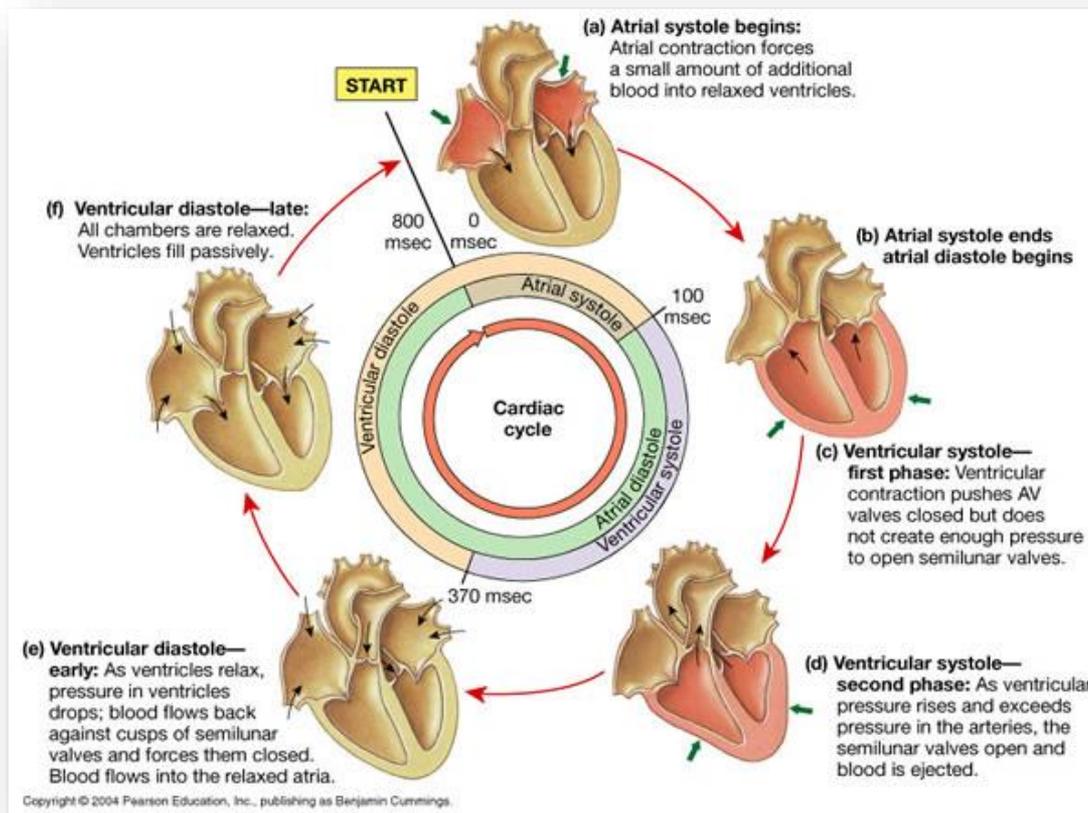
NZ HF stats

- Approximately 12,000 hospital admissions, of approximately 5,500 patients, for HF each year.
- HF costs ~1.5-2% of the total health budget
- Despite a decline in mortality through the 1990s, HF mortality in NZ has been sustained over the last 5 years and remains high (20% at 6 months and 30% at 12 months).
- HF among Māori occurs on average 10-15 years earlier and mortality from HF is ~8 X higher among Māori males aged 45-64 years than among non-Māori and approximately 3½ times higher among Māori aged >65 years. A similar excess mortality rate is also observed for Māori females. Hospital admissions for HF are 8 to 9 x higher among Māori compared with non-Māori.
- The prevalence of HF is increasing as the population ages and the number of people affected by HF **will increase by approximately 50%** over the next few decades.

Video

How the normal heart works

[video](#)



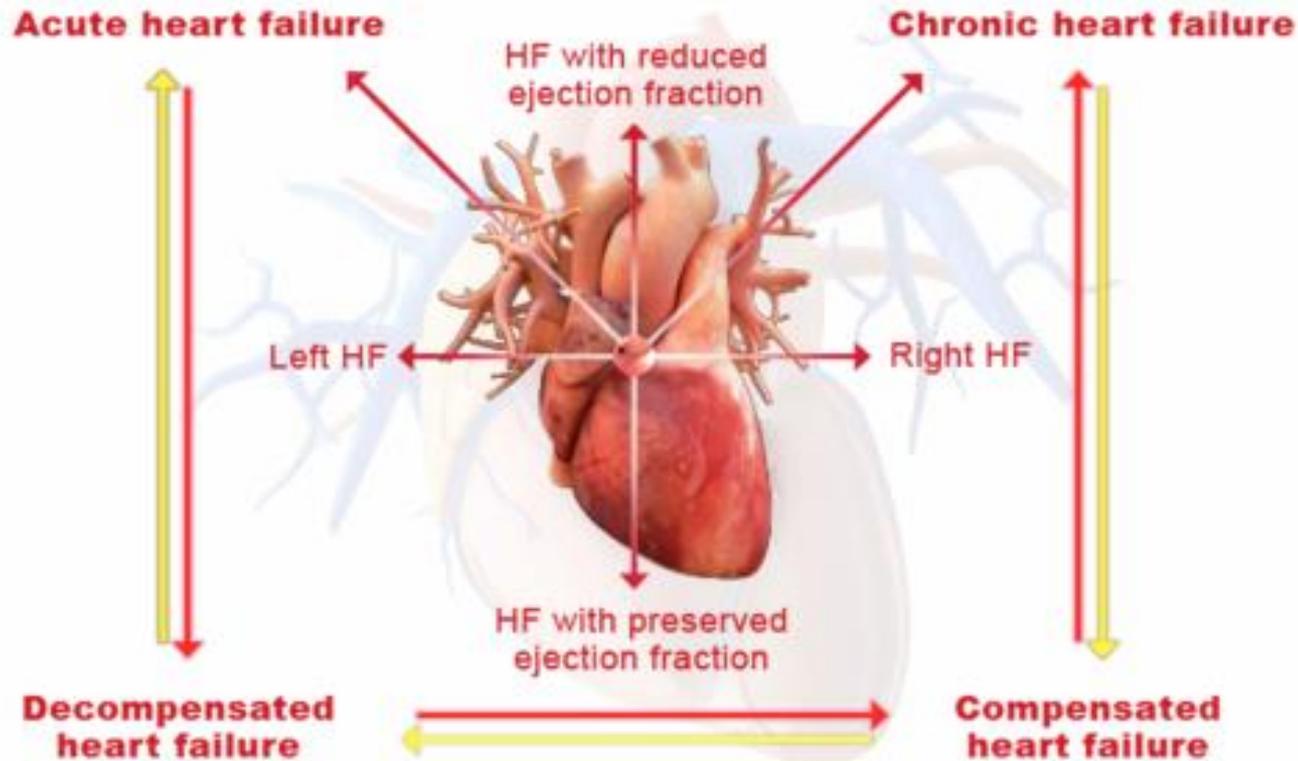
Definition

- A complex **syndrome** that can result from any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood to meet the needs of the body
 - (ACC/AHA 2013)
-leads to a failure of the heart to deliver sufficient oxygen to the metabolising tissues
-Compensatory mechanisms, e.g. an increase in heart rate, cardiac muscle mass, cardiac filling pressures and blood volume, work to maintain the ability of the heart to pump effectively, however, over time the heart progressively fails.
 - BPAC (50)

HF: a clinical syndrome

What is the clinical presentation of heart failure?

5/6



New terminology

Heart failure with reduced ejection fraction (HF-REF)

- i.e. impaired left ventricular systolic function, is typically seen in patients with structural heart disease, e.g. ischaemic heart disease.
- Many other causative factors, including hypertension, diabetes and idiopathic dilated cardiomyopathy
- The majority of research into effective, evidence-based treatment strategies for heart failure has been based on patients who have HF-REF.

Heart failure with preserved ejection fraction (HF-PEF) –

- i.e. impaired diastolic function (such as impaired diastolic relaxation and filling due to stiffening of the ventricles) is more frequently seen in older people, females and people who are obese.
- People with HF-PEF are also more likely to have atrial fibrillation and to be more hypertensive.
- In addition, other underlying causes include constrictive pericarditis or cardiomyopathy, hypertrophic cardiomyopathy and restrictive cardiomyopathy, e.g. from amyloidosis or sarcoidosis.

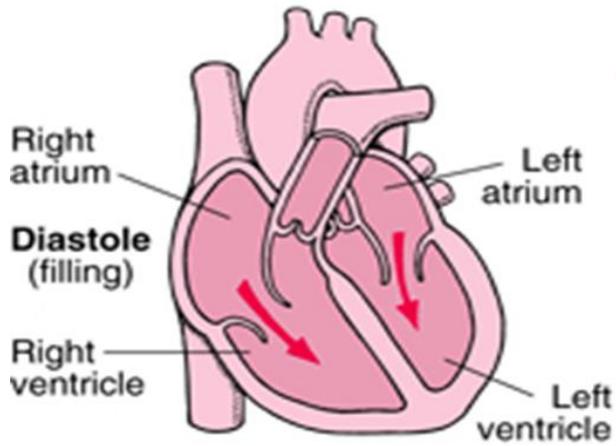
Video

What goes wrong in HF

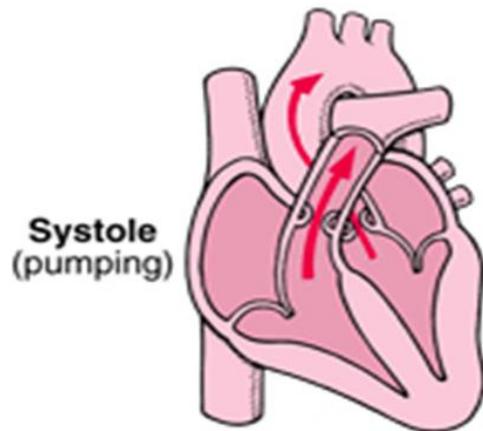
[video](#)



Normal

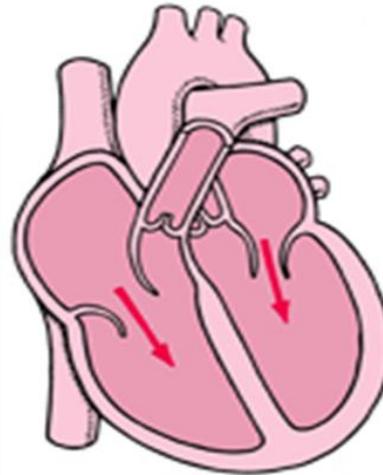


The ventricles fill normally with blood.

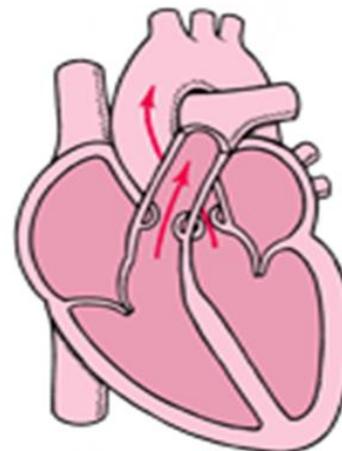


The ventricles pump out about 60% of the blood.

Systolic Dysfunction

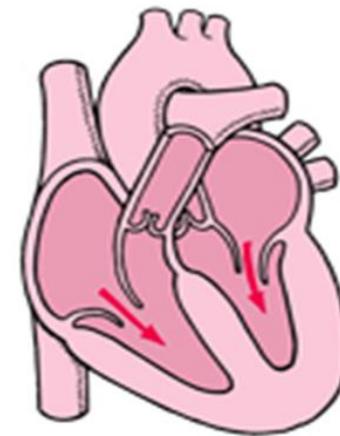


The enlarged ventricles fill with blood.

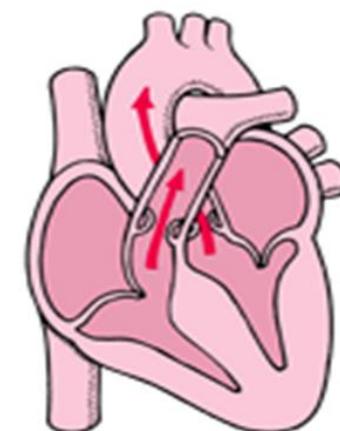


The ventricles pump out less than 40 to 50% of the blood.

Diastolic Dysfunction

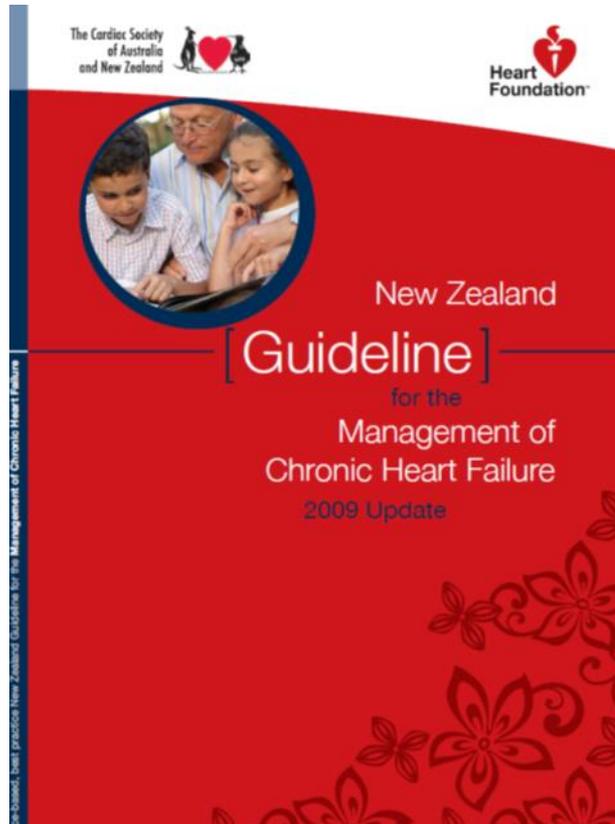


The stiff ventricles fill with less blood than normal.



The ventricles pump out about 60% of the blood, but the amount may be lower than normal.

Lots of guidelines



European Heart Journal (2012) 33, 1787-1847
doi:10.1093/eurheartj/ehs104

ESC GUIDELINES

ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012

The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC

Authors/Task Force Members: John J.V. McMurray (Chairperson) (UK), Stamatis Adamopoulos (Greece), Stefan D. Anker (Germany), Angelo Auricchio (Switzerland), Michael Böhm (Germany), Kenneth Dickstein (Norway), Volkmär Falk (Switzerland), Gerasimos Filippatos (Greece), Cândida Fonseca (Portugal), Miguel Angel Gomez-Sanchez (Spain), Tiny Jaarsma (Sweden), Lars Køber (Denmark), Gregory Y.H. Lip (UK), Aldo Pietro Maggioni (Italy), Alexander Parkhomenko (Ukraine), Burkert M. Pieske (Austria), Bogdan A. Popescu (Romania), Per K. Rønnevik (Norway), Frans H. Rutten (The Netherlands), Juerg Schwiter (Switzerland), Petar Seferovic (Serbia), Janina Stepinska (Poland), Pedro T. Trindade (Switzerland), Adriaan A. Voors (The Netherlands), Faiez Zannad (France), Andreas Zeiher (Germany).

www.escardio.org/guidelines

European Heart Journal (2012) 33, 1787-1847
European Journal of Heart Failure (2012) 14, 803-869



ACCF/AHA Practice Guideline

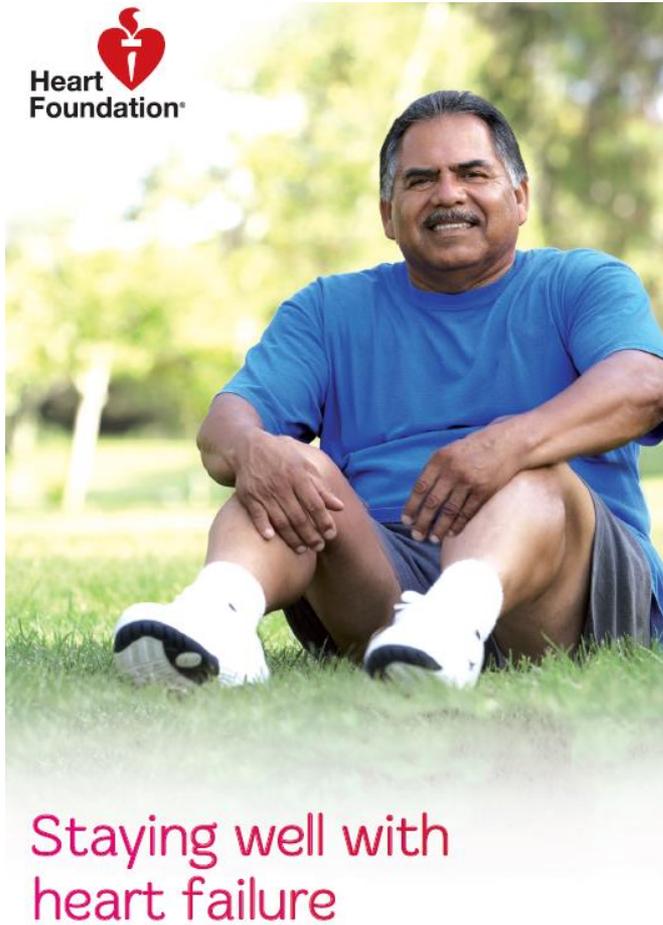
2013 ACCF/AHA Guideline for the Management of Heart Failure

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American College of Chest Physicians, Heart Rhythm Society and International Society for Heart and Lung Transplantation

Endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation

Excellent patient resources



heartfailurematters.org

ANNA, YOUR VIRTUAL GUIDE

- Understanding heart failure
- What can your doctor do
- What can you do
- Living with Heart Failure For caregivers
- Warning signs
- FAQ
- Ask Your Doctor

HEART FAILURE MATTERS: PRACTICAL INFORMATION FOR PATIENTS, FAMILIES AND CAREGIVERS.

English

SCROLL DOWN

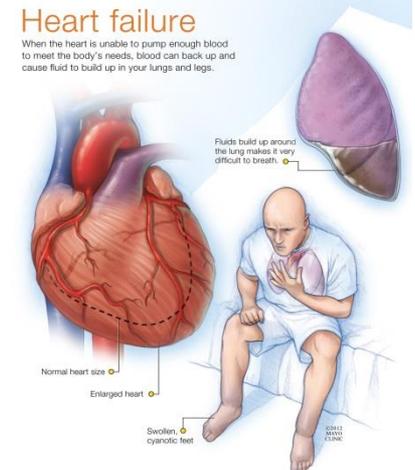
A screenshot of a website interface. On the left, there is a navigation menu with icons and text. On the right, there is a main content area with a photograph of a woman, a young man, and an older man looking at a laptop. The woman is holding a green mug.

Waitemata District Health Board
Te Wai Awhina

Heart Failure Medicines

Kia mataara – kia ora
Be vigilant – be well

A photograph of a doctor in a white coat examining an elderly woman. The doctor is looking at the woman's chest, and she is smiling slightly. The background is a blurred clinical setting.



Video

How the heart and body compensate in HF
[video](#)



Diagnosis of heart failure

HF-REF

- 1.Symptoms typical of heart failure
- 2.Signs typical of heart failure
- 3.Evidence of reduced left ventricular ejection fraction on echocardiography

HF-PEF

- 1.Symptoms typical of heart failure
- 2.Signs typical of heart failure
- 3.Normal or only mildly reduced left ventricular ejection fraction and no left ventricular dilatation
- 4.Relevant structural heart disease such as left ventricular hypertrophy or left atrial enlargement and/or diastolic dysfunction

Making a diagnosis of HF-PEF is essentially one of exclusion after other potential non-cardiac causes for the patient's symptoms, e.g. anaemia, respiratory disease, are ruled out.

Video

How HF causes fluid accumulation

[video](#)



Symptoms and signs typical of heart failure (1)

Symptoms	Signs
<i>Typical</i>	<i>More specific</i>
Breathlessness	Elevated jugular venous pressure
Orthopnoea	Hepatojugular reflux
Paroxysmal nocturnal dyspnoea	Third heart sound (gallop rhythm)
Reduced exercise tolerance	Laterally displaced apical impulse
Fatigue, tiredness, increased time to recover after exercise	Cardiac murmur
Ankle swelling	

Symptoms and signs typical of heart failure (2)

Symptoms	Signs
<i>Less typical</i>	<i>Less specific</i>
Nocturnal cough	Peripheral oedema (ankle, sacral, scrotal)
Wheezing	Pulmonary crepitations
Weight gain (>2 kg/week)	Reduced air entry and dullness to percussion at lung bases (pleural effusion)
Weight loss (in advanced heart failure)	Tachycardia
Bloated feeling	Irregular pulse
Loss of appetite	Tachypnoea (>16 breaths/min)
Confusion (especially in the elderly)	Hepatomegaly
Depression	Ascites
Palpitations	Tissue wasting (cachexia)
Syncope	

HF symptoms

Symptoms caused by fluid accumulation or congestion

- Shortness of breath
- Coughing/wheezing
- Weight gain
- Swollen ankles

Symptoms related to the reduced blood flow to parts of the body

- Tiredness/fatigue
- Dizziness
- Rapid heart rate

Other symptoms of heart failure

- Loss of appetite
- Need to urinate at night

Figure A

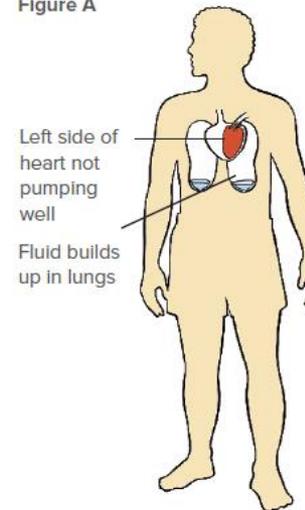
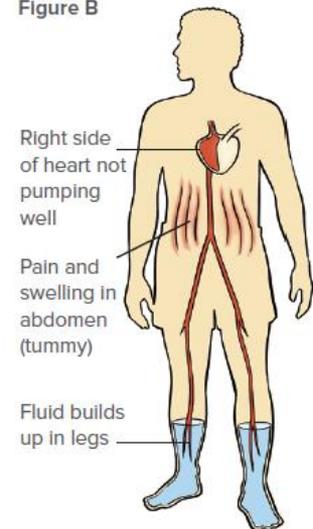


Figure B



HF warning symptoms

Emergency

- Persistent Chest pain that is not relieved by GTN / nitroglycerin)
- Severe and persistent shortness of breath
- Fainting
- Coughing up pink & frothy spit

GP urgently

- Progressive shortness of breath
- Frequent awakenings due to shortness of breath
- Needing more pillows to sleep comfortably
- Rapid heart rate or worsening palpitations

GP /PN

- Rapid weight gain
- Progressive swelling or pain in the abdomen
- Increased swelling of the legs or ankles
- Loss of appetite/nausea
- Increasing fatigue
- Worsening cough



Brain natriuretic peptide (BNP) or NT-proBNP*

BNP is...

- most useful in ruling out heart failure in a patient with an atypical presentation or a patient with respiratory co-morbidities.
- released from the cardiac ventricles in response to increases in ventricular volume and pressures.
- regarded as a good “rule out test” for heart failure, but should be interpreted in view of the clinical features of the patient. BNP cannot be used to differentiate between HF-REF and HF-PEF.
- BNP can also be useful for monitoring treatment and has prognostic implications – high levels are associated with a poorer prognosis.

Table 3: Suggested cut-off values for BNP in the diagnosis of heart failure²⁰

	Heart failure unlikely (rule out test)	Heart failure likely (rule in test)
BNP	< 30 pmol/L (approximately < 100 pg/mL)	>145 pmol/L (approximately > 500 pg/mL)
NT-proBNP	< 35 pmol/L (approximately < 300 pg/mL)	Age < 50 years – > 50 pmol/L (> 450 pg/mL) Age 50–70 years – >100 pmol/L (> 900 pg/mL) Age > 75 years – > 210 pmol/L (> 1800 pg/mL)

Notes:

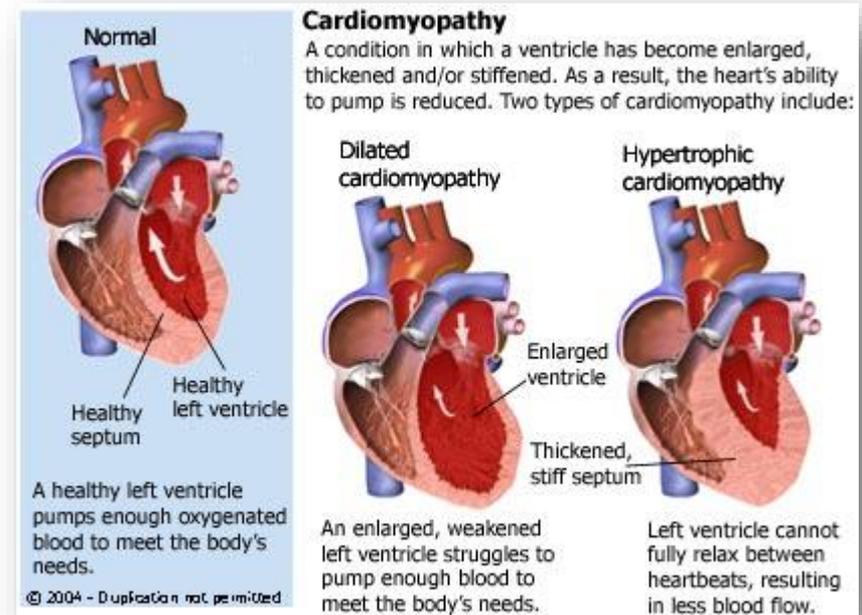
For indeterminate values, e.g. BNP > 30 pmol/L but < 145 pmol/L, clinical assessment is the key factor for interpretation

To convert BNP from pmol/L to pg/mL, multiply by 3.47

To convert NT-ProBNP from pmol/L to pg/mL, multiply by 8.46

Causative factors in HF?

- Coronary artery disease
- Hypertension
- Endocrine disorders, eg: diabetes, hypo/hyperthyroidism, acromegaly, Cushing's syndrome, aldosteronism, phaeochromocytoma
- Valvular heart disease
- Alcohol
- Cardiomyopathies
- Infections, such as viral myocarditis
- Congenital heart disease
- Infiltrative, such as sarcoidosis, amyloidosis, haemochromatosis
- Drugs, such as cytotoxic agents
- Nutritional, such as obesity, thiamine deficiency
- Chronic arrhythmias, eg: uncontrolled atrial fibrillation or bradycardia (complete heart block

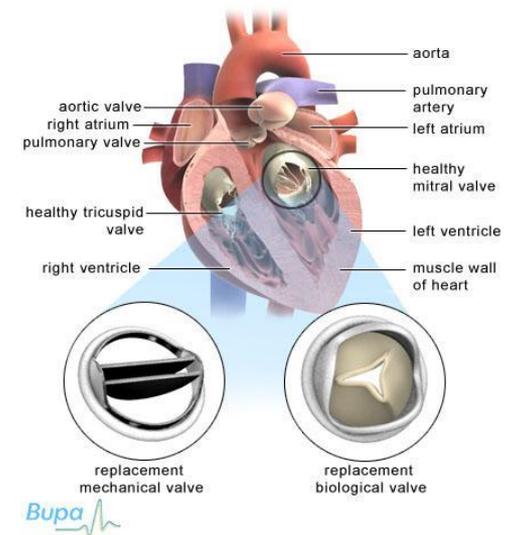
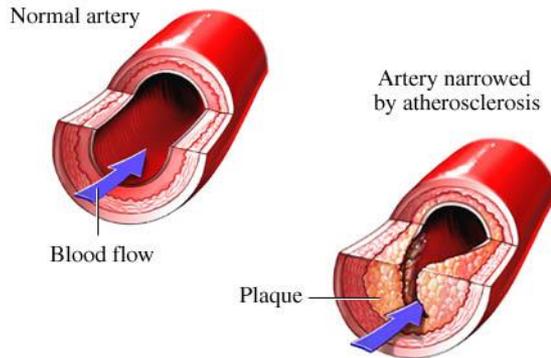


Video

How heart attack causes [HF](#)

And

How abnormal heart valves can cause [HF](#)



How heart failure is graded

New York Heart Association (NYHA)

Class I (no symptoms)	no symptoms and can perform daily activities without feeling tired or short of breath.
Class II (mild symptoms)	comfortable when resting, but moderate activity makes you tired or short of breath.
Class III (moderate symptoms)	comfortable when resting, but even limited physical activity makes you tired or short of breath.
Class IV (severe symptoms)	unable to do any physical activity without discomfort and experience some symptoms at rest.

How heart failure is graded

American Heart Association/American College of Cardiology stages of HF

Stage A	You don't have heart failure. But you are at high risk due to having another medical condition that can lead to heart failure, such as high blood pressure, diabetes, obesity or coronary artery disease.
Stage B	Heart has been damaged by your other medical condition(s) or other factors, but you don't have any symptoms yet.
Stage C	Your heart is damaged and you are experiencing heart failure symptoms.
Stage D	You have severe heart failure that requires specialised care, despite receiving treatment.

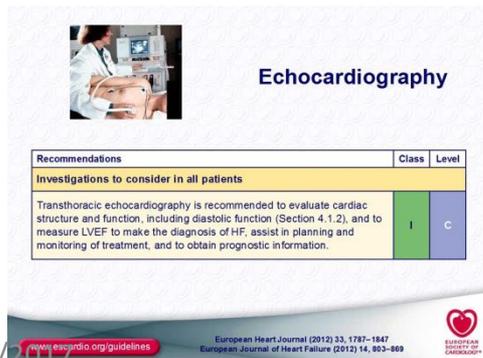
How can heart failure change over time?

- Heart failure is a serious, chronic condition that tends to gradually get worse over time.
- The progress of heart failure is unpredictable and different for each person.
- In many cases, the symptoms remain at a stable level for quite some time (months or years) before becoming worse.
- Careful management can not only ease symptoms but can also improve prognosis and prolong life..



Common tests for HF

- Medical history and physical examination
- Electrocardiogram (ECG)
- Blood tests
- Chest x-ray
- Echocardiogram



Echocardiography

Recommendations	Class	Level
Investigations to consider in all patients		
Transthoracic echocardiography is recommended to evaluate cardiac structure and function, including diastolic function (Section 4.1.2), and to measure LVEF to make the diagnosis of HF, assist in planning and monitoring of treatment, and to obtain prognostic information.	I	C

www.eurocardio.org/guidelines

European Heart Journal (2012) 33, 1787–1847
European Journal of Heart Failure (2012) 14, 803–809

EUROPEAN SOCIETY OF CARDIOLOGY

Table 2: Investigations for diagnosis and monitoring of patients with heart failure^a

Investigation	Comment
Echocardiography and Doppler	The gold standard test for heart failure that ideally should be used in every patient with suspected heart failure. Ventricular and valvular function can be assessed. Echocardiography can confirm a diagnosis of heart failure, can distinguish between HF-REF and HF-PEF and guide management options. An echocardiogram is also often useful if the patient has unexplained symptoms of shortness of breath or fatigue. Echocardiography is also used to follow a patient's progress once treatment is initiated. It can provide a sequential assessment of the response to treatment, of ejection fractions, left atrial remodelling and filling pressures. Echocardiography can also be used to assess for dyssynchrony for cardiac resynchronisation therapy (CRT).
Brain natriuretic peptide (BNP) or NT-proBNP*	BNP is most useful in ruling out heart failure in a patient with an atypical presentation or a patient with respiratory co-morbidities. BNP is released from the cardiac ventricles in response to increases in ventricular volume and pressures. BNP is regarded as a good "rule out test" for heart failure, but should be interpreted in view of the clinical features of the patient. BNP cannot be used to differentiate between HF-REF and HF-PEF. BNP can also be useful for monitoring treatment and has prognostic implications – high levels are associated with a poorer prognosis.
Electrocardiography (ECG)	Long-term left ventricular dysfunction will usually result in left atrial enlargement and left ventricular hypertrophy which will be apparent on ECG. If an ECG is normal this usually rules out heart failure. If there is uncertainty, consider discussing the interpretation of the ECG with a cardiologist. An ECG is useful for assessing other cardiac pathology, e.g. arrhythmia, cardiac ischaemia which may cause or aggravate heart failure.
Chest x-ray (CXR)	A CXR is most useful in a patient who is acutely unwell with pulmonary oedema. In primary care, a CXR is generally of limited value but can show enlargement of the heart and pulmonary congestion, and help assess possible alternative respiratory causes of dyspnoea.
Spirometry	This may be helpful to assess respiratory causes of dyspnoea but does not assist in the diagnosis of heart failure.
Full blood count (FBC)	Severe anaemia may cause or aggravate heart failure. Rarely, a raised white cell count may indicate infection as a possible precipitating cause of acute heart failure.
Thyroid function	Hyperthyroidism or hypothyroidism can precipitate heart failure and are potentially reversible forms of heart failure.
Renal function	An assessment of renal function is important to provide a baseline prior to treatment, to guide medicine choice and to monitor changes once treatment is initiated, especially if the patient is prescribed diuretics or angiotensin-converting enzyme (ACE) inhibitors.
Liver function tests	Elevated liver enzymes may indicate hepatic congestion associated with heart failure. Acute hepatic venous congestion can increase bilirubin levels and in some patients cause jaundice. Abnormal LFTs usually resolve with successful treatment of heart failure. Patients with long term heart failure may have low albumin levels as a result of decreased albumin synthesis which may in turn aggravate fluid retention.
Other tests	HbA _{1c} and lipids should be requested as part of a cardiovascular work-up depending on the patient's cardiovascular risk. Consider troponin to investigate cardiac ischaemia in a patient where symptoms are atypical or presentation has been delayed. N.B. if symptoms and ECG findings are suggestive of MI, immediate referral to secondary care is recommended.
Other secondary care investigations	Other investigations that may be requested, usually in secondary care, include tests such as stress echocardiography, nuclear perfusion scan, cardiac catheter, cardiac MRI or CT angiogram and rarely, cardiac biopsy, and genetic testing in patients with a family history of cardiomyopathy.

^a Depending on the laboratory, BNP or N-terminal pro-BNP (NT-proBNP) may be measured. The normal ranges for each test are different (although provide similar information) and may also vary between laboratories. BNP can be affected by factors such as age, gender, obesity and renal impairment.

Triggers

- Metabolic derangement

Increased demand – infection / thyroid disease / arrhythmia

Inadequate supply – anaemia / hypoxaemia

Drugs

Toxic effect – alcohol

Altered cardiac dynamics (negative inotropes / increased afterload)

Fluid retention – NSAIDs / steroids – esp mineralocorticoids

Lifestyle triggers

- High salt intake – processed foods etc
- Alcohol binge
- Non-compliance - multifactorial
 - Multidosing regimens
 - Drug side effects – perceived vs real
 - Cost issues
 - Difficulty with disease acceptance
 - Inadequate patient education

What are Treatment Goals?

- Immediate:
 - Improve symptoms

- Longer term:
 - Maintain well being (reduce morbidity)
 - Prevent mortality
 - Allow recovery of cardiac function

Initial pharmacological therapy

Diuretics to relieve symptoms/signs of congestion



ACE inhibitor (or ARB if not tolerated)

Add a beta-blocker

Still NYHA class II-IV?

Yes

No

Add a MR antagonist

Still NYHA class II-IV?

Yes

No

Loop diuretics

- "first line of defense" eg. Frusemide
- No evidence of prognostic benefit but provide symptomatic relief
- most potent and expedient diuretics available inhibit the reabsorption of sodium, chloride, and potassium
- excrete large volumes of fluid and electrolytes (primarily as sodium chloride) in urine
- increased venous capacitance , increased ejection fraction , decreased systemic and peripheral vascular resistance
- Low dose to start, increased according to clinical response, reviewed regularly

Diuretics

Examples

- Amiloride
- Bendrofluazide
- Bumetanide
- Chlortalidone
- Frusemide
- Indapamide
- Metolazone
- Spironolactone

Side effects

Most common:

- Altered balance of fluid or chemicals (e.g. sodium, potassium) in the body (symptoms such as dry mouth, tiredness, muscle pain, feeling sick, cramps, or fast heart rate)
- Stomach irritation
- Low blood pressure (hypotension)
- Rash
- Hyperuricaemia
- Hyperglycaemia .

Rarely:

- Tingling, numbness or 'pins and needle' sensations (paraesthesia)
- Blood disorders (such as thrombocytopenia, leucopaenia, agranulosis, or anaemia)
- Ringing in the ears (tinnitus)
- Rashes
- Pancreatitis

Video

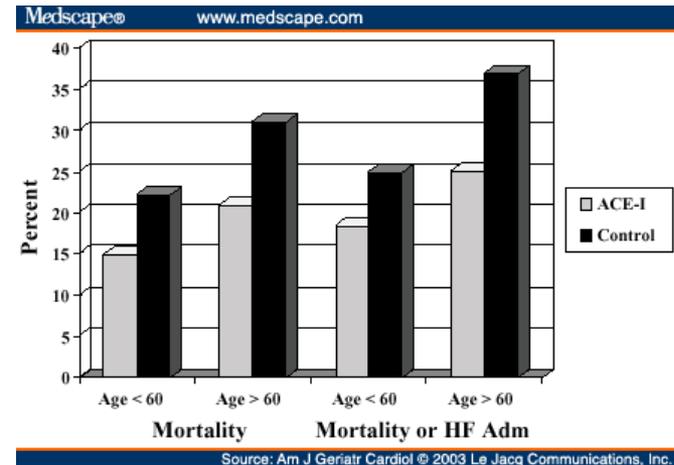
How diuretics work in [HF](#)



Angiotensin converting enzyme (ACE) inhibitors

ACE inhibitors block the systematic production of angiotensin II by preventing the conversion of angiotensin I to angiotensin II.

- decrease peripheral vascular resistance,
- prevent vasoconstriction
- decrease blood pressure (by reducing the effects of aldosterone)
- increases renal blood flow (to further promote sodium, potassium, and water excretion).



A meta-analysis of ACE inhibitor trials found that the absolute benefits were similar in patients older and younger than age 60. All persons with reduced LV ejection fractions should receive ACE inhibitor therapy unless contraindicated

Examples of ACE i

Majority of data is with
Enalapril (10mg bd) and
Captopril (25mg tds) –
extrapolated to class effect

Accupril – bd in heart failure
– aim > 10mg

Cilazapril – od aim > 2.5mg

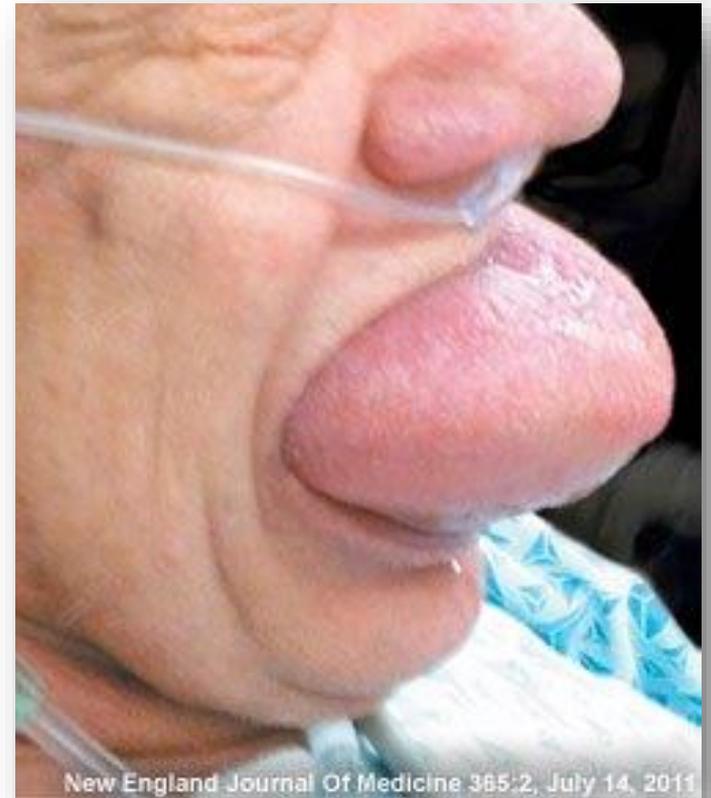
ACE inhibitors / ARBs in heart failure

- Approximately 7,000 patients evaluated in placebo-controlled clinical trials
- Consistent improvement in cardiac function, symptoms and clinical status
- Decrease in all-cause mortality by 20-25% ($p < 0.001$)
- Decrease in combined risk of death and hospitalisation by 20-25% ($p < 0.001$)

Possible ACE inhibitor side effect

- Dry cough
- Increased blood-potassium level (hyperkalemia)
- Fatigue
- Dizziness
- Headaches
- Rapid heartbeat
- Fainting

- In rare cases can cause tissues to swell (**angioedema**).



ARBs (Angiotensin II receptor blockers)

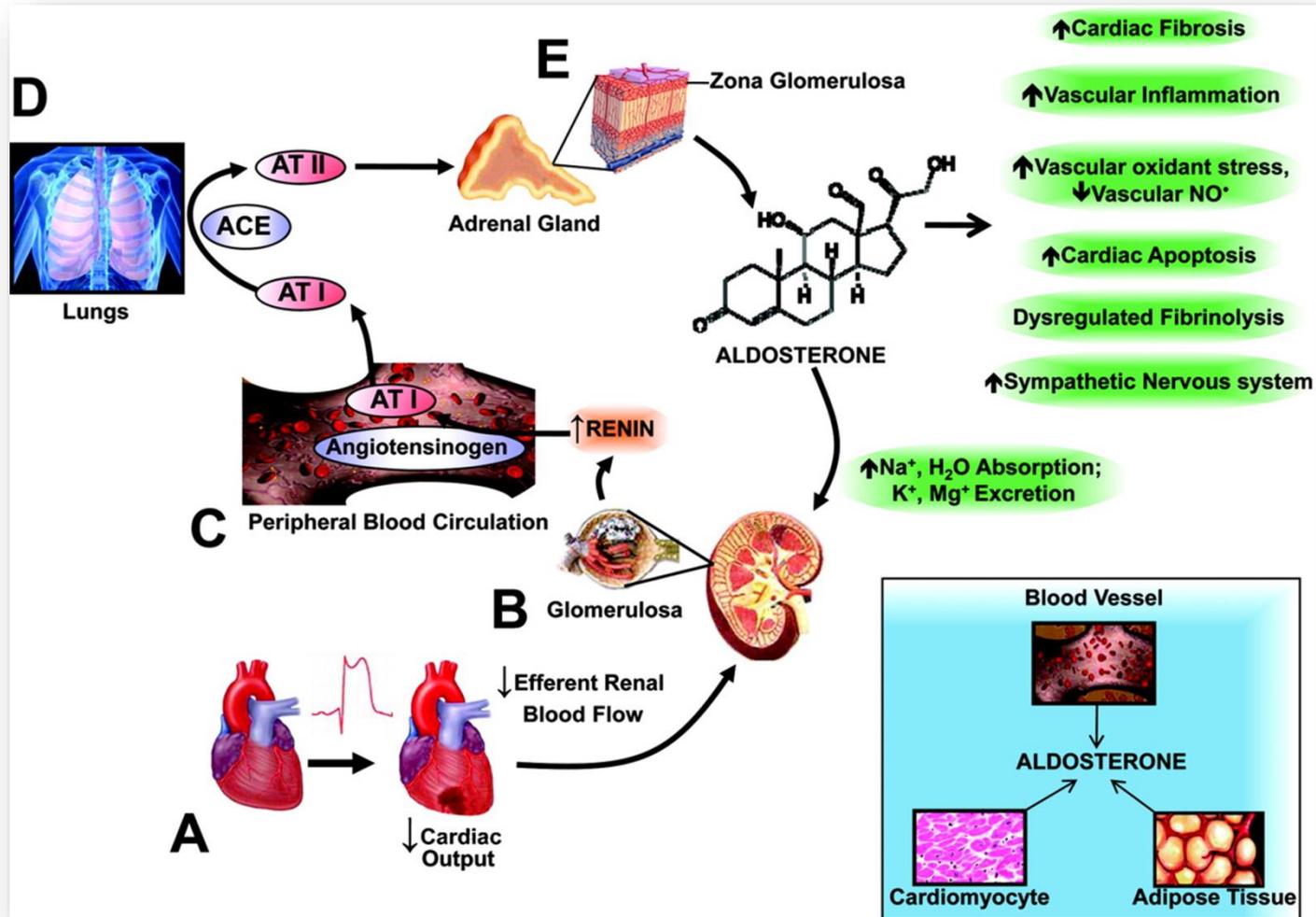
- Block the actions of angiotensin II, a hormone naturally produced by kidneys.
- ARBs relax blood vessels, which lowers your blood pressure.
- Heart doesn't have to work so hard
- ARBs have almost identical actions to ACE inhibitors. Because they are usually more expensive than ACE inhibitors, they are often reserved for patients who do not tolerate ACE inhibitors.
- Losartan ~ 100mg



Video

How ACE/vasodilators work in HF





The effect of impaired LV function on aldosterone synthesis.

A, A decrease in cardiac output as a result of LV systolic dysfunction is perceived as a decrease in efferent renal blood flow.

B, This stimulates renin secretion from the juxtaglomerular apparatus.

C, In the peripheral circulation, renin cleaves angiotensinogen to angiotensin I (AT I), which is converted to angiotensin II (AT II) by ACE in the pulmonary artery vasculature (D).

E, Angiotensin II stimulates zona glomerulosa cells in the adrenal cortex to secrete aldosterone. Extraadrenal synthesis of aldosterone occurs in vascular, adipose, and myocardial tissue (inset). Elevated plasma levels of aldosterone have a number of adverse effects on the cardiovascular system.

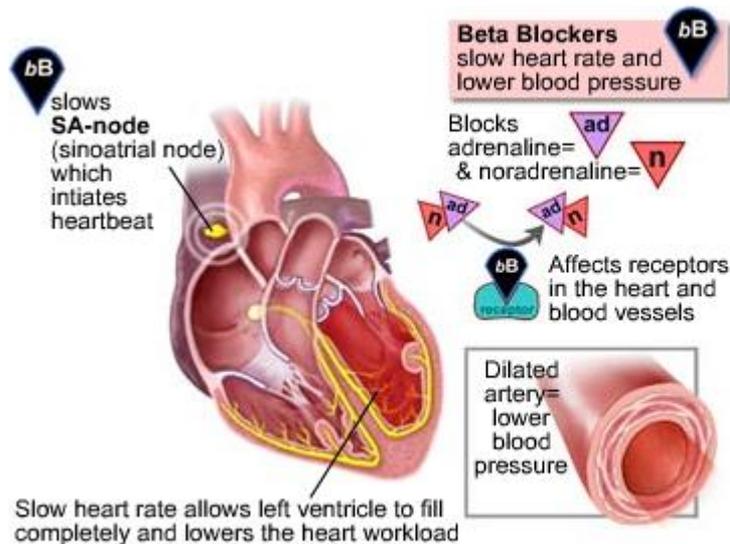
Nonsteroidal anti-inflammatory drugs (NSAIDs)

eg Ibuprofen, diclofenac and naproxen decrease the effectiveness of both frusemide and ACE inhibitors.

- The use of NSAIDs increases the risk of HF, including the exacerbation of preexisting HF.
 - observational study of over 40,000 patients in Denmark who had survived a first hospitalization for HF and had subsequently used NSAIDs
 - The outcomes in these patients were compared with over 70,000 controls with HF who had not received NSAIDs.
 - The adjusted risk of rehospitalization for HF was statistically significantly increased in patients on diclofenac (adjusted HR 1.35) or ibuprofen (adjusted HR 1.16), and to a numerical but nonsignificant level for users of naproxen (adjusted HR 1.18).
 - There was a dose-dependent increase in risk of death, which was highest with diclofenac (adjusted HR 2.08). Higher doses of ibuprofen (>1200 mg/day) and naproxen (>500 mg/day), but not lower doses, were also associated with an increased risk of death (adjusted HR 1.31 and 1.22, respectively, for the higher doses).

Beta-blocker therapy

- Used in conjunction with ACE inhibitors and diuretics - lessen heart failure symptoms, improve NYHA functional class, and **decrease mortality rates** in patients with systolic dysfunction (EF < 35% to 45%)
- prolong the life of the weakened heart by preserving the myocardial tissue and improving overall ejection fractions



Examples of Beta Blockers

Metoprolol CR

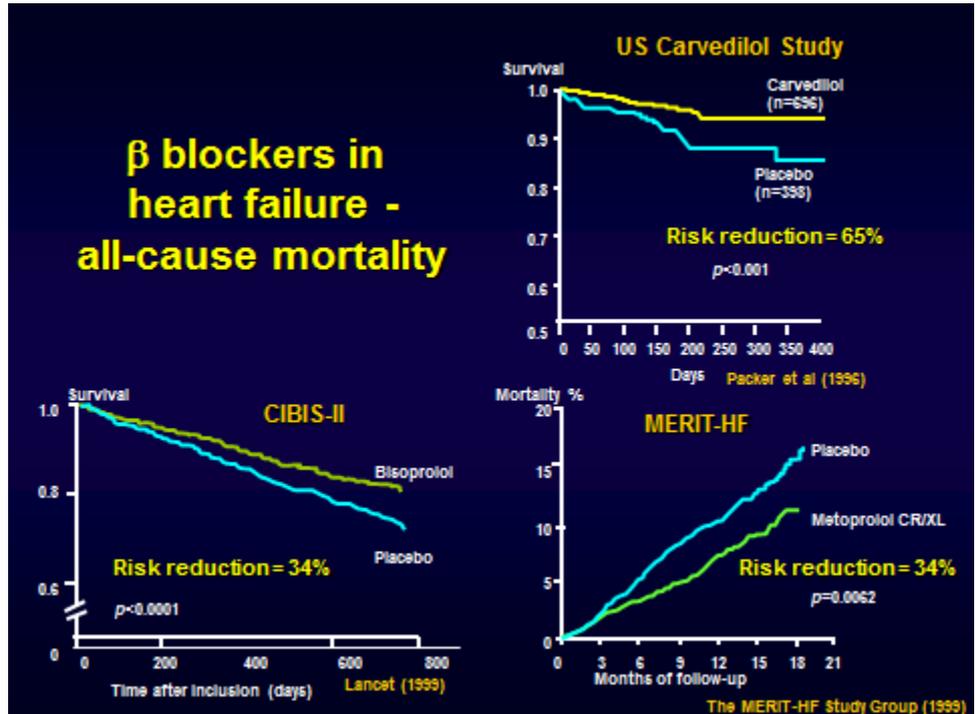
Start 23.75mg od
and increase to
190mg

Carvedilol

Start 3.125 mg bd
and increase to 25
mg bd if <85 kg
and 50mg if >85kg

Bisoprolol

1.25mg up to 10mg



Approximately 17,500 patients with HF have been entered into 30 randomised clinical trials of beta-blocker therapy (this body of clinical trial data is approximately twice the size of that available for ACE inhibitors in patients with HF). The trials have shown conclusively that beta-blockers improve survival, decrease hospitalisations and improve LV function in patients with HF.

Side effects of beta blockers

Common include:

- Fatigue
- Cold hands
- Headache
- Upset stomach
- Constipation
- Diarrhea
- Dizziness

Less common side effects include:

- Shortness of breath
- trouble sleeping
- Loss of sex drive
- Depression

- Beta blockers generally aren't used in people with asthma
- In people who have diabetes, beta blockers may block signs of low blood sugar.
- You shouldn't abruptly stop taking a beta blocker because doing so could increase your risk of a heart attack or other heart problems

Dos and Don'ts

DO

- start at low dose
- gradually increase dose slowly over a few weeks
- warn patient may feel slightly worse after starting drug
- consider in patients with COPD with little reversibility

DO NOT

- stop suddenly – ensure patient has a supply
- be afraid to use
- start when in overt failure

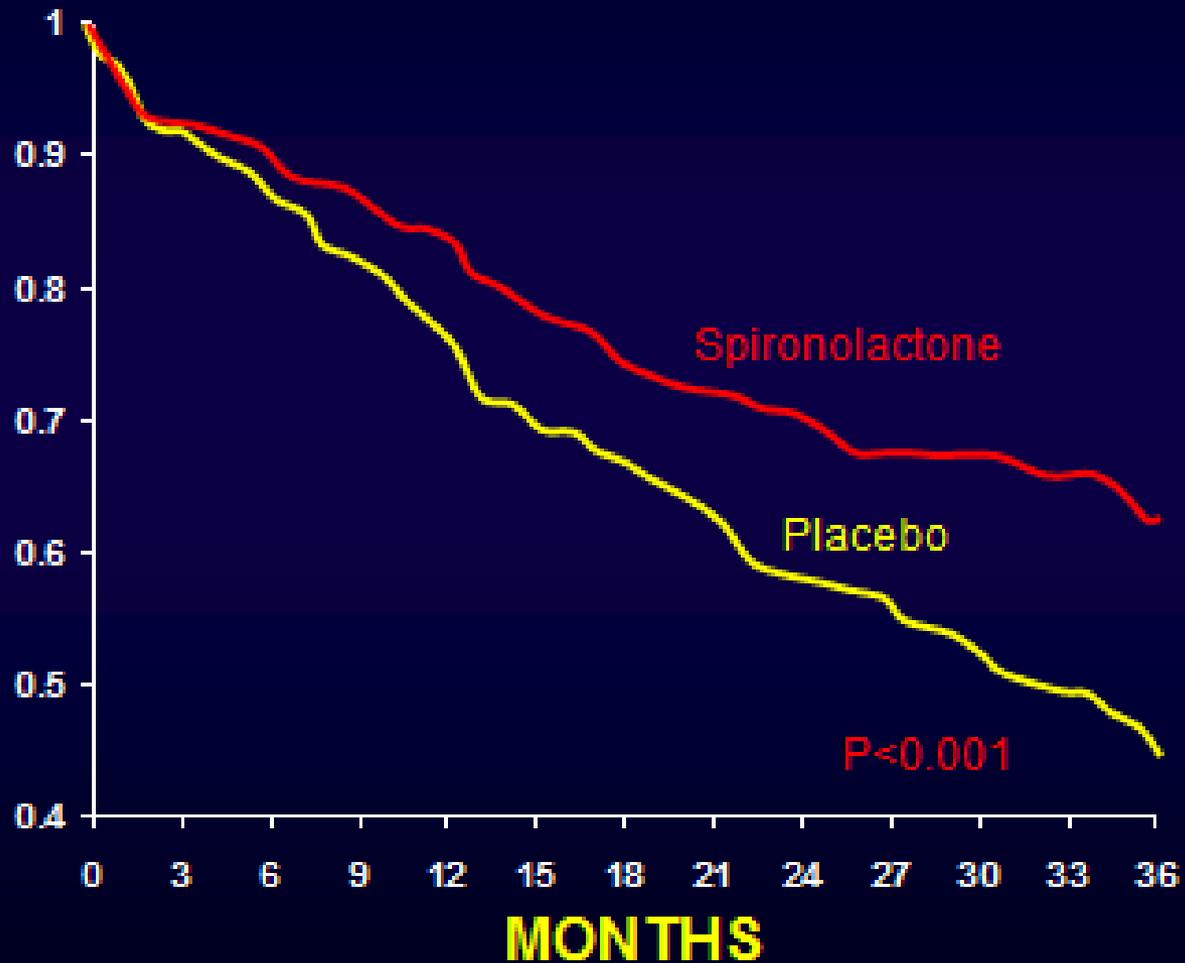
Aldosterone receptor antagonists

- Block the effects of a hormones produced naturally by adrenal glands which can cause heart failure to get worse.
- Aldosterone receptor antagonists affect the balance of water and salts going into your urine and are weak diuretics.
- They help lower blood pressure, reduce congestion and thus protect the heart.
- Aldosterone receptor antagonists are particularly effective in advanced heart failure, taken together with other heart failure drugs.
- Spironolactone ~50mg

- It is recommended that patients receive treatment with an ACE inhibitor (or ARB) and a beta-blocker, both in appropriate doses, prior to starting spironolactone.
- Spironolactone is the aldosterone antagonist commonly used in New Zealand:
 - recommended dose of spironolactone is 25mg once daily. Lower doses (spironolactone 12.5mg once daily) may be considered if adverse effects (see below) occur at the higher dose;
 - eplerenone is an alternative aldosterone antagonist with less oestrogenic side effects but is not currently funded in New Zealand.
- Contraindications to aldosterone antagonists:
 - serum potassium >5.0 mmol/L;
 - serum creatinine >200 µmol/L;
 - for patients at high risk of renal dysfunction, such as the elderly and those with diabetes, spironolactone should not be used if glomerular filtration rate (GFR) is <30 mL/min.
- Concomitant medications:
 - spironolactone is not recommended in patients who are receiving combined treatment with an ACE inhibitor and ARB;
 - nonsteroidal anti-inflammatory agents should not be co-administered with spironolactone.
- Monitoring/Side effects:
 - hyperkalaemia and worsening renal function may occur with spironolactone therapy, and are more common in patients who are elderly and have pre-existing renal dysfunction;
 - serum creatinine and electrolytes should be checked 3-4 days, one week and one month after initiation of therapy and then as indicated by renal function (usually a minimum of every 3 months);
 - hyperkalaemia (serum potassium >5.5 mmol/L) or worsening renal function requires dose reduction or cessation of spironolactone. Manage severe hyperkalaemia or worsening renal function according to standard clinical practice;
 - patients who become ill with intercurrent illness such as diarrhoea and vomiting are at increased risk of renal failure and hyperkalaemia when receiving spironolactone in combination with an ACE inhibitor. It is recommended that patients are instructed to withhold their spironolactone if any such volume-depleting intercurrent illness should develop and to seek medical advice prior to re-starting this therapy (see spironolactone patient information sheet);
 - gynaecomastia and breast pain may occur in approximately 10% of men.

RALES Survival

Probability
of
Survival



Pharmacological therapy

Other treatments with less certain benefits in systolic HF (2)

Recommendations	Class	Level
Digoxin		
May be considered to reduce the risk of HF hospitalization in patients in sinus rhythm with an EF $\leq 45\%$ who are unable to tolerate a beta-blocker (ivabradine is an alternative in patients with a heart rate ≥ 70 b.p.m.). Patients should also receive an ACE inhibitor (or ARB) and an MRA (or ARB).	IIb	B
May be considered to reduce the risk of HF hospitalization in patients with an EF $\leq 45\%$ and persisting symptoms (NYHA class II–IV) despite treatment with a beta-blocker, ACE inhibitor (or ARB), and an MRA (or ARB).	IIb	B
H-ISDN		
May be considered as an alternative to an ACE inhibitor or ARB, if neither is tolerated, to reduce the risk of HF hospitalization and risk of premature death in patients with an EF $\leq 45\%$ and dilated LV (or EF $\leq 35\%$). Patients should also receive a beta-blocker and an MRA.	IIb	B
May be considered to reduce the risk of HF hospitalization and risk of premature death in patients with an EF $\leq 45\%$ and dilated LV (or EF $\leq 35\%$) and persisting symptoms (NYHA class II–IV) despite treatment with a beta-blocker, ACE inhibitor (or ARB), and an MRA (or ARB).	IIb	B
An n-3 PUFA preparation may be considered to reduce the risk of death and the risk of cardiovascular hospitalization in patients treated with an ACE inhibitor (or ARB), beta-blocker, and an MRA (or ARB).	IIb	B

Digitalis

Cardiac glycosides are the oldest treatment of CHF.

- decreased ventricular rate of contraction
- depression of the AV node
- indirect stimulation of the vagus nerve
- increase in the force of the contraction of the heart and a decrease in the rate of contraction
- especially useful in people with irregular heart rhythms, notably atrial fibrillation with a rapid heart rate.

Other agents

Anticoagulants

- Warfarin, dabigitran

Statins

- Atorvastatin, Pravastatin, simvastatin
- Vasodilators
- GTN/ Duride

Medicines that can worsen heart failure

Medicines that may worsen heart failure in symptomatic patients include:¹

- NSAIDs including COX-2 inhibitors because they may cause renal impairment and sodium and water retention
- Pioglitazone due to dose related fluid retention
- Most calcium channel blockers in patients with HF-REF (with the exception of amlodipine and felodipine) due to their negative inotropic effect
- The combination of an ACE inhibitor AND an angiotensin-II receptor blocker (ARB) AND a mineralcorticoid antagonist (e.g. spironolactone) because this combination can worsen renal function which in turn may render loop diuretics ineffective and cause hypokalaemia or hyperkalaemia

What about alternative or natural remedies?

...frequently no medical evidence that these improve heart failure.

On the contrary, ingredients within some of these alternative therapies may interfere with the actions of some heart failure medicines and may have harmful effects.

Some of the more common alternative or natural remedies that may affect certain heart failure medicines include:

- Ephedra (ma huang)
- Ephedrine metabolites
- Chinese herbs
- Hawthorne (cratageus) products
- Garlic
- Ginseng
- Gingko
- Coenzyme Q-10



Pharmacologic therapy

Normal

Asymptomatic
LV dysfunction
EF <40%

ACEI

Symptomatic CHF
NYHA II

Diuretics
 β Blockers
Spironolactone

Symptomatic CHF
NYHA - III

Loop
Diuretics
Spironolactone

Symptomatic CHF
NYHA - IV

Inotropes
Levosimendan

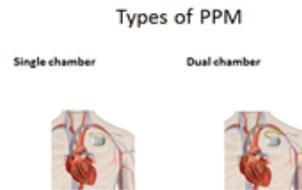
Specialised therapy, Transplant

Secondary prevention
Lifestyle modification

Device therapies

Implantable devices

- Pacemakers
- Cardiac Resynchronisation Therapy (CRT)
- Implantable Cardioverter Defibrillators (ICDs)
- Left Ventricular Assist Devices (LVAD)

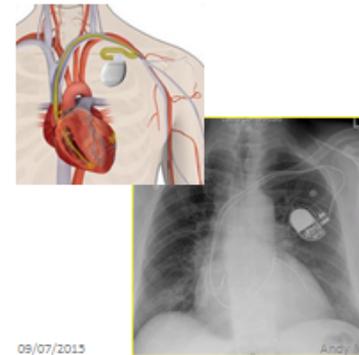


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Cardiac Resynchronisation Therapy (CRT)

CRT (biventricular pacing)



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CRT

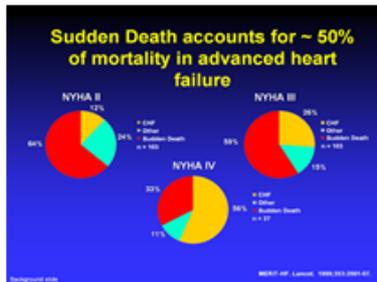
pacemaker + re-coordinates (resynchronises) the beating of the two ventricles by pacing both simultaneously

- improves contraction of the left ventricle.
- improves the overall efficiency of heart.
- may not only improve the symptoms of heart failure but have been shown to prolong long-term survival.
- Often combine a CRT with an ICD in the same device (CRT-D).

Device therapies

Implantable Cardioverter Defibrillators (ICDs)

ICD



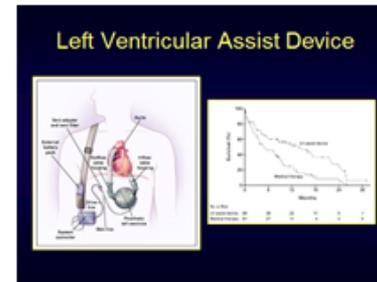
Pacemaker-like device that continuously monitors heart rhythm.

1. If it senses there is a problem with the rhythm that is not too serious it delivers a series of painless electrical impulses to correct the heart rhythm.
2. If this doesn't work, or a more serious heart rhythm problem is detected, the ICD will deliver a small electrical shock, known as cardioversion.
3. If this doesn't work, or a very serious problem is detected, the device will deliver a more noticeable shock to the heart, known as defibrillation.

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Left Ventricular Assist Devices (LVAD)



VADs

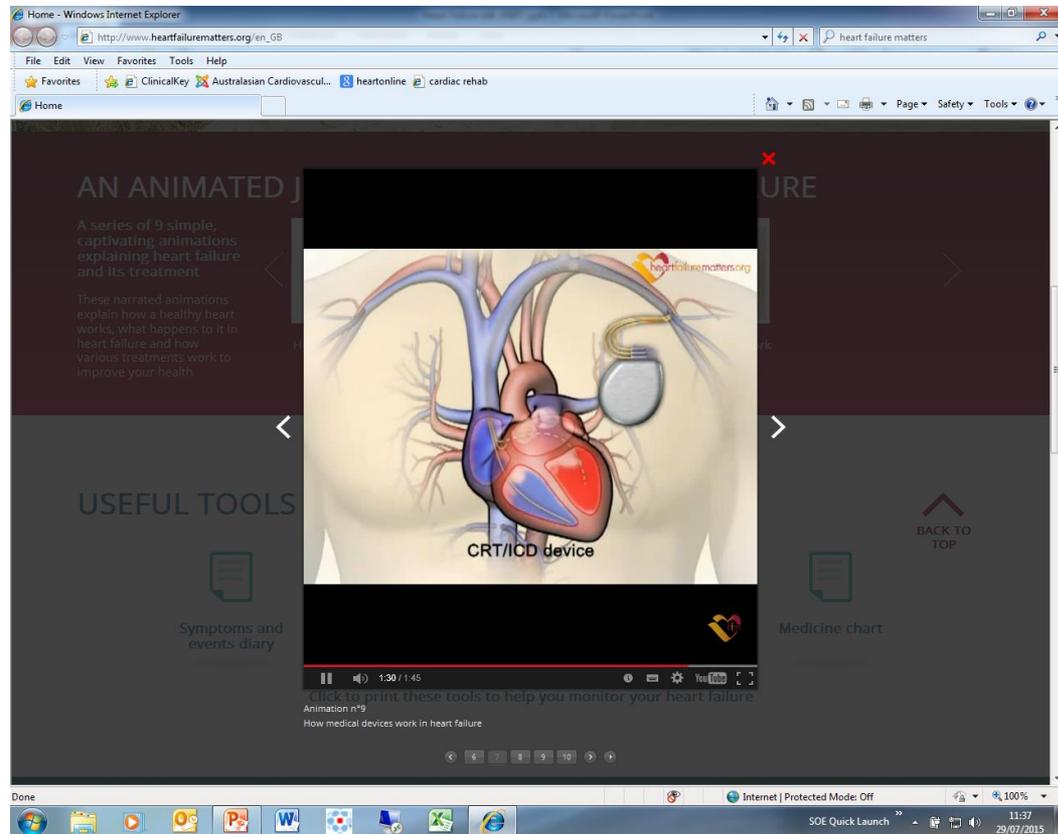
1. To keep patients alive until a donor heart can be found for transplantation. If this is the case, the VAD is used as a bridge to transplantation
1. To let the heart "rest" so that it can recover some of its normal function. In patients who have some heart recovery, the device can be removed and a heart transplant may not be needed at all. If this is the case, the VAD is used as a bridge to recovery.
1. To support the circulation over a period of years. This is usually the option for certain patients who are too sick to have a heart transplant. In this case, the VAD is used as destination therapy.

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Video

How medical devices work in HF



Surgery

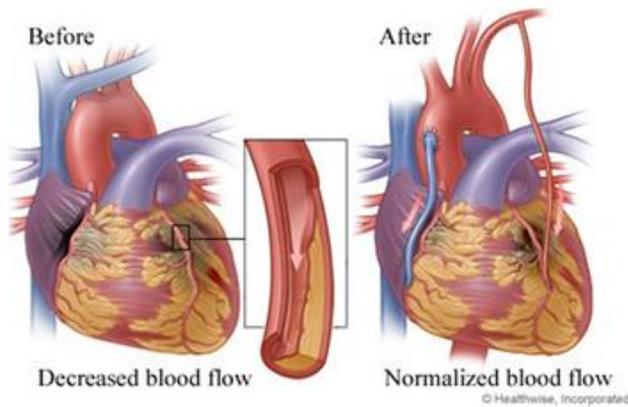
Surgery generally improves heart failure, if the anticipated benefits of the procedure outweigh the risks.

Surgery that can improve heart failure includes:

- Coronary artery bypass grafting (CABG)
- Valve surgery
- Heart transplantation

Surgery

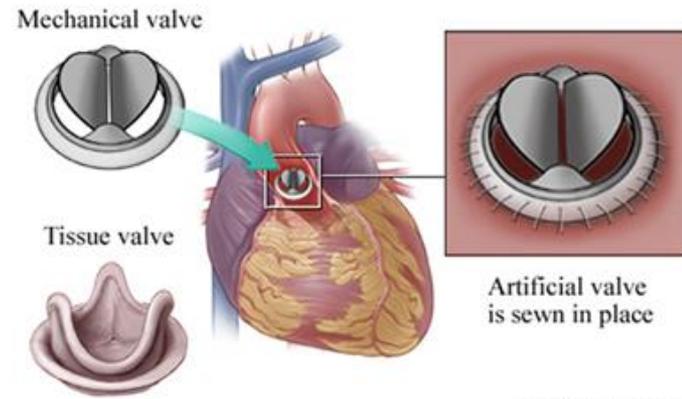
CABG



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Valve Surgery

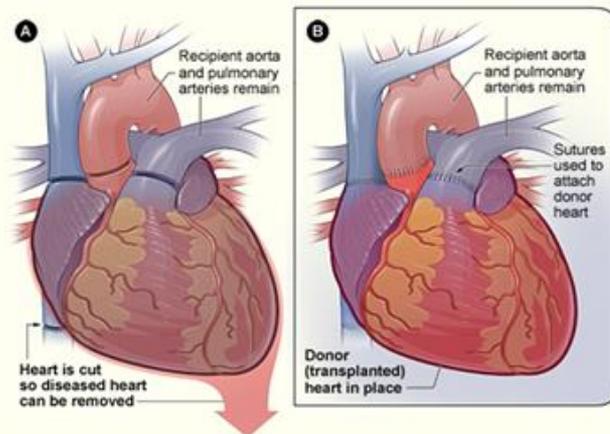


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Surgery/ Interventions

Heart transplant

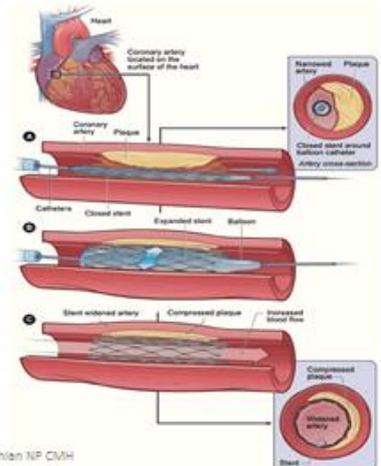


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Other procedures

- Angiography
- Percutaneous Coronary Intervention (PCI)
- Stenting



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Management of co-morbidities

- Anaemia
- Angina
- Asthma/COPD
- Cachexia
- Cancer
- Depression
- Diabetes mellitus
- Erectile dysfunction
- Gout

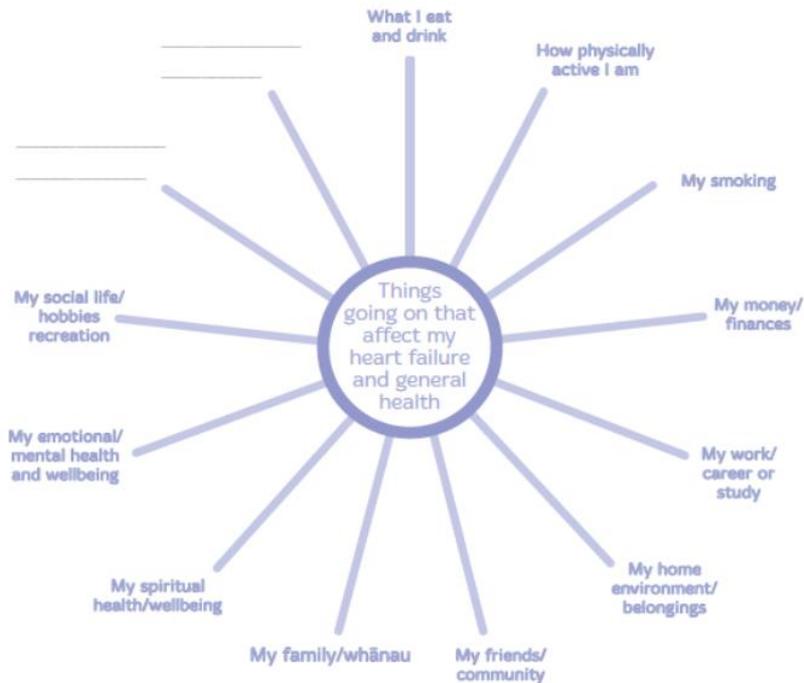
- Hyperlipidaemia
- Hypertension
- Iron deficiency
- Kidney dysfunction
- Obesity
- Prostatic obstruction
- Sleepdisturbance/ sleep disordered breathing

Lifestyle change

My 'plan for change' – choosing my goal

1. What do you want to change first? What is your goal?

- To help you decide, look at the wheel below
- The sections of the wheel show different areas of life and lifestyle which affect your heart failure and general health
- There is also space to add in other areas of life which may be important to you
- Circle the areas in your life that you would like to do better in
- Circling these will help you identify where to focus your energy and take control by making your 'plan for change'.



10/01/2017

Andy Mclachlan NP CMH

Lifestyle and non-pharmacological / device / surgical interventions

Recommendations	Class	Level
It is recommended that regular aerobic exercise is encouraged in patients with heart failure to improve functional capacity and symptoms.	I	A*
It is recommended that patients with heart failure are enrolled in a multidisciplinary-care management programme to reduce the risk of heart failure hospitalization.	I	A*

* O'Connor CM, Whellan DJ, Lee KL, Kutylian SJ, Cooper LS, Ellis SJ, Laffer ES, Kraus WE, Kitzman DW, Blumenthal JA, Rendall DS, Miller HL, Fog JL, Schulman KA, McKelvie RS, Zannad F, Pitt B, et al. HF-ACTION Investigators. Efficacy and safety of exercise training in patients with chronic heart failure: HF-ACTION randomized controlled trial. JAMA. 2009;301:1439-1450.
Piepoli MF, Corra U, Corra U, Dickstein K, Francis DP, Jaarsma T, McMurray JJ, Ponikvar B, Piesowicz E, Schmidt JP, Anker SD, Solal AC, Filippatos GS, Hoes AW, Gheles S, Giannuzzi P, Poekovskii PP. Exercise training in heart failure: from theory to practice. A consensus document of the Heart Failure Association and the European Association for Cardiovascular Prevention and Rehabilitation. Eur J Heart Fail. 2011;13:347-357.

www.escardio.org/guidelines

European Heart Journal (2012) 33, 1787-1847
European Journal of Heart Failure (2012) 14, 803-869



What's new in treatment Lifestyle/non-pharmacological or device therapy?

Treatment	Trial	Question
Exercise training	HF-ACTION	Efficacy and safety of exercise training in HF-REF.
Self management counselling	HART	Self-management/adherence counselling in HF-REF and HF-PEF.

www.escardio.org/guidelines

European Heart Journal (2012) 33, 1787-1847
European Journal of Heart Failure (2012) 14, 803-869



Adherence/ concordance

Its not how much information you give but how much the patient understands



Barriers to compliance/ adherence

- Language: speech and hearing
- Perceived benefits
- Low social support
- Low self esteem- lack of confidence
- Finances
- Cultural

Diet

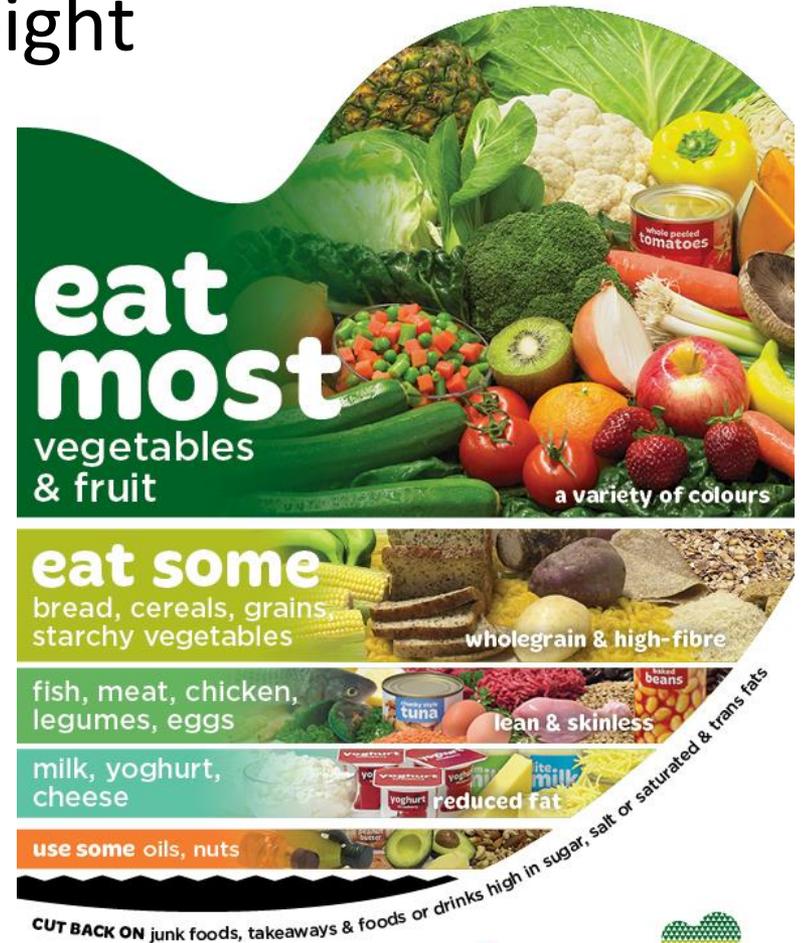
- Maintaining a healthy weight
- Salt
- ↓ Fluids
- Alcohol
- Potassium
- Fats and cholesterol



A standard drink is equivalent to a:

- Can of 4% beer (330ml)
- Small glass of wine (100ml)
- Pub measure of spirits (30ml).

If you are worried about the amount you are drinking, talk to your doctor or nurse or call the Alcohol Helpline on 0800 787 797 for free and confidential advice.



Malnutrition

- Up to 50% heart failure patients may be malnourished
- Patient becomes tired and weak and muscle mass reduces
- Independent predictor of mortality

Cachexia

A weakness and wasting of the body due to severe chronic illness.

- Reversible causes such as untreated nausea, ill- fitting dentures, medications, constipation
- Additional nutrition such as high calorie drinks
- Diet higher in fat and carbohydrates
- Regular snacks throughout the day



Salt



<120mg/
100gm

- Salt restriction is important as salt is an anti-diuretic
- High sodium consumption increases the risk of heart disease and stroke.
- Most people consume too much salt—on average 9–12 grams per day, or around twice the recommended maximum level of intake.
- Salt intake of less than 5 grams per day for adults helps to reduce blood pressure and risk of cardiovascular disease, stroke and coronary heart attack. The principal benefit of lowering salt intake is a corresponding reduction in high blood pressure.
- Reducing salt intake has been identified as one of the most cost-effective measures countries can take to improve population health outcomes. An estimated 2.5 million deaths could be prevented each year if global salt consumption were reduced

Choosing foods at the supermarket

- Choose foods that are low in salt
- Most of the salt we eat is hidden in processed foods. Checking the nutrition information on food labels is an easy way to choose foods lower in salt.

If choosing processed foods, look for 'no added salt', 'reduced salt/sodium', 'low salt/sodium' or 'unsalted'.

Salt is measured as sodium on food labels.

The main ingredients come at the start of the ingredients list. Avoid foods where salt or sodium chloride is listed near the start of the ingredients.

Nutrition information		
Serving size: 45g		
Servings per package: 10		
	Per serve	Per 100g
Energy (kJ)	659	1465
(cal)	158	350
Protein (g)	4.3	10.6
Fat-Total (g)	1.3	2.9
- Saturated Fat (g)	0.3	0.6
Carbohydrate-Total (g)	28.0	62.3
Sugars (g)	11.2	24.8
Dietary Fibre (g)	7.5	16.6
Sodium (mg)	195	300
Ingredients: Cereals (68%) [wholegrain Cereals (52%) (wheat, whole wheat flour, barley malt flour), wheat bran (16%)], suitarani (20%), sugar, barley malt extract, maize starch, salt, vitamin E.		

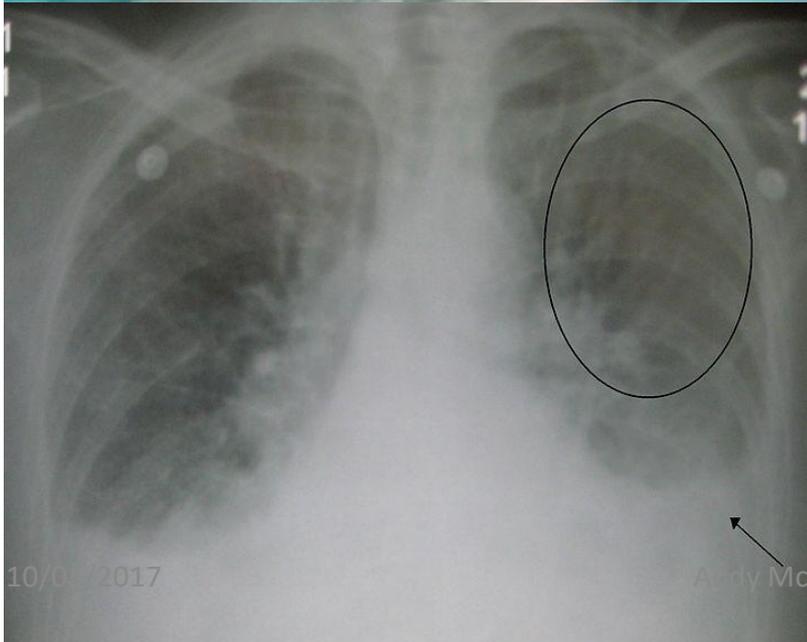
Compare foods and choose the brand with the lowest sodium per 100g.

Look for the words salt, sodium chloride or brine on the ingredients list.

Fluid



- Monitor fluid intake – fluid should be restricted to between 1.5 and 2 L/day in patients with **moderate or more severe** symptoms of fluid overload.



- There is less evidence that fluid restriction is beneficial in patients with mild symptoms of heart failure.

Potassium

- Excreted when taking diuretics
- Hypokalemia can cause weak muscles, abnormal heart rhythms, and a slight rise in blood pressure.
- Hyperkalemia may cause abnormal and dangerous heart rhythms.

The following foods provide good sources of potassium:

- bananas
 - oranges
 - prunes
 - soybeans
 - cantaloupe melon
 - fish such as halibut or flounder
 - potatoes.
- Eating salty foods will increase sodium concentration and as a result, potassium loss occurs.



Activity



Exercise-based rehabilitation for heart failure (Review)

Taylor RS, Sagar VA, Davies EJ, Briscoe S, Coats AJS, Dalal H, Lough F, Rees K, Singh S



This updated Cochrane review supports the conclusions of the previous version of this review that, compared with no exercise control, exercise-based rehabilitation does not increase or decrease the risk of all-cause mortality in the short term (up to 12-months' follow-up) but reduces the risk of hospital admissions and confers important improvements in health-related quality of life. This update provides further evidence that exercise training may reduce mortality in the longer term and that the benefits of exercise training on appear to be consistent across participant characteristics including age, gender and HF severity. Further randomised controlled trials are needed to confirm the small body of evidence seen in this review for the benefit of exercise in HFPEF and when exercise rehabilitation is exclusively delivered in a home-based setting.

Smoking cessation

- ABC for smoking cessation

- ASK
- BRIEF ADVICE
- CESSATION SUPPORT



Emotions

- Encourage people to talk about their feelings
- Support people to take a more active role in managing heart failure
- Promote regular activity and exercise
- Support to attend new activities
- Laughter is amazingly therapeutic



Nursing perspective

- Understanding of the cause of heart failure
- Regular monitoring
- Functional aspects
- Nutrition
- Early detection of deterioration
- Familiarity with the medications used
- Psychological perspective
- Regular communication with medical team

your action plan.



1. One to two pillows
– able to lie flat with no shortness of breath.

2. Need to add more than two pillows to avoid shortness of breath.
Take action. Follow your action plan.

3. Unable to lie down flat
– have to sleep upright to avoid shortness of breath.
Take action. Follow your action plan.



1. Weigh yourself everyday



2. Check for swelling everyday



3. Be aware of changes in your breathing

<p>I FEEL WELL</p>	<p>My symptoms:</p> <ul style="list-style-type: none"> • Weight is on target • Little or no swelling • Breathing is easy. 	<p>What to do:</p> <ul style="list-style-type: none"> • Keep taking my pills • Keep eating less salt as part of a healthy, balanced diet • Keep doing my daily checks – weight, swelling and breathing • Keep making changes to improve my health.
<p>I DO NOT FEEL WELL</p>	<p>My symptoms:</p> <p>Weight is up by ___ kgs over 1–2 days</p> <ul style="list-style-type: none"> • Swelling in ankles, legs or tummy • Hard to breathe with activity or at night • Need to use more pillows at night • Constant cough or wheeze • Very tired. <p>Weight is down by ___ kgs over 1–2 days</p> <ul style="list-style-type: none"> • Dry mouth/skin • Dizziness. 	<p>What to do:</p> <p>If my weight has increased:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>If my weight has decreased:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Call my doctor or nurse:</p> <p>_____</p>
<p>I NEED TO GET HELP NOW</p>	<p>My symptoms:</p> <ul style="list-style-type: none"> • Sudden, severe shortness of breath • Angina not relieved after following angina action plan • Develop new chest pain/ tightness/heaviness • Sweating, weakness or fainting. 	<p>What to do:</p> <ul style="list-style-type: none"> • Get help NOW • Call 111 for emergency help.

HF action plan

Heart Failure and Death

Reality of heart failure is:

- Usually terminal
- Prognostic uncertainty
- Sudden death
- Worse prognosis than for most common cancers

Planning for end of life

- Advance care directive
- Do-not-resuscitate order
- Living will
- Financial plan

09/07/2015

Andy Mclachlan NP CMH

All patients with end-stage heart failure resistant to optimal heart failure therapy should be offered a palliative approach.

Strength of Evidence = B

NZ guidelines 2012

End of Life Considerations

- Inclusive in disease management
- Discuss specific directions in response to clinical events such as CPR or ICD deactivation
- Should be reviewed frequently
- The addition of palliative care **does not mean rejection** of heart failure therapies

Palliative Care in Heart Failure

- Ease suffering
- Morphine – anxiolytic, sedative, pulmonary vasodilator, mild respiratory depressant
- Oxygen eases dyspnoea
- Review non essential medication
- Some therapies may assist with symptom management at end of life and should be continued, whilst others may not be required.

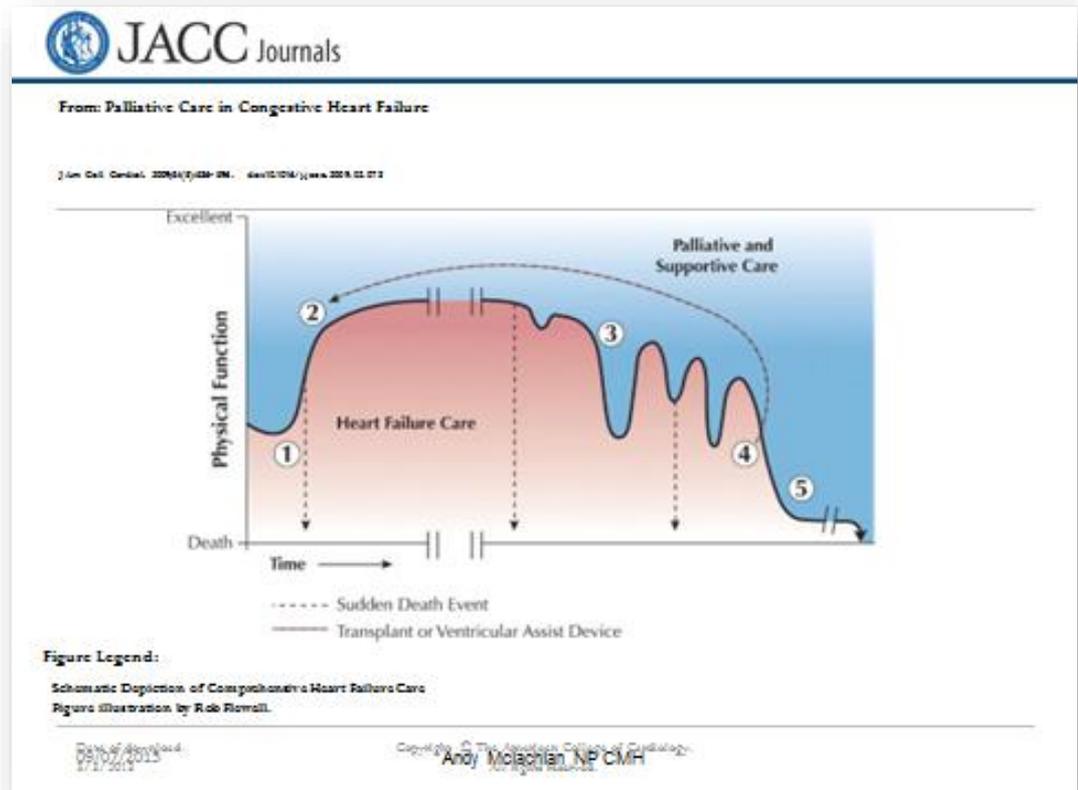
Morphine

- Should be used routinely if patient is breathless despite conventional cardiac drugs
- Reduces sensation of breathlessness and can increase exercise tolerance
- May reduce hospitalisations when all other therapeutic options have been exhausted

- A palliative care plan does not replace the multidisciplinary programmes of care used for optimal heart failure management, but rather builds on and adds to such strategies.
- Management of symptoms associated with heart failure at the end of life is an important aspect of palliative care:
 - *breathlessness*: diuretics will generally still be required to optimise management of fluid overload. Opioids such as morphine can also be effective in managing shortness of breath;
 - *fatigue*: look for potentially reversible causes such as an infection, anaemia and drug side effects. Measures such as gentle exercise, relaxation, visualisation techniques and pacing of activities may be helpful;
 - *thirst*: sucking on frozen juice cubes, using mouth washes or artificial salivas/ saliva stimulants (such as chewing gum) may be effective in managing xerostomia;
 - *angina*: some patients with end-stage heart failure may have ongoing debilitating angina. Continuation of long-acting nitrate therapy and morphine may be required;
 - *anorexia/cachexia*: look for potentially reversible causes such as oral candidiasis, untreated nausea, constipation and ill-fitting dentures.
- The indications for ongoing medical heart failure therapies should be reviewed regularly. Some therapies may assist with symptom management at end of life and should be continued, whilst others may not be required. Therapeutic decisions should be individualised for each patient.
- Patients with an ICD may require specific counselling regarding switching off the ICD during end-of-life care.

Different model to cancer

- No clearly defined terminal stage
- Less predictable course, “roller coaster ride” with dips and highs
- Prognosis uncertain but risk of sudden death



When is heart failure end-stage?

- Confirmed diagnosis
- Severely impaired, EF <20%
- Not a candidate for device therapy, or surgery
- BNP >200 on maximal therapy
- Persistent NYHA class III-IV symptoms
- Multiple co-morbidities which influence initiating HF therapy
- Inability to optimise medical therapy

- “The course to death should not be characterized by severe dyspnoea or volume overload. Rather, most dying patients managed well experience metabolic derangement and coma, or sudden death”

And the presence of.....

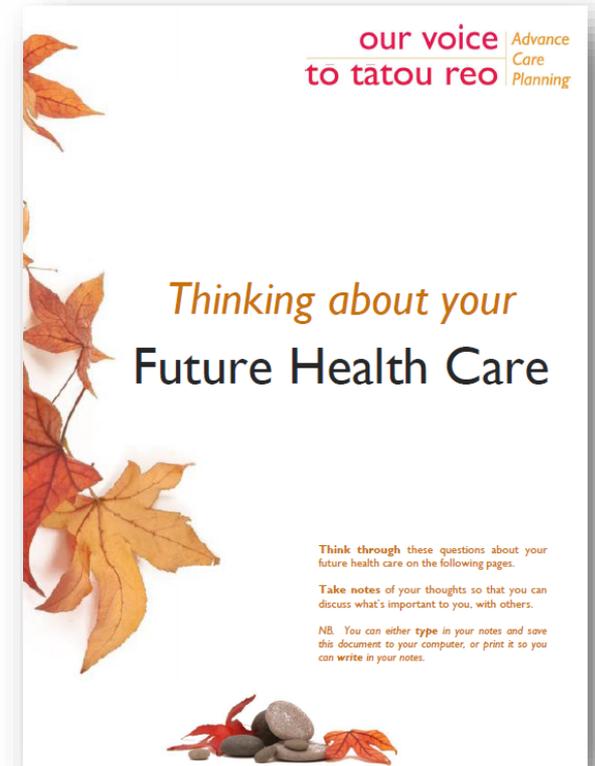
- Cachexia
- Hyponatraemia
- Anaemia
- Elevated uric acid and deteriorating renal functions
- Wide QRS >0.12
- Age
- Substantial functional decline
- Depression
- LV diameter $>70\text{mm}$
- Social support
- Hr >100
- Syncope, frequent firing of ICD
- Serious co-morbidity
- Multiple admissions
- Low income

NYHA class IV

- Refractory end stage disease (stage D, NYHA class IV)
- 1-2 year survival of less than 50%
- Medications no longer so well tolerated
- Spontaneous reversal of this stage is unusual

Difficult conversations

- What's the most important issue in your life right now?
- What helps you keep going?
- How do you see the future?
- What is your greatest worry or concern?
- Are there ever times when you feel down?
- If things got worse, where would you like to be cared for?



Cinical Practice Points

Management of symptoms associated with heart failure at the end of life is an important aspect of palliative care:

–*Breathlessness*

–*Fatigue*

–*Thirst*

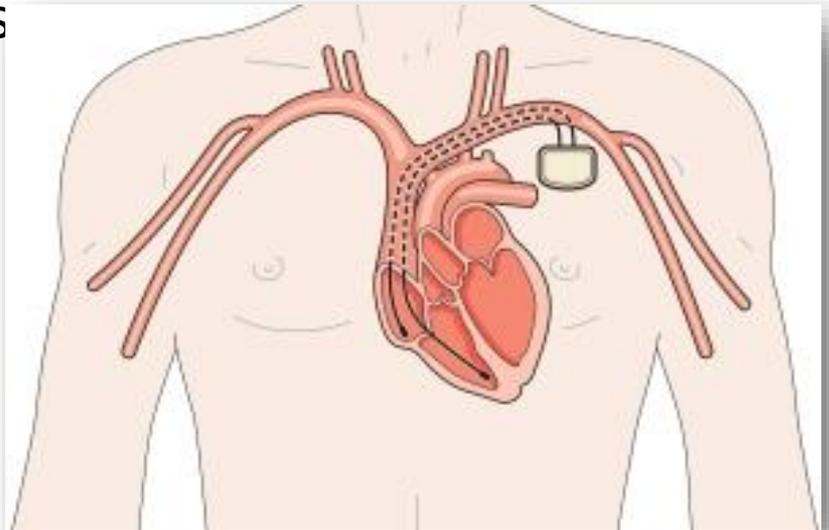
–*Angina*

–*anorexia/cachexia:*



ICD deactivation

- Advanced HF patients who prefer to be allowed to die naturally when the time comes should have a defibrillator electively deactivated
- **Will I die immediately when the ICD is switched off?**
- No. The ICD only functions to treat any life-threatening interruptions in heart rhythm as they arise. It doesn't keep you alive on a day-to-day basis.



Barriers to Palliative Care

- Unpredictable course for heart failure
- Palliative model is an acute model based on end stage cancer
- Doctors understanding of the palliative role
- GPs reluctance to endorse the expansion of specialist palliative services
- Chronic care model

Dual approach?

- Active management continued
- Possibility of death acknowledged and discussed
- Focus on symptom control/family support
- Benefit from multidisciplinary/ continuity of care

Management interventions for patients with heart failure

Include:

- comprehensive education and involvement of the patient and family/support people;
- social support;
- focus on patient self-management strategies;
- attention to compliance with healthcare and self management;
- optimisation of medical therapy;
- structured follow-up (often in shared-care settings with hospital and primary care);
- more intensive disease management strategies for patients recently hospitalised with heart failure who are particularly vulnerable (such as those with English as a second language, multiple previous hospital admissions or from lower socioeconomic conditions);
- interventions may commence during a hospital admission and continue with early, planned and structured follow-up to address the needs of the patient.
- Any structured programme/intervention should have flexibility and be able to be adapted according to the needs of the individual patients and the local healthcare environment.
- The heart failure nurse specialist has a key role in management and often will work as part of a multidisciplinary team.
- Remote monitoring (telemonitoring) may be considered for some patients.
- **Adequate funding is required to sustain such management interventions.**

Management interventions for patients with heart failure

- Weight monitoring is advised as part of regular self-care management programmes in patients with heart failure.
- Provide a clear action plan as to when a patient should seek medical help in the face of deteriorating symptoms such as weight gain, shortness of breath, peripheral oedema, or other symptoms.
- All patients should understand the reasons for taking their prescribed drugs, the dosing and potential side effects.
- An ABC approach to smoking cessation should be used for all patients with heart failure who smoke.
- Influenza and pneumococcal vaccination should be considered for all patients with heart failure.
- Dietary sodium should be restricted, excessive fluid intake avoided and alcohol intake limited in patients with heart failure.

Questions

- Acknowledge
- June Poole and Tim Sutton and Katherine Mclean for sharing slides

