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# Modern management of Heart Failure

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# Prevalence and burden of heart failure

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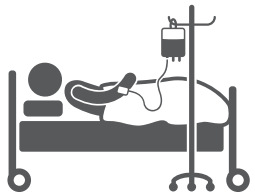
Up to **1 in 5** people are expected to develop **heart failure** in their lifetime[1]

There are **920,000 people** in the **UK** living with **heart failure**[2]



**~30%** of people hospitalised with heart failure are **readmitted** within **90 days**[4]

**Heart failure** is the leading cause of **hospitalisation** in people aged **>65 years**[3]

£

**2%** of the total **NHS budget** is spent on heart failure hospitalisations[5]

Up to **80%** of costs for HFpEF are related to **hospitalisation***[6]

**~30%** of people **die within 1 year** of a hospitalisation for heart failure[7]

The overall prevalence of heart failure is increasing due to an ageing population and improved survival post-ischaemic disease[5]

***Based on single studies from Hong Kong, Northern Ireland and Sweden, and six studies from the USA.**

HFpEF, heart failure with preserved ejection fraction.

1. European Society of Cardiology. One in five people will develop heart failure. Available at: www.escardio.org/The-ESC/Press-Office/Press-releases/One-in-five-people-will-develop-heart-failure. Accessed May 2023; 2. British Heart Foundation. BHF statistics factsheet – UK 2018. Available at: www.bhf.org.uk/what-we-do/our-research/heart-statistics. Accessed May 2022; 3. NICE. Acute heart failure: diagnosis and management (CG187). Available at: https://www.nice.org.uk/guidance/cg187. Accessed May 2023; 4. Khan MS, et al. Circ. Heart Fail 2021;14:e008335; 5. NICE. Chronic heart failure in adults: diagnosis and management. Research impact report (NG106). Available at: www.nice.org.uk/guidance/ng106. Accessed May 2022; 6. Clark H, et al. Heart Fail Rev 2021; doi:10.1007/s10741-021-10097-7; 7. Taylor CJ, et al. BMJ 2019;364:l223.

# Underlying causes of heart failure

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Heart failure can be underpinned by a range of mechanisms, often acting in synergy, including:*

## Direct cardiac causes[1]

- Ischaemia (e.g. MI, CAD)
- Ventricular or atrial arrythmias (e.g. atrial fibrillation)
- Infiltrative (e.g. amyloidosis)
- Valvular disease
- Inflammatory or autoimmune disease (e.g. myocarditis)

## Systemic causes

- Hypertension[1]
- Renal dysfunction/ failure[2]
- Diabetes,[3] metabolic perturbations,[1] and obesity[1]

## Environmental/ genetic causes[1]

- Genetic conditions (e.g. hypertrophic cardiomyopathy)[1]
- Toxin consumption (e.g. alcoholic cardiomyopathy)[1]
- Cardio-oncology

***For a full list of causes of heart failure, please refer to slide references.**

CAD, coronary artery disease; MI, myocardial infarction.

1. McDonagh TA, et al. Eur Heart J 2021;42:3599–3726; 2. Garcia-Donaire JA & Ruilope LM. Int J Nephrol 2011;2011:975782; 3. Gulsin G, et al. Ther Adv Endocrinol Metab 2019;10:2042018819834869.

# What is heart failure?

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- A complex clinical syndrome resulting from any structural or functional cardiac disorder that impairs the ability of the heart to function as a pump[1]
- Classification based on left ventricular ejection fraction (LVEF)[2]
- LVEF is a measure, expressed as a percentage, of how much blood the left ventricle pumps out with each contraction[3]
    - LVEF = (stroke volume / end-diastolic volume) x 100[4]
    - 'Normal' LVEF may be between 50 and 70%[5]

| LVEF ≤40% | LVEF 41–49% | LVEF ≥50% |
|---|---|---|
| **HFrEF**[2] (Heart failure with **reduced** ejection fraction) | **HFmrEF**[2] (Heart failure with **mildly reduced** ejection fraction) | **HFpEF**[2] (Heart failure with **preserved** ejection fraction) |

HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; LVEF, left ventricular ejection fraction.

1. Yusuf SW, et al. Chronic congestive heart failure. BMJ Best Practice 2021. Available at: bestpractice.bmj.com/topics/en-gb/61. Accessed May 2023; 2. Bozkurt B, et al. Eur J Heart Fail 2021;23:352–380; 3. American Heart Association (AHA). Ejection fraction heart failure measurement 2017. Available at: www.heart.org/en/health-topics/heart-failure/diagnosing-heart-failure/ejection-fraction-heart-failure-measurement. Accessed May 2023; 4. Kosaraju A, et al. Left ventricular ejection fraction. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Available at: www.ncbi.nlm.nih.gov/books/NBK459131/. Accessed May 2023; 5. McDonagh TA, et al. Eur Heart J 2021;42:3599–3726.

# HFrEF and HFpEF are distinct categories of heart failure

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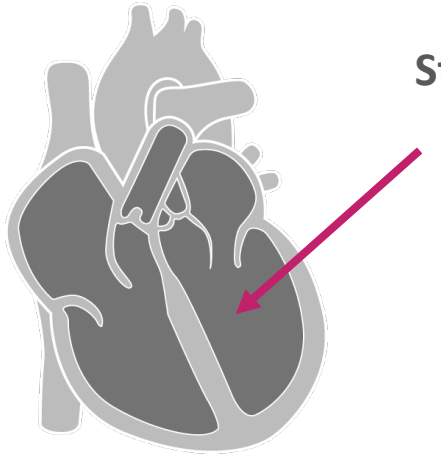
## Heart failure with reduced ejection fraction (HFrEF, LVEF ≤40%)[1]

Failure of normal **contraction** and **emptying**



**Stretched** and **dilated** chambers

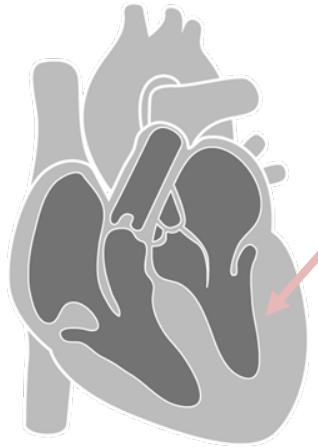
**Increased** diastolic volume

Left ventricle **fails to eject blood**, leading to:

- **reduced volume** of blood leaving the heart when it contracts
- **lowered LVEF**

## Heart failure with preserved ejection fraction (HFpEF, LVEF ≥50%)[2,3]

Failure of normal **relaxation** and **filling**



**Stiffened** or **thickened** chambers

Ventricle walls are **stiffened** or **thickened**, leading to:

- **diastolic dysfunction** and ventricle filling with **increased pressure**
- **preserved LVEF**

**Patients with an LVEF of 41–49% are classified as HFmrEF (heart failure with mildly reduced ejection fraction)[4]**

HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; LVEF, left ventricular ejection fraction.

1. Kemp CD & Conte JV Cardiovasc Pathol 2012;21:365–371; 2. Obokata M, et al. JACC Cardiovasc Imaging 2020;13:245–257; 3. Bozkurt B, et al. Eur J Heart Fail 2021;23:352–380; 4. McDonagh TA, et al. Eur Heart J 2021;42:3599–3726.

# What does this mean in figures?

| Normal | HFREF | HFpEF |
|---|---|---|
| EDV in LV = 142mls | EDV in LV = 150mls | EDV in LV = 100mls |
| ESV in LV = 47mls | ESV in LV = 100mls | ESV = 47mls |
| Stroke Volume = 95mls | Stroke volume = 50mls | Stroke volume = 53mls |
| LVEF (SV/EDV x100) = 67% | LVEF = 33% | LVEF = 53% |

# Definition of heart failure with reduced ejection fraction, mildly reduced ejection fraction and preserved ejection fraction

| Type of HF | | HFrEF | HFmrEF | HFpEF |
|---|---|---|---|---|
| CRITERIA | 1 | Symptoms ± Signs[a] | Symptoms ± Signs[a] | Symptoms ± Signs[a] |
| | 2 | LVEF ≤40% | LVEF 41–49%[b] | LVEF ≥50% |
| | 3 | - | - | Objective evidence of cardiac structural and/or functional abnormalities consistent with the presence of LV diastolic dysfunction/raised LV filling pressures, including raised natriuretic peptides[c] |

HF = heart failure; HFmrEF = heart failure with mildly reduced ejection fraction; HFpEF = heart failure with preserved ejection fraction; HFrEF = heart failure with reduced ejection fraction; LV = left ventricle; LVEF = left ventricular ejection fraction.
[a]Signs may not be present in the early stages of HF (especially in HFpEF) and in optimally treated patients.
[b]For the diagnosis of HFmrEF, the presence of other evidence of structural heart disease (e.g. increased left atrial size, LV hypertrophy or echocardiographic measures of impaired LV filling) makes the diagnosis more likely.
[c]For the diagnosis of HFpEF, the greater the number of abnormalities present, the higher the likelihood of HFpEF.

©E2C



2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure
(European Heart Journal 2021 – doi:10.1093/eurheartj/ehab368)

# HOW TO CODE – UMBRELLA CODE

## USE ME:

- Heart failure (disorder) **84114007**[1] *(previously G580.)*

1. Expanded Cluster List. Available at: https://digital.nhs.uk/binaries/content/assets/website-assets/data-and-information/data-collections/qof/expanded_cluster_list_qof_v46.xlsm (Last accessed April 2023)

# ADD THE APPROPRIATE SUBCATEGORY CODE HUB SPOKE[1]

## USE ME

**HFrEF**

- Heart Failure with reduced ejection fraction (disorder) – 703272007
  The advantage of using this code is that it simultaneously places the patient on the HF register.
- Echocardiogram shows left ventricular systolic dysfunction (finding) – 407596008
  This is a commonly used code that can be used to subcategorise HFrEF patients. When using this code remember to code HF in addition to place a patient on the register

**HFpEF**

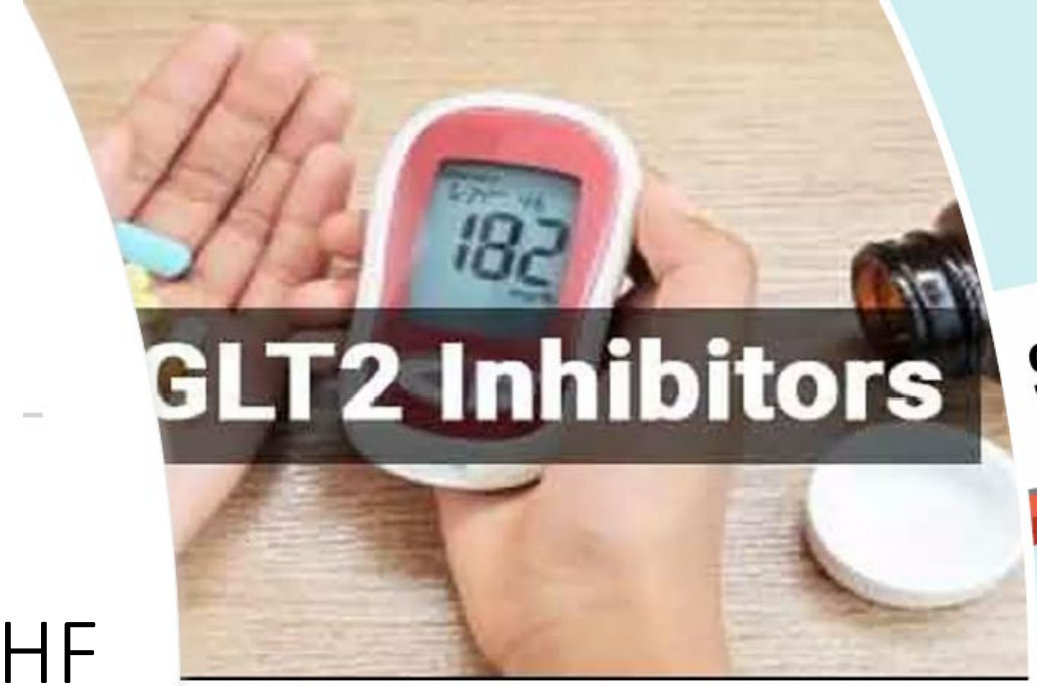
- Heart Failure with normal ejection fraction (disorder) – 446221000
  The advantage of using this code is that it simultaneously places the patient on the HF register.
- Echocardiogram shows left ventricular diastolic dysfunction (finding) – 407597004
  This is a commonly used code that can be used to subcategorise HFpEF patients. When using this code remember to code HF in addition to place a patient on the register

**HFmrEF**

- Heart failure with mid range ejection fraction (disorder) – 788950000
  The advantage of using this code is that it simultaneously places the patient on the HF register.

1. Expanded Cluster List. Available at: https://digital.nhs.uk/binaries/content/assets/website-assets/data-and-information/data-collections/qof/expanded_cluster_list_qof_v46.xlsm (Last accessed April 2023)

# Preventing HF






# Preventing HF

**Recommendations for the primary prevention of heart failure in patients with risk factors for its development**

| Recommendations | Class[a] | Level[b] |
|---|---|---|
| Treatment of hypertension is recommended to prevent or delay the onset of HF, and to prevent HF hospitalizations.[287–290] | I | A |
| Treatment with statins is recommended in patients at high risk of CV disease or with CV disease in order to prevent or delay the onset of HF, and to prevent HF hospitalizations.[291,292] | I | A |
| SGLT2 inhibitors (canagliflozin, dapagliflozin, empagliflozin, ertugliflozin, sotagliflozin) are recommended in patients with diabetes at high risk of CV disease or with CV disease in order to prevent HF hospitalizations.[293–297] | I | A |
| Counselling against sedentary habit, obesity, cigarette smoking, and alcohol abuse is recommended to prevent or delay the onset of HF.[298–302] | I | C |

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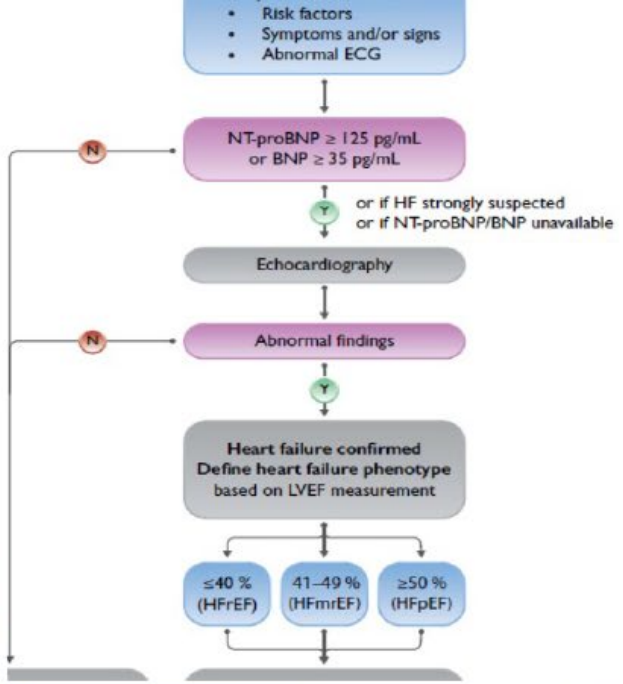
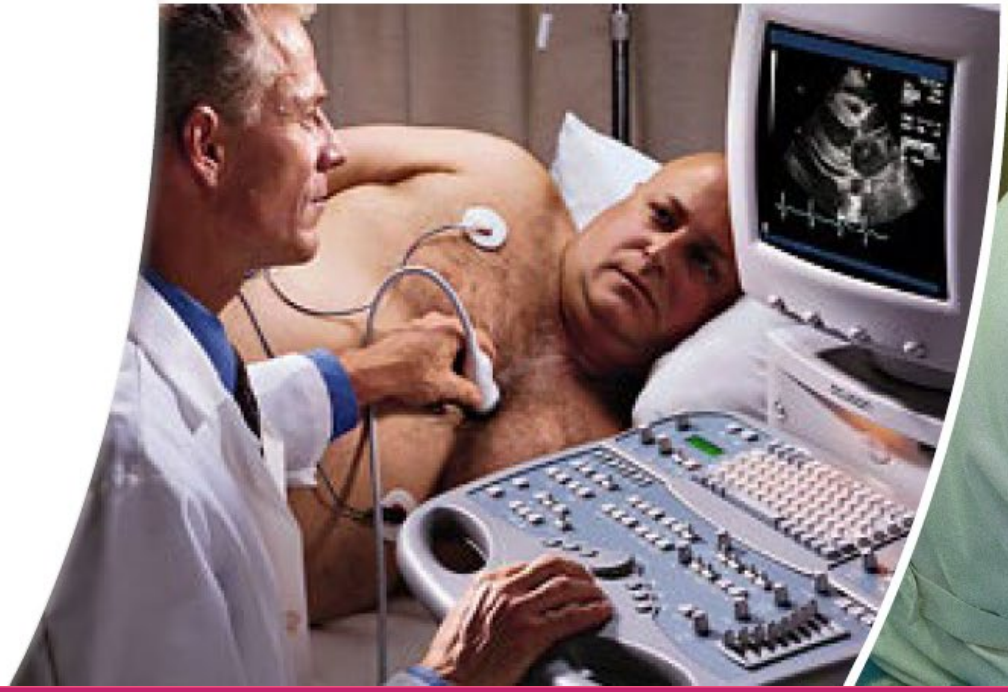
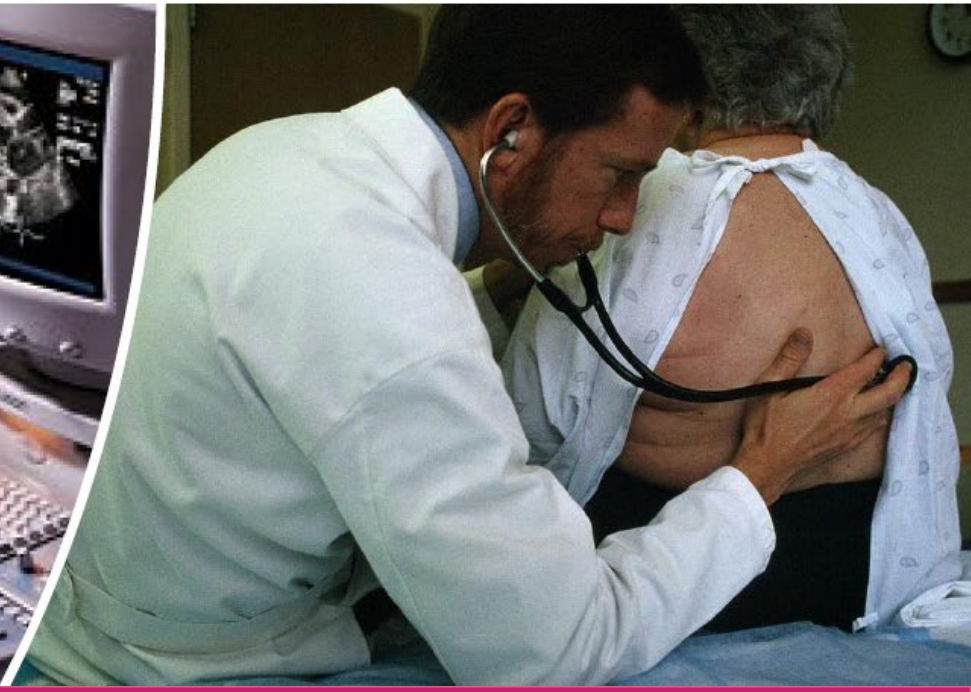
CV, cardiovascular; HF, heart failure; SGLT2, sodium-glucose co-transporter-2.
McDonagh TA, et al. Eur Heart J 2021;42:3599-3726.

# Diagnosing HF





# NICE guidance on diagnosing chronic heart failure

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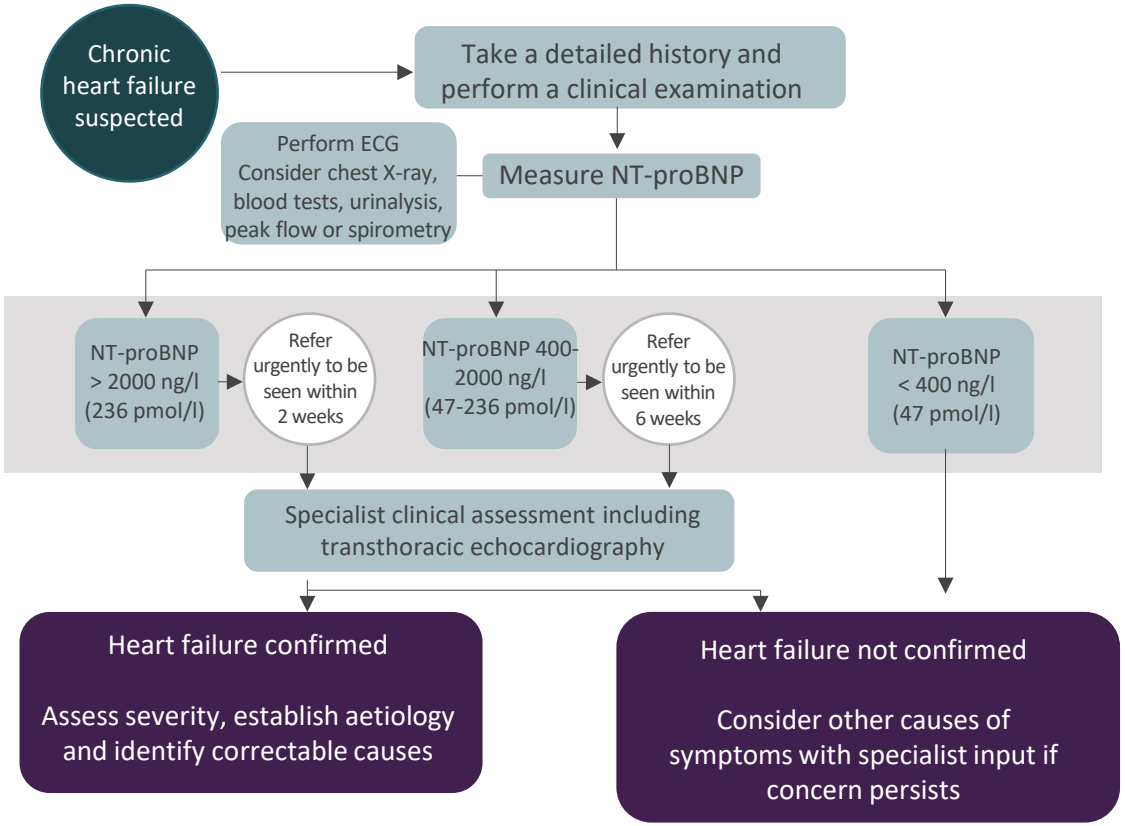
Blood tests:

- renal function profile
- thyroid function profile
- liver function profile
- lipid profile
- glycosylated haemoglobin (HbA1c)
- full blood count




ECG, electrocardiogram; NICE, National Institute for Health and Care Excellence; NT-proBNP, N-terminal pro-B-type natriuretic peptide.

NICE. Chronic heart failure in adults: diagnosis and management (NG106). Available at: www.nice.org.uk/guidance/ng106. Accessed May 2023.

# LEFT VENTRICULAR WALL STRESS INDUCES NEW BNP SYNTHESIS

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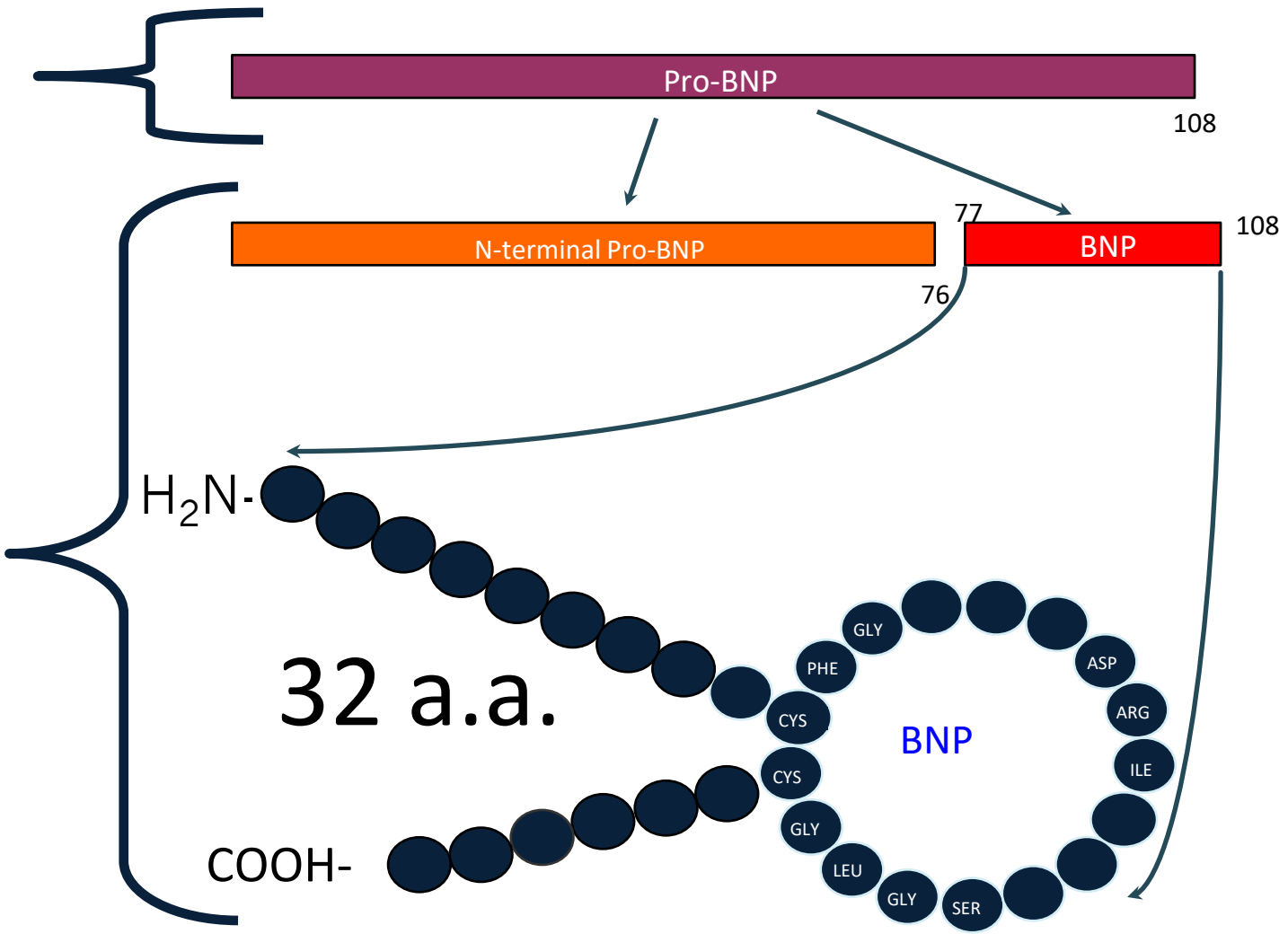
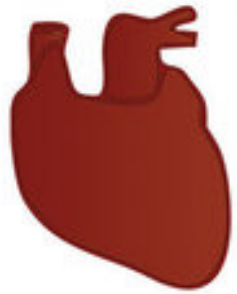


**Natriuretic peptides**

Kidney

Increase sodium and water excreation by:
•RAAS inhibition
•GFR increase
•renal SNS inhibition

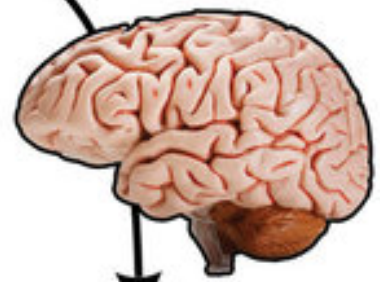


Heart

•Cardiac load reduction
•Hypertrophy inhibition
•Fibrosis inhibition

Vascular system

•Vasodilation
•Hypotensive efects
•Angiogenic efects



Nervous system

•SNS inhibition
•Lowering of vagal afferents activation treshold

# Other conditions can cause elevated natriuretic peptides

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## Cardiac causes

- Heart failure
- Acute coronary syndrome
- Myocarditis
- Left ventricular hypertrophy
- Hypertrophic or restrictive cardiomyopathy
- Valvular heart disease
- Congenital heart disease
- Atrial and ventricular tachyarrhythmias
- Heart contusion
- Cardioversion, ICD shock
- Surgical procedures involving the heart
- Pulmonary hypertension

## Non-cardiac causes

- Advanced age
- Ischaemic stroke
- Subarachnoid haemorrhage
- Renal dysfunction
- Liver dysfunction (mainly liver cirrhosis with ascites)
- Paraneoplastic syndrome
- COPD
- Severe infections (including pneumonia and sepsis)
- Severe burns
- Anaemia
- Severe metabolic and hormone abnormalities (e.g. thyrotoxicosis, diabetic ketosis)

***Note some medications for comorbidities like hypertension may make N-terminal pro-B-type natriuretic peptide (NT-proBNP) levels appear lower (e.g. ACE inhibitors).**

ACE, angiotensin-converting enzyme; COPD, chronic obstructive pulmonary disease; ICD, implantable cardiac defibrillator.

McDonagh TA, et al. Eur Heart J 2021;00:1–28.

# Investigations to evaluate possible aggravating factors and/or alternative diagnoses[1]

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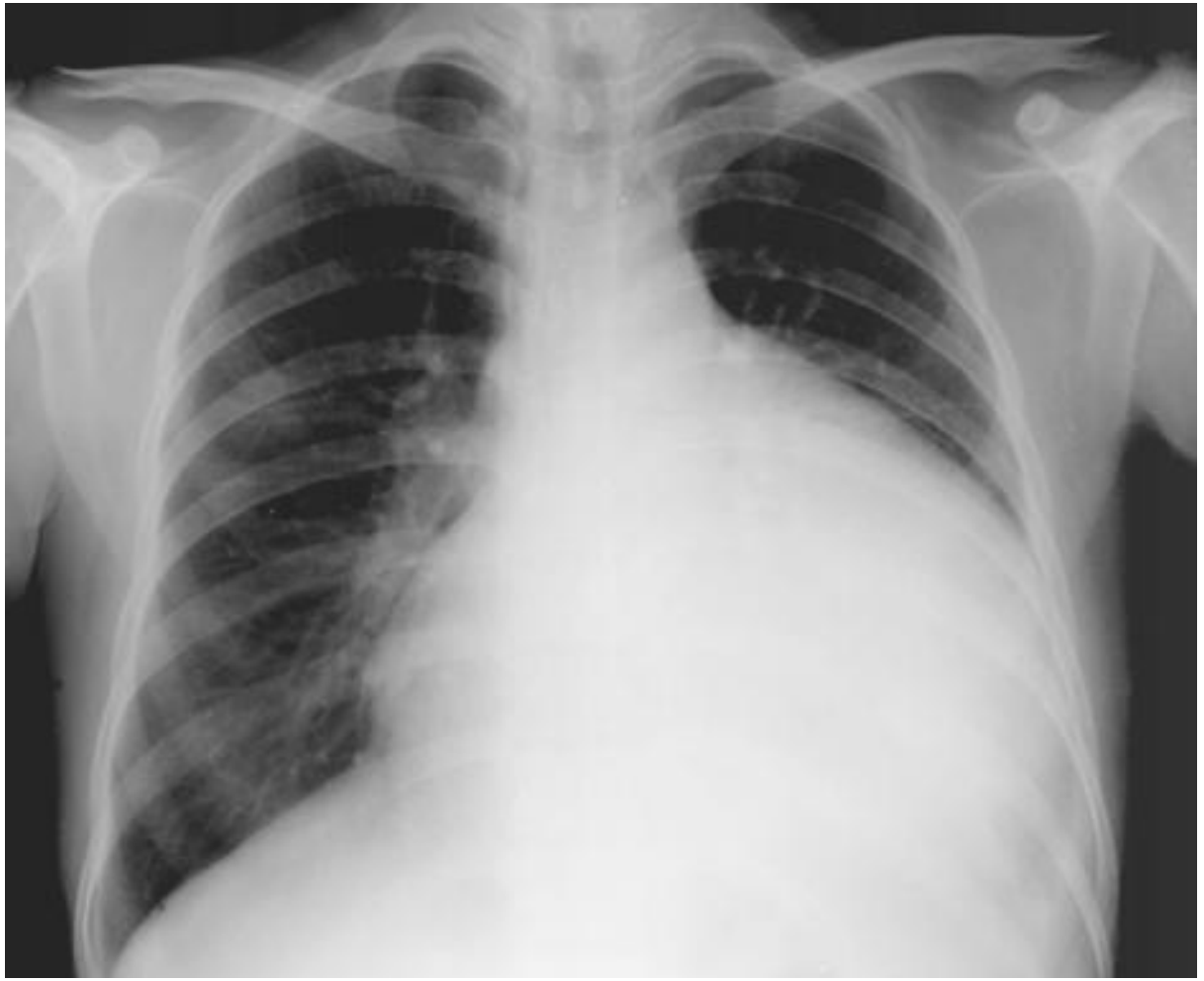
- ECG
- Chest X-ray
- Urinalysis
- Peak flow or spirometry

**Blood tests**

- Renal function profile
- Thyroid function profile
- Liver function profile
- Lipid profile
- Glycosylated haemoglobin
- Full blood count

ECG, electrocardiogram.

# Other Tests: CXR



# HF screening in chronic disease management / health promotion

✓Hypertension

✓CHD

✓Stroke/TIA

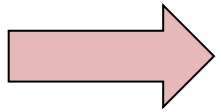
✓Diabetes

✓AF

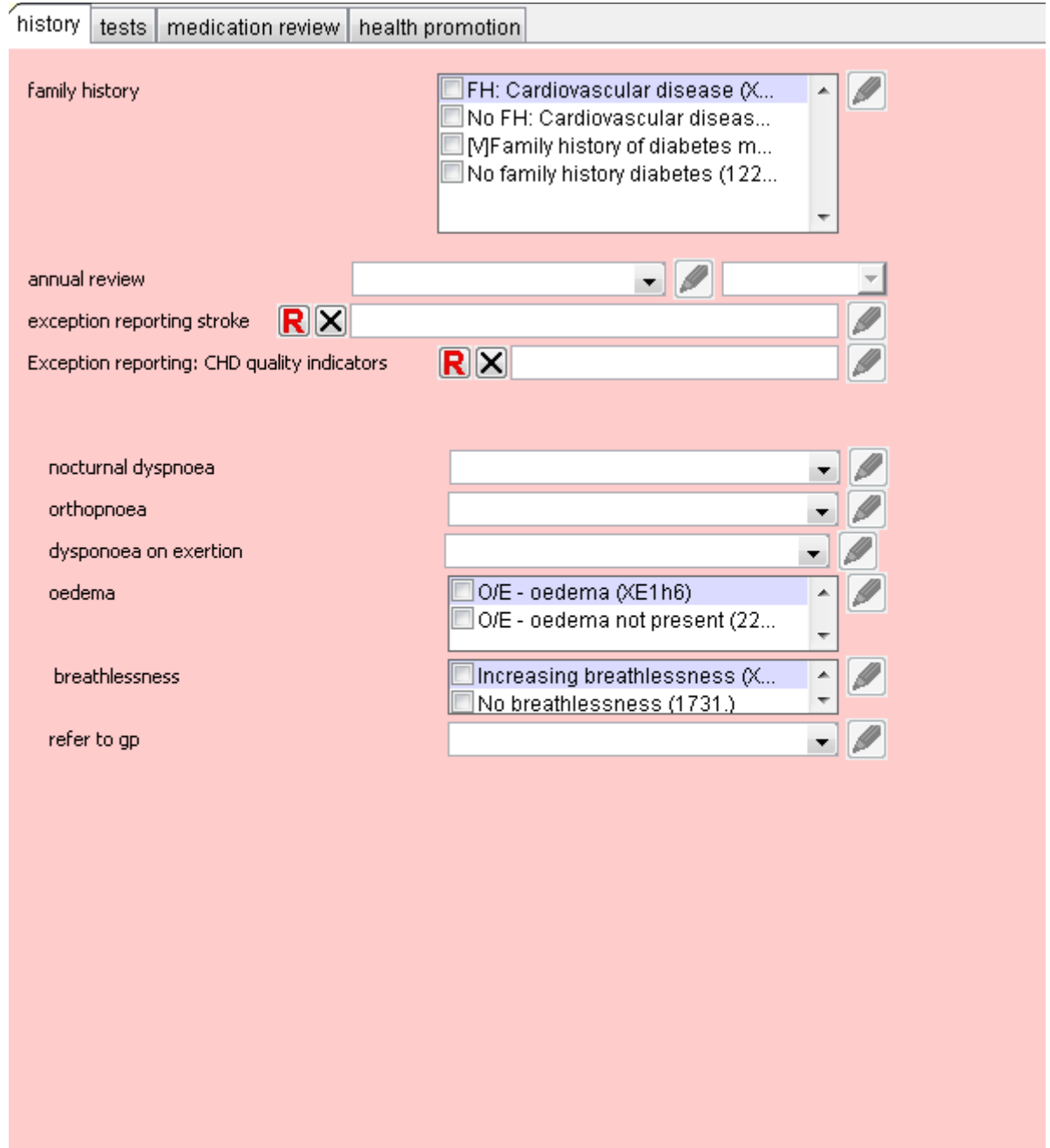
✓CKD

✓PVD

✓Obesity



**> 90% target population coverage**


history
tests
medication review
health promotion
family history
FH: Cardiovascular disease (X...
No FH: Cardiovascular diseas...
[V]Family history of diabetes m...
No family history diabetes (122...
annual review
exception reporting stroke
R
Exception reporting: CHD quality indicators
R
nocturnal dyspnoea
orthopnoea
dysponoea on exertion
oedema
O/E - oedema (XE1h6)
O/E - oedema not present (22...
breathlessness
Increasing breathlessness (X...
No breathlessness (1731.)
refer to gp

Darlington CCG has the highest prevalence of heart failure in the region (93), but the lowest rate of admission to hospital (Figure 31), significantly lower than England as a whole. Darlington also had one of the lowest mortality rates from heart failure in the region in 2015-17 (94). A similar pattern can be seen for Durham Dales, Easington and Sedgefield CCG.

**Figure 31: Heart failure admissions for North East CCG populations, 2017/18**

**Heart failure admissions (all ages)** 2017/18 — Directly standardised rate - per 100,000

| Area | Count | Value | 95% Lower CI | 95% Upper CI |
|---|---|---|---|---|
| **England** | 84,062 | 161.7 | 160.6 | 162.8 |
| Cumbria and North East NHS region | - | - | - | - |
| NHS North Tyneside CCG | 398 | 191.1 | 172.7 | 211.0 |
| NHS Hartlepool And Stockt... | 510 | 189.2 | 173.0 | 206.4 |
| NHS South Tyneside CCG | 282 | 185.4 | 164.2 | 208.4 |
| NHS North Cumbria CCG | 663 | 178.8 | 165.4 | 192.9 |
| NHS Northumberland CCG | 632 | 169.4 | 156.3 | 183.2 |
| NHS Newcastle And Gateshe... | 724 | 168.0 | 155.9 | 180.8 |
| NHS Sunderland CCG | 429 | 161.1 | 146.0 | 177.2 |
| NHS South Tees CCG | 405 | 152.5 | 137.9 | 168.2 |
| NHS North Durham CCG | 340 | 139.3 | 124.8 | 155.0 |
| NHS Durham Dales, Easingt... | 398 | 139.0 | 125.6 | 153.5 |
| NHS Darlington CCG | 123 | 112.0 | 93.0 | 133.7 |

*Source: HES, NHS Digital, ONS*

Source: Cardiovascular Disease Profile, within Fingertips at https://fingertips.phe.org.uk

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The heart failure charity

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# Aims of treatment for heart failure

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- To improve symptoms
- To reduce morbidity (admissions/QOL)
- To reduce mortality

There is now much evidence that treatment can improve prognosis as well as alleviating symptoms.

QOL, quality of life.

# The evolution of HF treatment

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## 1987

- Diuretics
- Digoxin

Improve symptoms only

- Cardiac Transplantation

## 2021

- Diuretics
- ACE-I/ARBs
- Beta-blockers
- MRAs (Aldosterone antagonists)
- ARNI (Entresto)
- SGLT2 inhibitors
- Ivabradine

Improve symptoms & life expectancy

- Ventricular Assist Devices
- CRT
- ICD

Improves life expectancy

- Cardiac Transplantation

ACE-I, angiotensin converting enzyme inhibitors; ARBs, angiotensin receptor blockers; ARNI, angiotensin receptor neprilysin inhibitor; CRT, cardiac resynchronisaton therapy; ICD, implantable cardioverter defibrillator; MRAs, mineralocorticoid receptor antagonists; SGLT2, sodium-glucose co-transporter 2.

# New York Heart Failure Association (NYHA) classifications

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## Chronic heart failure is also classified by patient symptoms using the NYHA classification system

| NYHA score | Patient symptoms |
|---|---|
| Class I | No limitation of physical activity, ordinary physical activity does not cause undue fatigue, palpitation, dyspnoea (shortness of breath) |
| Class II | Slight limitation of physical activity, comfortable at rest, ordinary physical activity results in fatigue, palpitation, dyspnoea |
| Class III | Marked limitation of physical activity, comfortable at rest, less than ordinary activity causes fatigue, palpitation, or dyspnoea |
| Class IV | Unable to carry on any physical activity without discomfort, symptoms of heart failure at rest, if any physical activity is undertaken, discomfort increases |

NYHA, New York Heart Association.

Yancy CW, et al. Circulation 2013;128(16):e240–e327.

# Pharmacological therapy: diuretics

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- Symptomatic treatment when fluid overload is present and manifests as pulmonary congestion or peripheral oedema
- Diuretic use results in rapid improvement of dyspnoea and increased exercise tolerance
- Titrate up and down (dynamic diuretic dosing)
- There are no RCTs that have assessed the effect on symptoms or survival of these agents
- Loop diuretics, thiazides and metolazone
- Diuretics should always be administered in combination with ACE-inhibitors and beta-blockers if tolerated

RCTs, randomised controlled trials.

McMurray JJV, et al. Eur Heart J 2012;33:1787-1847.

# Pharmacological therapy: ACE-inhibitors

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- First-line therapy in all patients (NYHA class I-IV) who have reduced LVEF (<40-45%) to improve survival, symptoms, functional capacity and reduction of hospitalisations
- ACE-inhibitors should be up-titrated if possible to the doses shown to be effective in large, controlled trials in heart failure and not titrated based on symptomatic improvement alone
- Regular monitoring of renal function is recommended

ACE, angiotensin converting enzyme; LVEF, left ventricular ejection fraction; NYHA, New York Heart Association.

Swedberg K, et al. Eur Heart J 2005; 26:1115-1140.

# Pharmacological therapy: angiotensin receptor blockers

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- For patients with heart failure and LVSD
- ARBs can be used as an alternative in ACE-inhibitor intolerant patients to improve morbidity and mortality
- ARBs can be considered in combination with ACE-inhibitors in patients who remain symptomatic to reduce mortality and CHF-related hospitalisations
- Regular monitoring of renal function is recommended

ACE, angiotensin converting enzyme; ARBs, angiotensin receptor blockers; CHF, chronic heart failure; LVSD, left ventricular systolic dysfunction.

1. Swedberg K, et al. Eur Heart J 2005; 26:1115-1140; 2. McMurray JJV, et al. Eur Heart J 2012;33:1787-1847.

# Heart failure alert card

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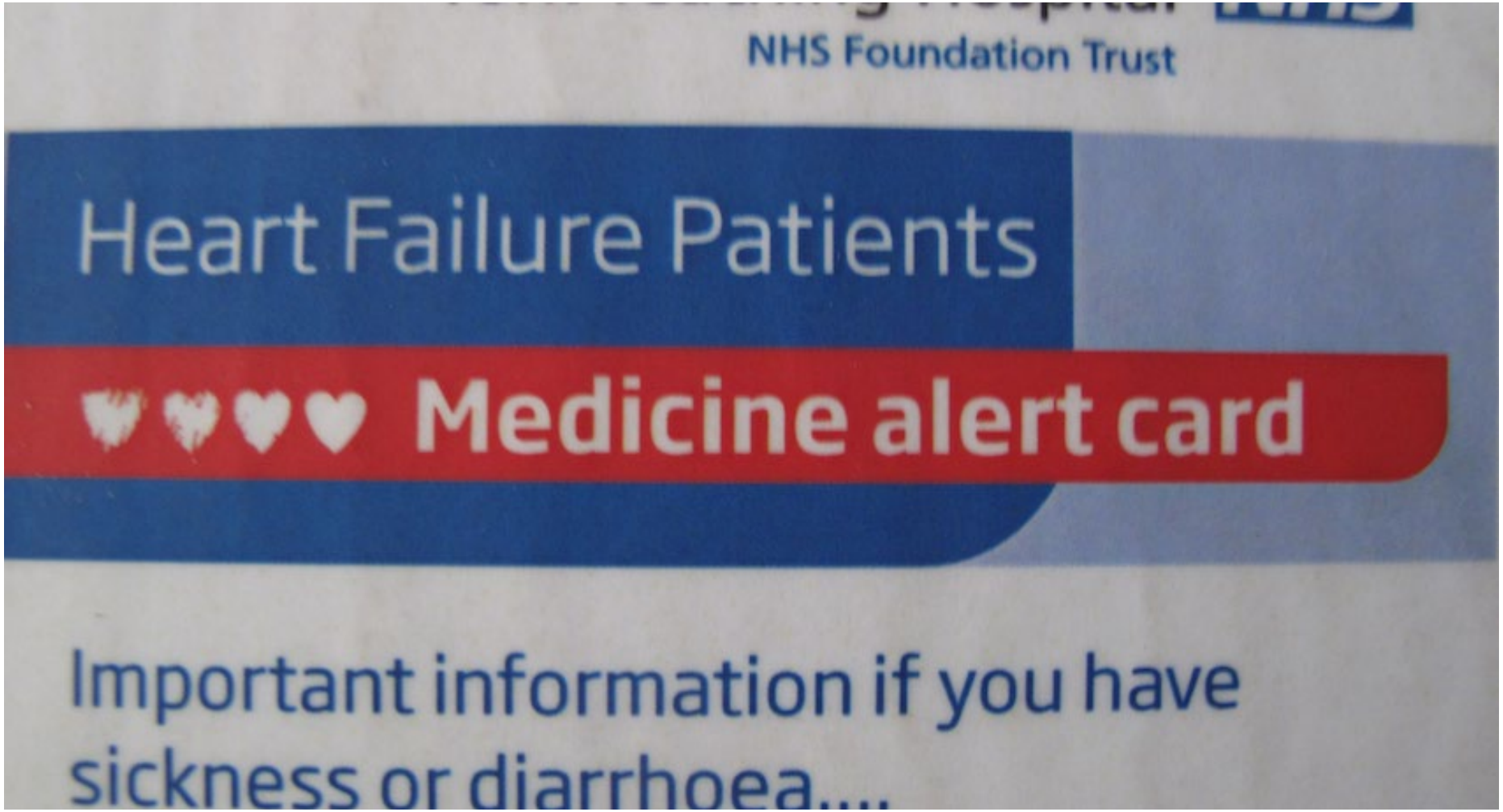

# Heart failure alert card

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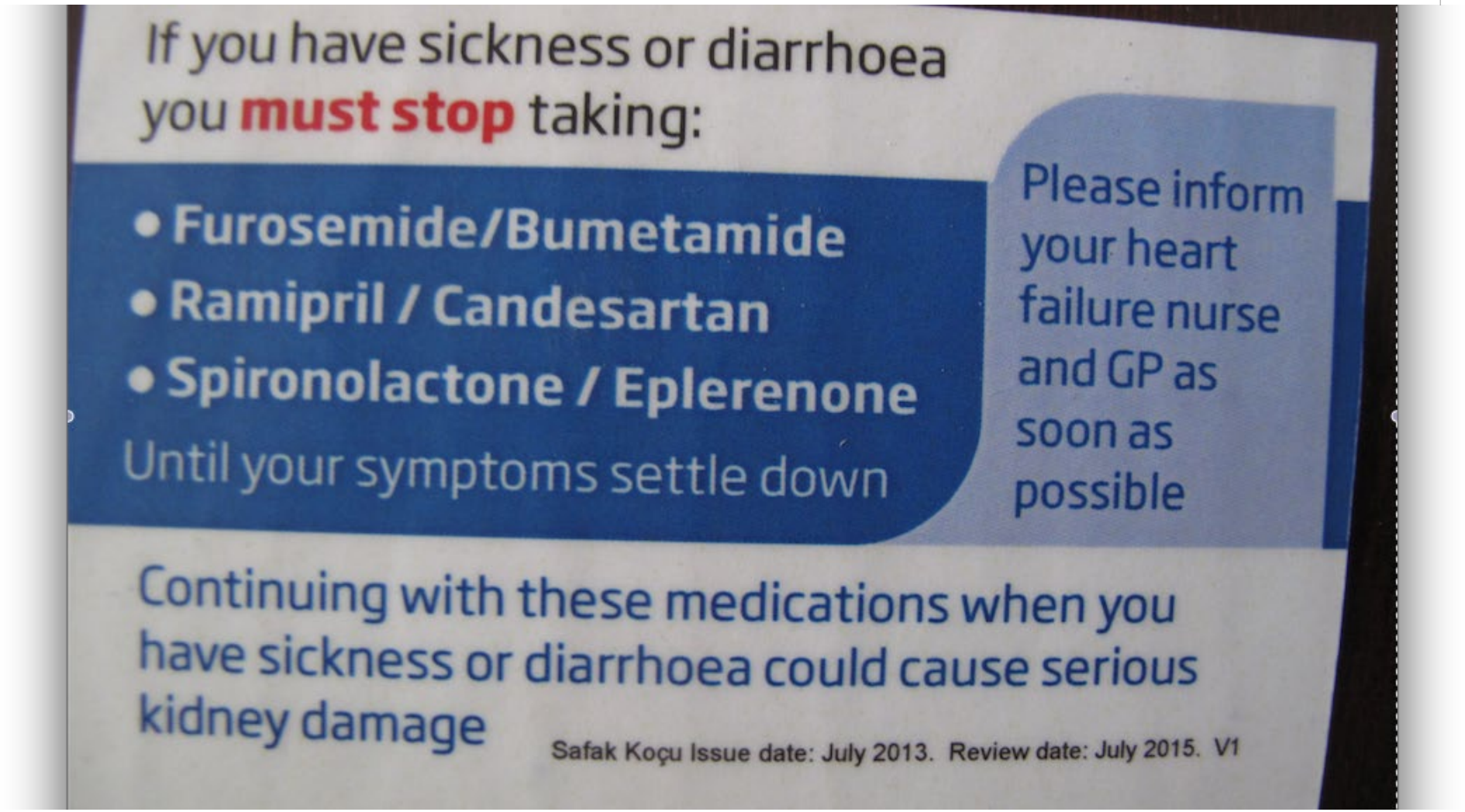

# Pharmacological therapy: beta-blockers

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- Beta-blockers are recommended for the treatment of all patients (NYHA class II-IV) with stable, mild, moderate and severe heart failure with reduced LVEF on standard treatment, including diuretics and ACE-inhibitors, unless there is a contraindication
- Beta-blockers reduce hospitalisations and improve functional class
- Differences in clinical effects may be present between different beta-blockers. Only bisoprolol, carvedilol, metoprolol and nebivolol can be recommended

ACE, angiotensin converting enzyme; LVEF, left ventricular ejection fraction; NYHA, New York Heart Association.

1. McDonagh TA, et al. Eur Heart J 2021;42:3599-3726; 2. NICE CKS. Heart failure – chronic: Scenario: Confirmed heart failure with reduced ejection fraction. Available at: https://cks.nice.org.uk/topics/heart-failure-chronic/management/confirmed-heart-failure-with-reduced-ejection-fraction/. Accessed May 2023.

# Beta blocker titration in CHF

- **S**tart low – **T**itrate slowly – **A**im for target doses

- **B-Blocker 1st dose titration scheme daily dose (mg)**
- Wk1 Wk2 Wk3 Wk4 Wk5 Wk6 Wk7 Wk8- Wk12
-
- **Bisoprolol** 1.25 2.5 3.75 5.0 5.0 5.0 5.0 7.5 10
- (CIBIS II)
- **Carvedilol** 3.125 3.125 3.125 6.25 6.25 12.5 12.5 25 25 50*
- (USCP)
- **Nebivolol** 1.25 2.5 3.75 5.0
- Dose once daily for bisoprolol and twice daily for carvedilol.
- *For patients >85kgs the dose may be increased to 50mgs bid.

# Pharmacological therapy: Mineralocorticoid receptor antagonists

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- MRA are recommended in addition to ACE-inhibitors, beta-blockers and diuretics in advanced heart failure (NYHA II-IV) to improve survival and morbidity
- Eplerenone: post MI (NICE post-MI guidelines) and in CHF or spironolactone intolerant
- Regular monitoring of renal function is recommended

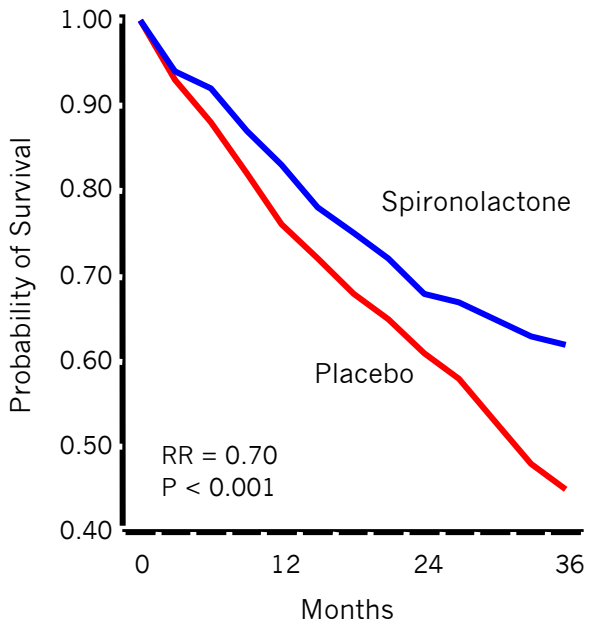
ACE, angiotensin converting enzyme; CHF, chronic heart failure; MI, myocardial infarction; NYHA, New York Heart Association.

1. McDonagh TA, et al. Eur Heart J 2021;42:3599-3726; 2. NICE. Acute coronary syndromes (NG185). Available at: https://www.nice.org.uk/guidance/ng185. Accessed May 2023; 3. Eplerenone SmPC.

# MRAs Beneficial in HFrEF and Post-MI LVD

## RALES
(Severe HFrEF)

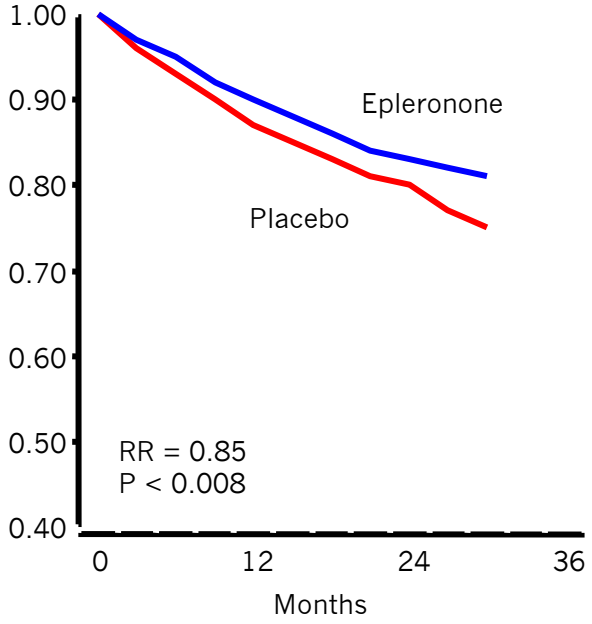
30% Risk Reduction




Pitt NEJM 1999

## EPHESUS
(Post-MI)

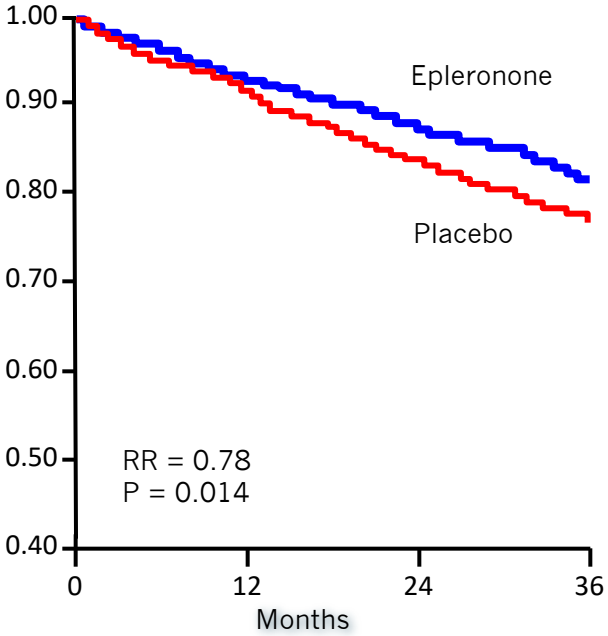
15% Risk Reduction




Pitt NEJM 2003

## EMPHASIS
(Mild HFrEF)

22% Risk Reduction




Zannad NEJM 2011

Reviews of Mechanisms : Pitt Heart Fail Rev 2012; Kamalov,...,Weber JCV Pharm 2013

| | | |
|---|---|---|
| In patients with T2DM and CKD,[c] finerenone is recommended to reduce the risk of HF hospitalization.[10,11,34,40] | I | A |

# Aim of the PARADIGM-HF Trial

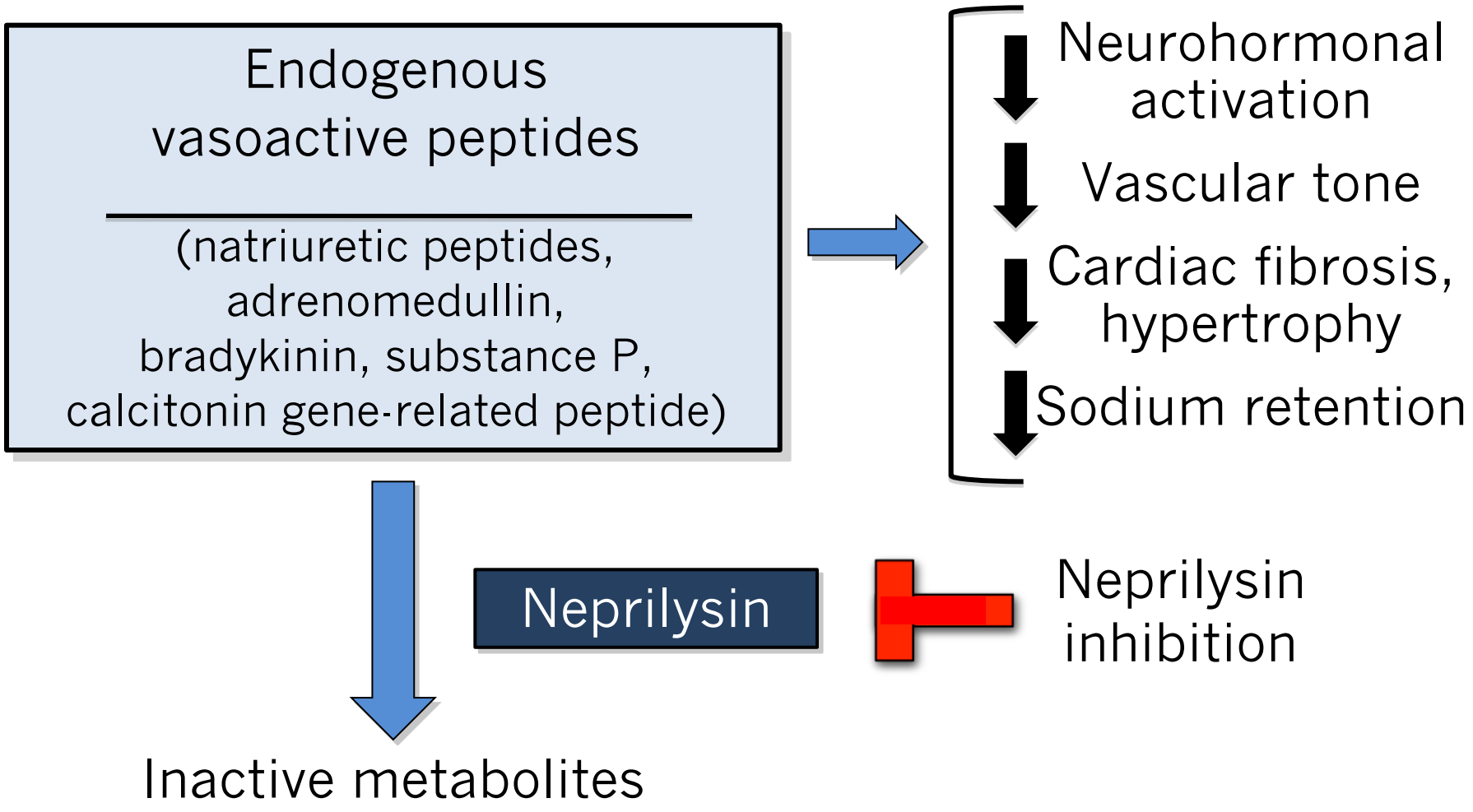
Prospective comparison of ARNI with ACEI to Determine Impact on Global Mortality and morbidity in Heart Failure trial (PARADIGM-HF)

LCZ696
400 mg daily

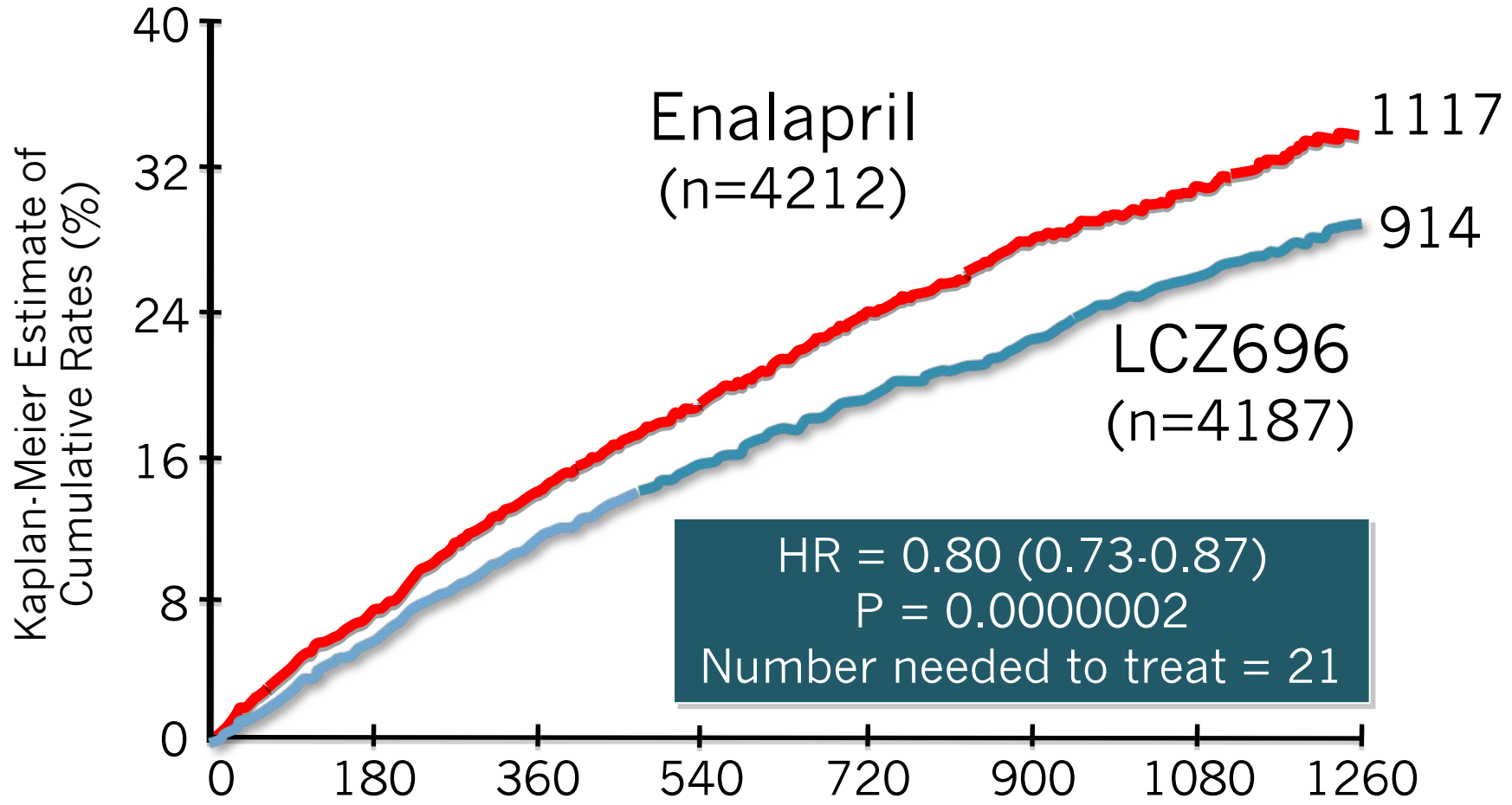
Enalapril
20 mg daily

specifically designed to replace current use
of ACE inhibitors and angiotensin receptor blockers as
the cornerstone of the
treatment of heart failure

# Neprilysin Inhibition Potentiates Actions of Endogenous Vasoactive Peptides That Counter Maladaptive Mechanisms in Heart Failure



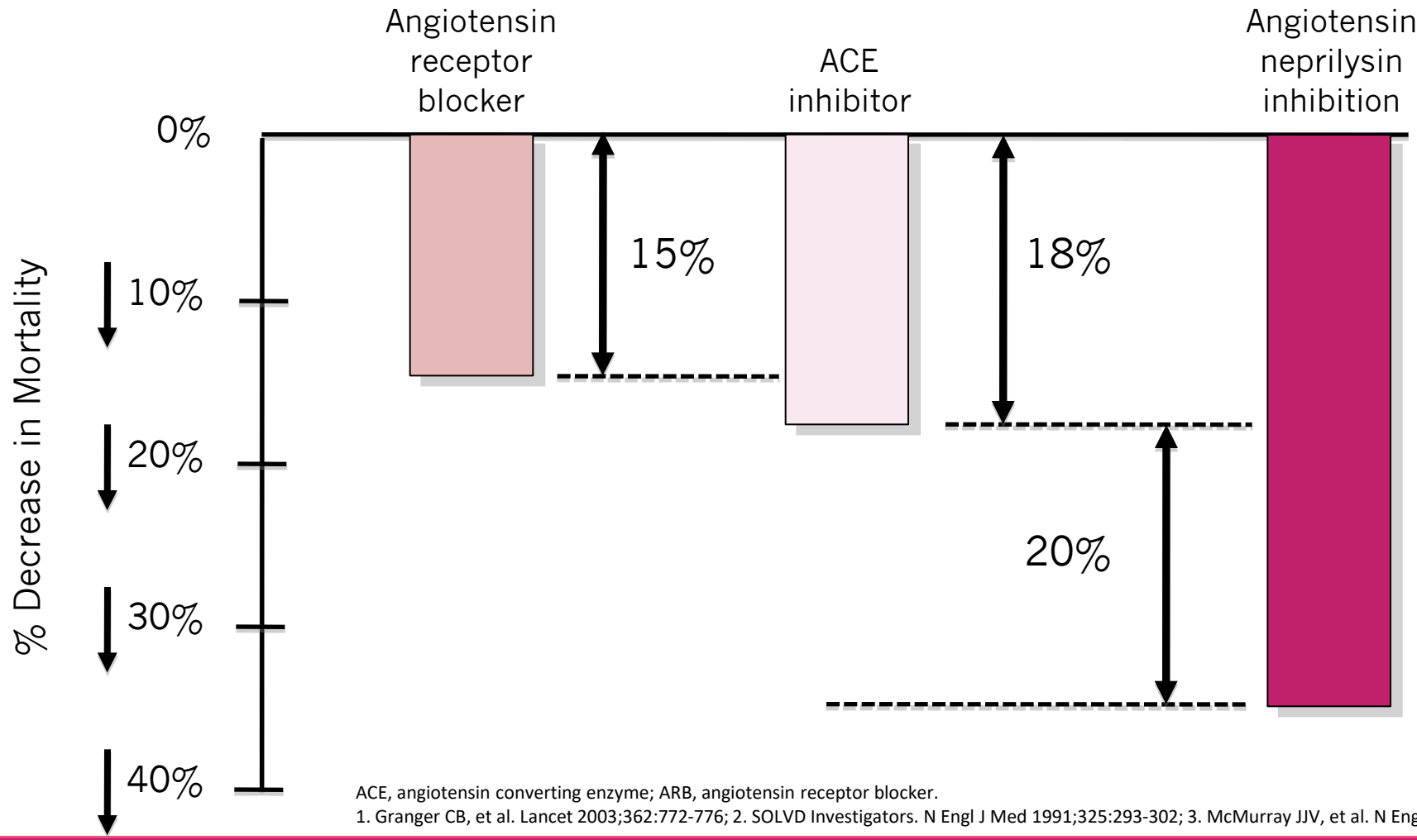
# PARADIGM-HF: Cardiovascular Death or Heart Failure Hospitalization (Primary Endpoint)




Patients at Risk

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LCZ696 | 4187 | 3922 | 3663 | 3018 | 2257 | 1544 | 896 | 249 |
| Enalapril | 4212 | 3883 | 3579 | 2922 | 2123 | 1488 | 853 | 236 |

# Angiotensin neprilysin inhibition with Sacubitril/Valsartan doubles effect on cardiovascular death of current inhibitors of the renin-angiotensin system




- Effect of ARB vs placebo derived from CHARM-Alternative trial
- Effect of ACE inhibitor vs placebo derived from SOLVD-Treatment trial
- Effect of LCZ696 vs ACE inhibitor derived from PARADIGM-HF trial

ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker.

1. Granger CB, et al. Lancet 2003;362:772-776; 2. SOLVD Investigators. N Engl J Med 1991;325:293-302; 3. McMurray JJV, et al. N Engl J Med 2014;371:993-1004.

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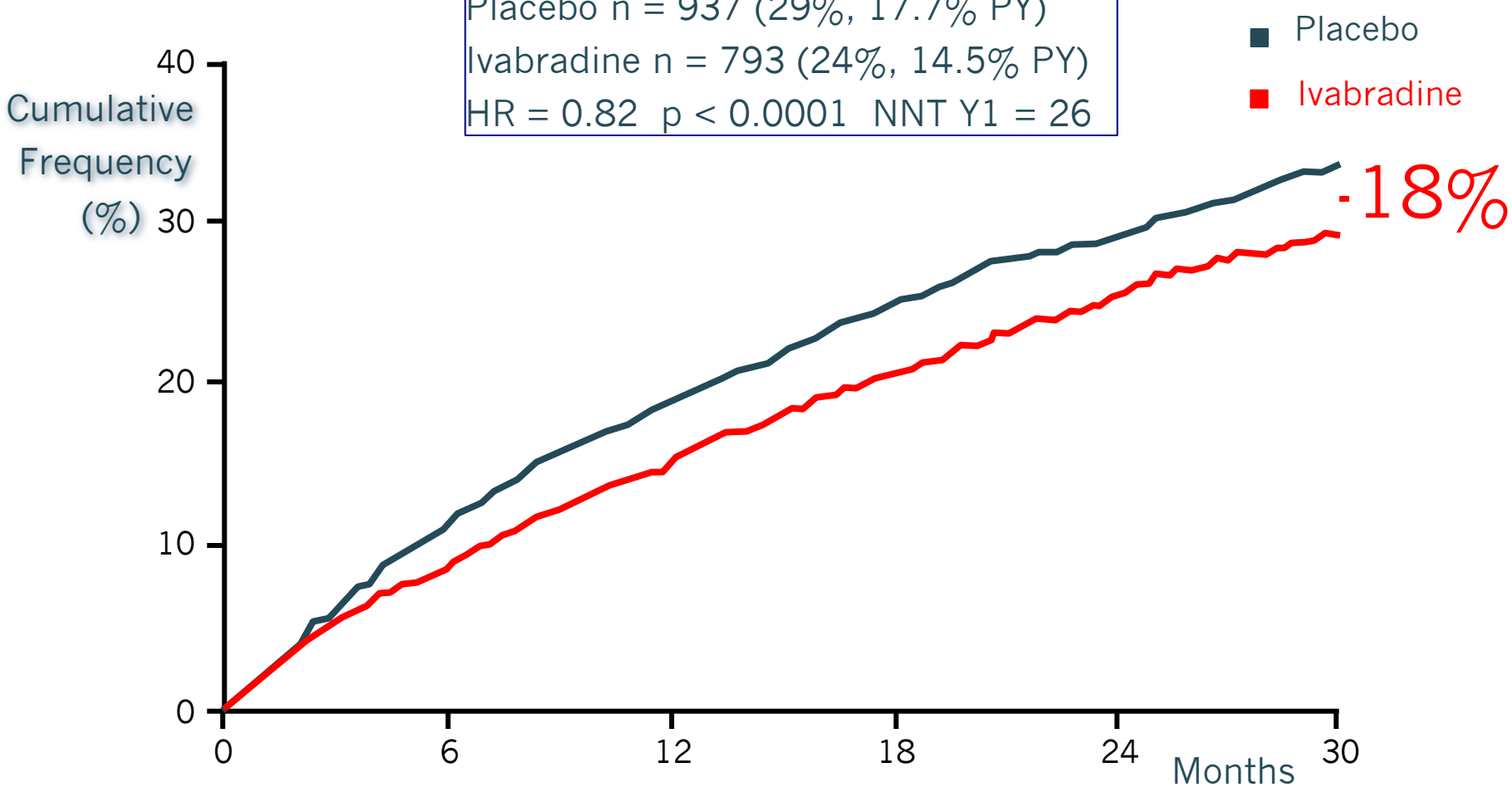
# SHIFT Study
# Primary endpoint

Placebo n = 937 (29%, 17.7% PY)
Ivabradine n = 793 (24%, 14.5% PY)
HR = 0.82  p < 0.0001  NNT Y1 = 26




Primary Endpoint a composite of:
•Cardiovascular Death
•Hospitalisation for worsening Heart Failure

Swedberg K, et al. *Lancet*. 2010; online August 29

# Ivabradine

| Ivabradine | | |
|---|---|---|
| Should be considered to reduce the risk of HF hospitalization in patients in sinus rhythm with an EF ≤35%, a heart rate remaining ≥70 b.p.m., and persisting symptoms (NYHA class II–IV) despite treatment with an evidence-based dose of beta-blocker (or maximum tolerated dose below that), ACE inhibitor (or ARB), and an MRA (or ARB).[e] | IIa | B |

Should be considered to reduce the risk of HF hospitalization in patients in sinus rhythm with an EF ≤ 35%, a heart rate remaining ≥70 beats per minute and persisting symptoms (NYHA class II–IV) despite treatment with an evidence-based dose of beta-blocker (or maximum tolerated dose below that), ACE inhibitor (or ARB) and an MRA (or ARB).

Caveat about EMA labelling: ≥75 b.p.m.

# The DAPA-HF trial showed a significant reduction in the risk of HF outcomes and improved symptom scores in patients with HFrEF (with or without T2DM)

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| | |
|---|---|
| Number of patients | 4744 |
| Patient population | HFrEF ± T2D |
| Primary outcome | Worsening HF* + CV death |
| Key secondary outcomes | HHF + CV death, total number of HHF + CV death events, KCCQ score change, worsening kidney function, all-cause mortality |
| Median follow-up | 1.5 years |

**Primary outcome[1]**

**Worsening HF* or CV death**

↓ 26% RRR
*p*<0.001

**Secondary outcomes[1]**

| HHF or CV death | Total HHF and CV death events | KCCQ total symptom score | Composite kidney outcome | All-cause mortality |
|---|---|---|---|---|
| ↓ 25% RRR | ↓ 25% RRR | 1.18 rate ratio | HR 0.71 (95% CI 0.44, 1.16) | HR 0.83 (95% CI 0.71, 0.97) |
| *p*<0.001 | *p*<0.001 | *p*<0.001 | NA† | NA† |

In a prespecified subgroup analysis, the effect of dapagliflozin was **consistent in patients with and without T2D**[2]
The rates of adverse events were similar between dapagliflozin and placebo[1]

**In Europe, dapagliflozin is not indicated for the treatment of heart failure.** *Unplanned HHF or urgent visit resulting in intravenous therapy for HF; †Exploratory outcome; NA denotes not applicable because p-values for efficacy outcomes are reported only for outcomes that were included in the hierarchical testing strategy
CV, cardiovascular; HF, heart failure; HHF, hospitalisation for heart failure; HFrEF, heart failure with reduced ejection fraction; KCCQ, Kansas City Cardiomyopathy Questionnaire; RRR, relative risk reduction; T2D, type 2 diabetes

1. McMurray J *et al.* Dapagliflozin in Patients with Heart Failure and Reduced Ejection Fraction. *N Engl J Med* 2019;381:1995–2008; 2. Petrie MC *et al.* Effect of Dapagliflozin on Worsening Heart Failure and Cardiovascular Death in Patients With Heart Failure With and Without Diabetes. *JAMA* 2020;323:1353–68

2019

# The Emperor-Reduced trial also showed a significant reduction in the risk of HF outcomes and improved symptom scores in patients with HFrEF (with or without T2DM)

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| | |
|---|---|
| Number of patients | 3730 |
| Patient population | HFrEF ± T2D |
| Primary outcome | Hospitalization for HF + CV death |
| Key secondary outcomes | Total HF hospitalizations (first + recurrent); rate of decline in eGFR |
| Median follow-up | 1.33 years |

## Primary outcome[1]

### hHF or CV death

↓ 25% RRR
*p*<0.001

## Secondary outcomes[1]

### Total HHF

↓ 30% RRR
*p*<0.001

### KCCQ total symptom score

1.7 point difference
NA †

### Slope of change in eGFR

1.73 ml/min/1.73m² per year (95% CI 1.10, 2.37)
P<0.001

### All-cause mortality

HR 0.92 (95% CI 0.77, 1.10)
NA†

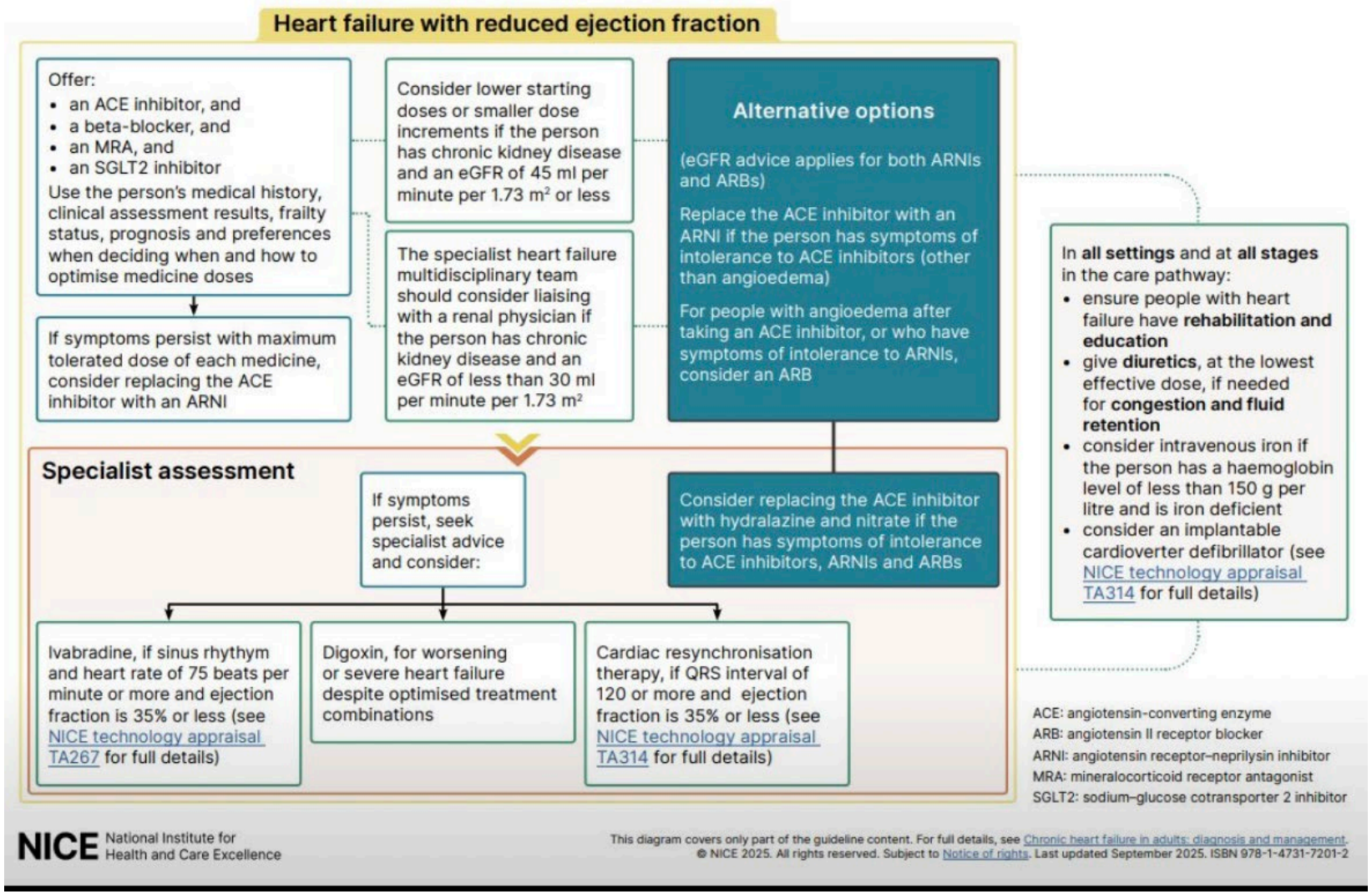
In a prespecified subgroup analysis, the effect of dapagliflozin was **consistent in patients with and without T2D**
The rates of adverse events were similar between empagliflozin and placebo[1]

**Empagliflozin is not indicated for the treatment of heart failure.** NA denotes not applicable because p-values for efficacy outcomes are reported only for outcomes that were included in the hierarchical testing strategy

CV, cardiovascular; HF, heart failure; HHF, hospitalisation for heart failure; HFrEF, heart failure with reduced ejection fraction; KCCQ, Kansas City Cardiomyopathy Questionnaire; RRR, relative risk reduction; T2D, type 2 diabetes

1. Packer M et al. N Engl J Med 2020 Aug 29. doi: 10.1056/NEJMoa2022190. Online ahead of print.

# Chronic heart failure: core treatments for heart failure




NICE National Institute for Health and Care Excellence

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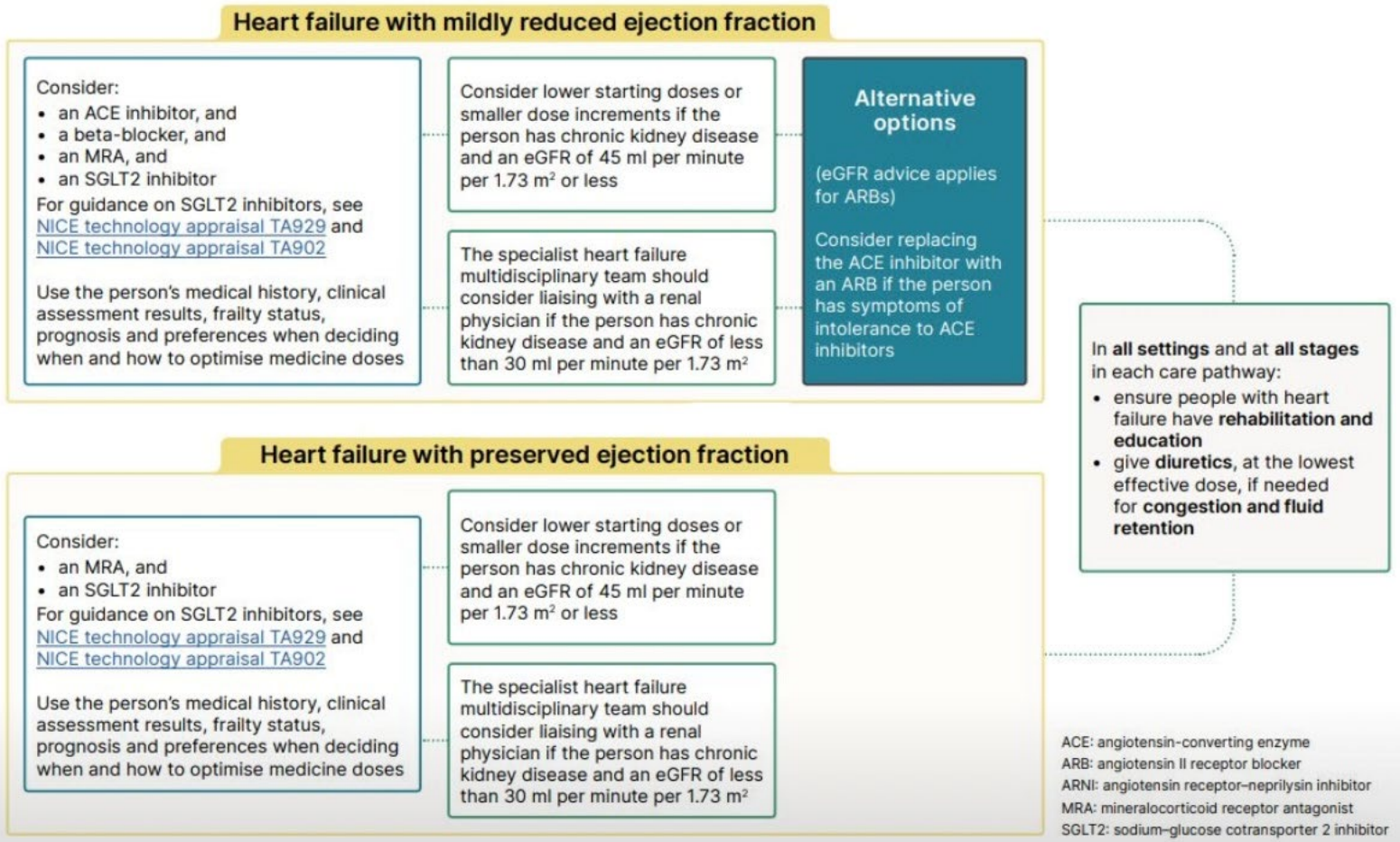
# Chronic heart failure: core treatments for heart failure




ACE: angiotensin-converting enzyme
ARB: angiotensin II receptor blocker
ARNI: angiotensin receptor–neprilysin inhibitor
MRA: mineralocorticoid receptor antagonist
SGLT2: sodium–glucose cotransporter 2 inhibitor

NICE National Institute for Health and Care Excellence

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# HFimpEF

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Improved LVEF is used to refer to those patients with a previous history of HFrEF who now have an LVEF > 40%. These patients should continue their HFrEF treatment

HFrEF, heart failure with reduced ejection fraction; LVEF, left ventricular ejection fraction.

# Four pillars of evidence-based therapy of HFrEF

Primary Care Cardiovascular Society

Empowering primary care to deliver the best in cardiovascular health

- SGLT2 inhibitors have a complementary mechanism of action to other HF treatments [3,4]
- All HFrEF treatments **work in different ways** – mechanistically can be used together and have additive and incremental benefits on CV outcomes[3,5,6]

| ACE i/ARB | Neprilysin inhibitor | Beta-blocker | MRA | SGLT2 inhibitor |
|---|---|---|---|---|

ACEi, angiotensin converting enzyme inhibitor; ARB, angiotensin 2 receptor blocker; CV, cardiovascular; HF, heart failure; HFrEF, heart failure with reduced ejection fraction; MRA, mineralocorticoid receptor antagonist; SGLT2, sodium-glucose co-transporter 2.

1. Seferović, PM, et al. Eur J Heart Fail 2020;22(2):196-213; 2. O'Meara E, et al. Can J Cardiol 2020;36:159-169; 3. Docherty KF, et al. Eur Heart J 2020;41:2379-2392.

# ‘Once in a lifetime’ breakthrough on heart failure treatment

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Conventional therapy: ACE-I/ARB & BB

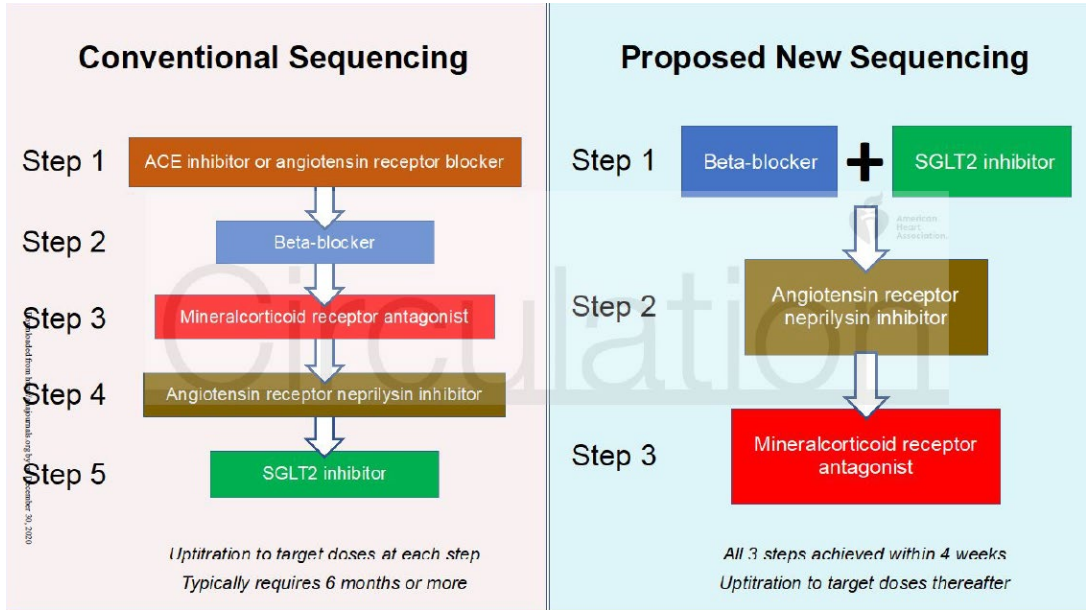
Comprehensive therapy: ARNI, BB, MRA, SGLT2i

Vaduganathan et al. Lancet 2020: Treatment with comprehensive disease-modifying pharmacological therapy compared with conventional therapy:

2.7 additional years free from CV death or first hospitalisation (for an 80-year-old) to 8.3 additional years free from CV death or first hospitalisation (for a 55-year-old)

ACEi, angiotensin converting enzyme inhibitor; ARB, angiotensin 2 receptor blocker; ARNI, angiotensin receptor-neprilysin inhibitor; BB, beta blocker; CV, cardiovascular; MRA, mineralocorticoid receptor antagonist; SGLT2i, sodium-glucose co-transporter 2 inhibitor.

Vaduganathan M, et al. Lancet 2020;396:121-128.


Conventional Sequencing
Step 1
ACE inhibitor or angiotensin receptor blocker
Step 2
Beta-blocker
Step 3
Mineralcorticoid receptor antagonist
Step 4
Angiotensin receptor neprilysin inhibitor
Step 5
SGLT2 inhibitor
Uptitration to target doses at each step
Typically requires 6 months or more
Proposed New Sequencing
Step 1
Beta-blocker
+
SGLT2 inhibitor
Step 2
Angiotensin receptor neprilysin inhibitor
Step 3
Mineralcorticoid receptor antagonist
All 3 steps achieved within 4 weeks
Uptitration to target doses thereafter

# Suboptimal dosing of RAASi therapy is associated with doubling of mortality across patient subtypes

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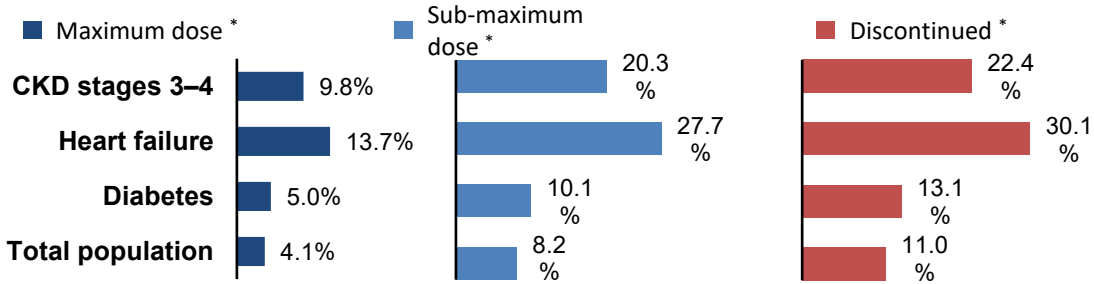
**HK among patients on ≥1 RAASi prescription in a retrospective study of a US EHR database study over a 5 year period; data includes any services provided in hospitals as well as office and outpatient setting.**

(descriptive statistics only, no formal statistical analysis performed)




**Mortality by prior RAASi dose, patients (%)**

Adapted from Epstein M, et al. (2015)

*In those receiving maximum doses of RAASi therapy; inclusion criteria required 12 months of data prior to index date.
CKD, chronic kidney disease; EHR, Electronic Health Record; RAASi, renin–angiotensin–aldosterone system inhibitor.
Epstein M, et al. Am J Manag Care 2015;21(Suppl. 11):S212–S220.

# Heart Failure

*HF008, HF007 and HF009 | 25 points combined | HF009 is new for 2026/27*

### EJECTION FRACTION CODING IS MISSION CRITICAL

**Without a recorded ejection fraction category, patients with HFrEF cannot be included in the HF009 denominator.**

Audit of primary care records has identified inconsistent recording of ejection fraction category (reduced, mildly reduced or preserved).

Practices should ensure ejection fraction category is coded for every patient on the heart failure register where applicable, ideally at the time of registration on the disease register.

Indicators HF003 and HF006 are retired for 2026/27 and replaced by HF009, reflecting the September 2025 update to NICE NG106.

## HF008

**6 pts | 50 - 90%**

Diagnosis confirmed by echocardiogram or specialist assessment within 6 months

## HF007

**7 pts | 50 - 90%**

Annual review with assessment of functional capacity and medicines optimisation

## HF009

NEW

**12 pts | 20 - 50%**

All four pillars of therapy required for heart failure with reduced ejection fraction

*Source: NHS England, Quality and Outcomes Framework guidance for 2026/27 (PRN02356)*

HF009

# Four pillar therapy in HFrEF

NEW 2026/27

*Based on NICE IND317 | Replaces retired HF003 and HF006 | Aligned with NICE NG106 (updated September 2025)*

| POINTS | ACHIEVEMENT THRESHOLD |
|---|---|
| 12 | 20 - 50% |

**INDICATOR WORDING**

Percentage of patients with HFrEF currently treated with ALL FOUR pillars co-prescribed: an ACE inhibitor or ARNI or ARB; AND a beta blocker; AND a mineralocorticoid receptor antagonist; AND a sodium glucose co transporter 2 inhibitor. Currently treated means a prescription in the past 6 months.

**REMEMBER | Patients must be on all four therapies simultaneously to count as a success. Three pillars is a failure for QOF purposes.**

1

**ACE-I, ARNI or ARB**

*Ramipril, sacubitril valsartan, candesartan*

2

**Beta blocker**

*Bisoprolol, carvedilol, nebivolol*

3

**MRA**

*Spironolactone, eplerenone*

4

**SGLT2 inhibitor**

*Dapagliflozin, empagliflozin*

**Cohort:** HFrEF only. Accurate ejection fraction coding determines who enters the denominator.

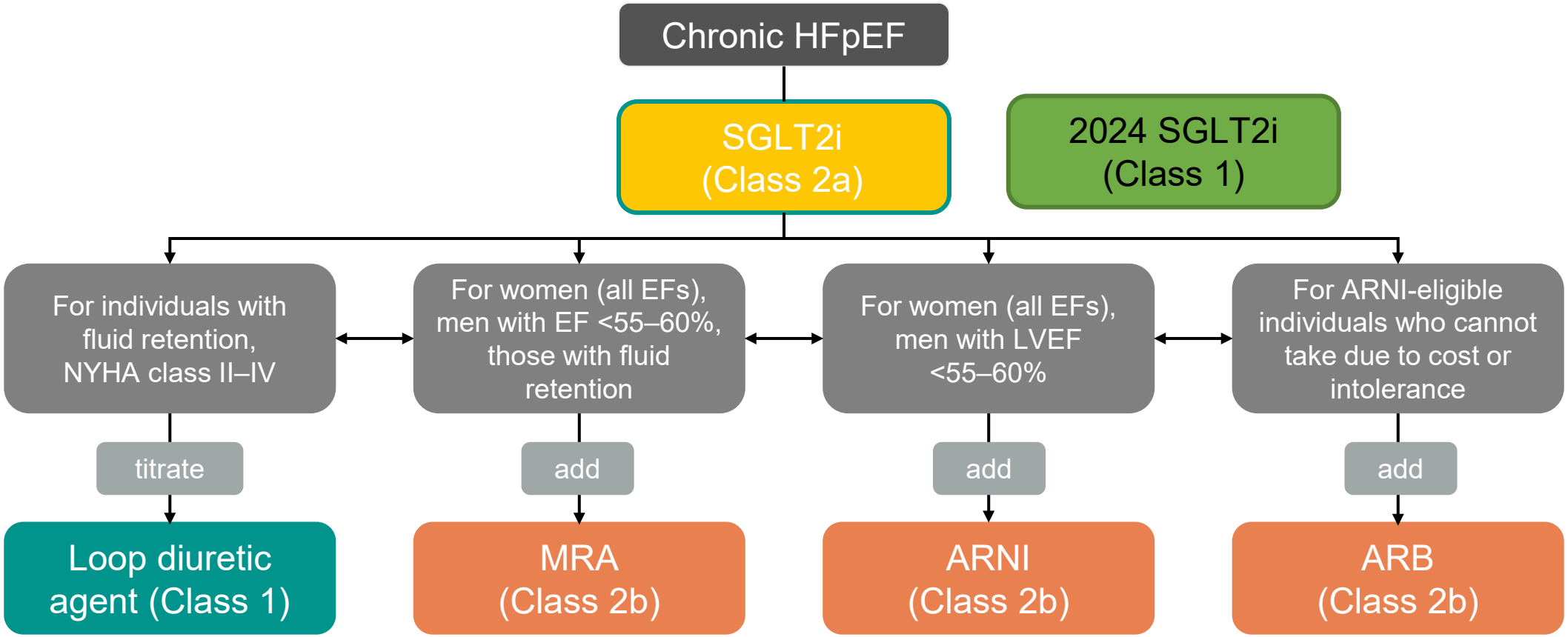
*Source: NHS England, Quality and Outcomes Framework guidance for 2026/27 (PRN02356)*

# Patient advice

| | |
|---|---|
| Monitor | Monitor BP, HR and rhythm |
| Weight | Daily weight: an increase of 1-2kg (2-4lb) in 2-3 days may indicate the need to increase the diuretic |
| Contact | Contact surgery if symptoms increase and persist despite self-management for 3 days |

# The 2023 ACC Expert Consensus Decision Pathway on Management of HFpEF recommends the use of SGLT2is

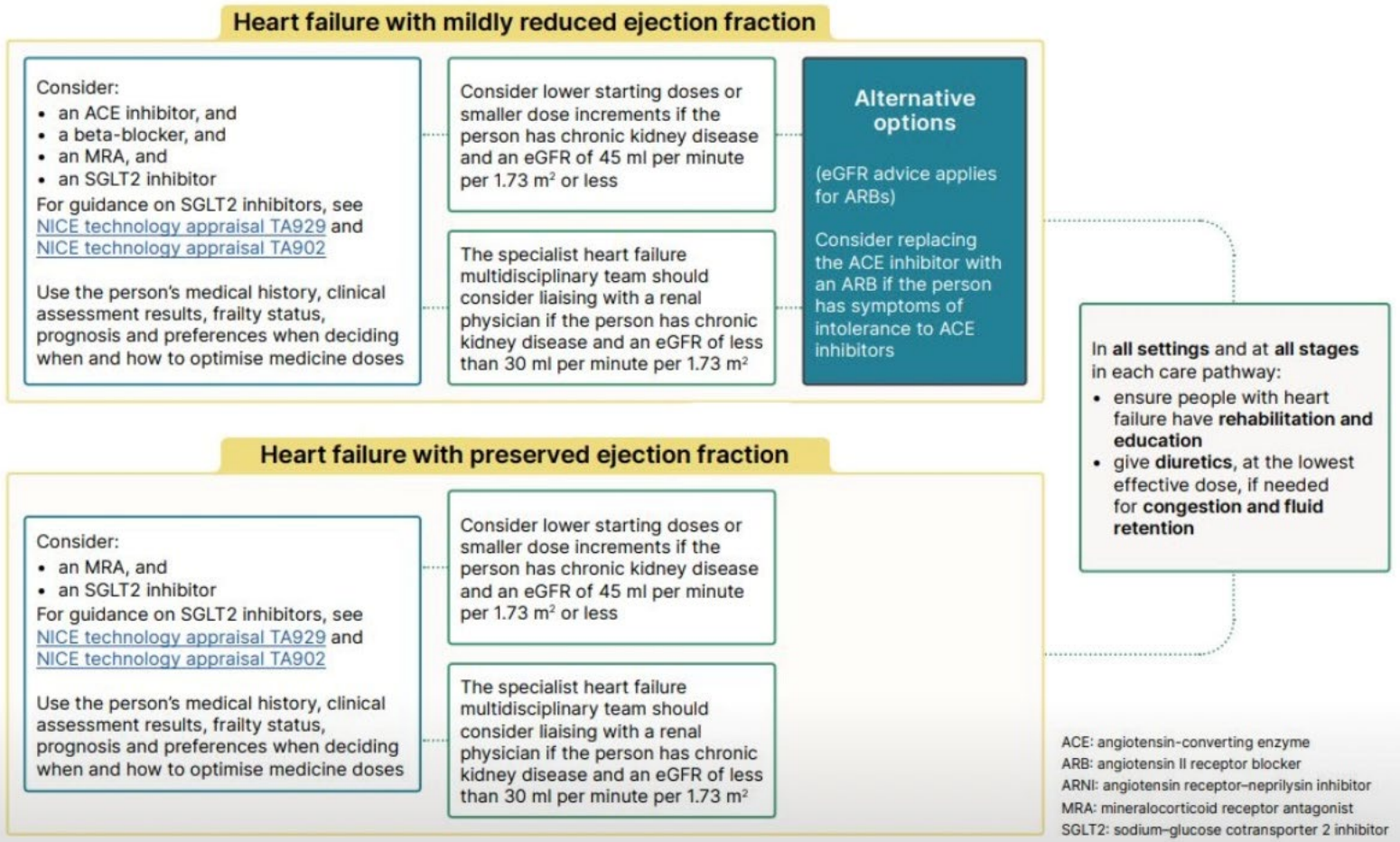
## Treatment algorithm for guideline-directed medical therapy in HFpEF*




*Teal colour identifies a Class 1 therapy from clinical practice guidelines, yellow colour indicates a Class 2a therapy, and orange colour denotes a Class 2b therapy. SGLT2is receive a Class 2a indication in the 2022 AHA/ACC/HFSA heart failure Guidelines, but the benefit, now confirmed in 2 randomised trials suggests that SGLT2is may receive a stronger class of recommendation in future guidelines, and thus the box is shaded yellow with a green border.
ACC: American College of Cardiology; AHA: American Heart Association; ARB: angiotensin receptor blocker; ARNI: angiotensin receptor/neprilysin inhibitor; EF: ejection fraction; HFpEF: heart failure with preserved ejection fraction; HFSA: Heart Failure Society of America; LVEF: left ventricular ejection fraction; MRA: mineralocorticoid receptor antagonist; NYHA: New York Heart Association; SGLT2i: sodium-glucose co-transporter-2 inhibitor.

Kittleson MM *et al. J Am Coll Cardiol* 2023;81(18):1835–1878.

# Chronic heart failure: core treatments for heart failure




ACE: angiotensin-converting enzyme
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NICE National Institute for Health and Care Excellence

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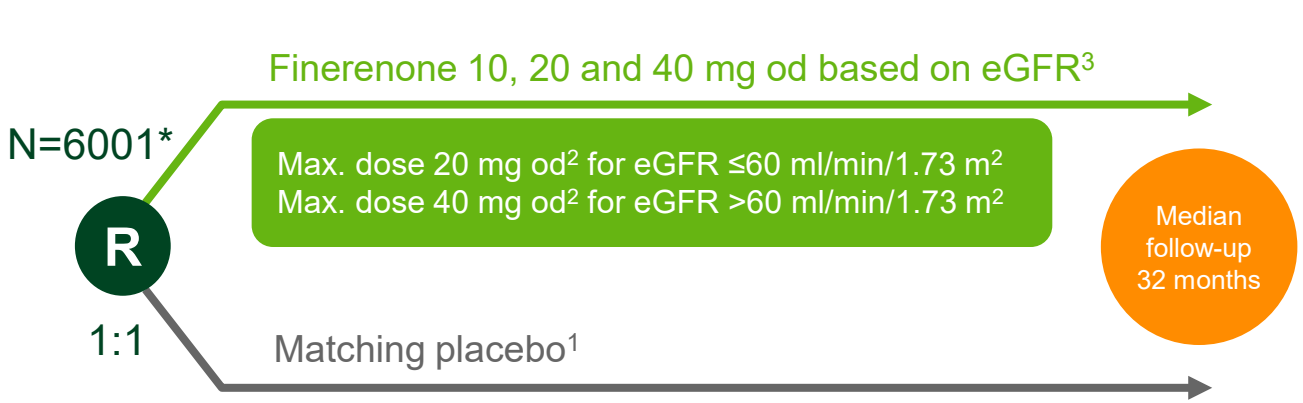
# FINEARTS :Trial Design




**Primary endpoint**[1]

Total WHF events † (first and recurrent) and CV death

**Secondary endpoints**[1]

**Total HF events**† (first and recurrent)

Change from baseline to months 6, 9 and12 in **KCCQ-TSS**

Improvement in **NYHA class** from baseline to Month 12

**Composite renal endpoint** (sustained decrease in eGFR ≥50%; sustained eGFR decline <15 ml/min/1.73 m$^2$; initiation of dialysis or kidney transplantation)

**All-cause mortality**

- **If eGFR </=60mL/min/1.73m$^2$ starting dose was 10mg od**
- **If eGFR >60 mL/min/1.73m$^2$ starting dose was 20mg od**

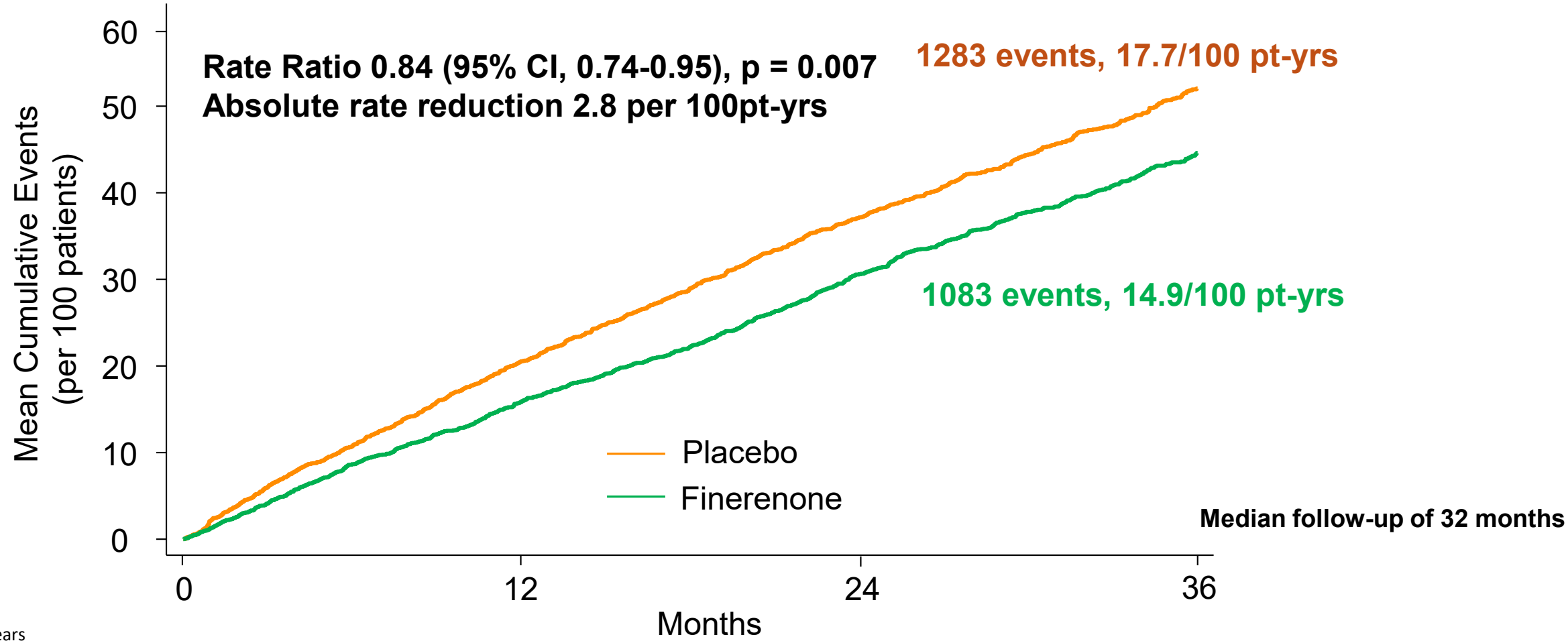
**Finerenone is indicated for the treatment of chronic kidney disease (with albuminuria) associated with T2D in adults.[4] For prescribing information please refer to the SMPC. Finerenone is not indicated for the treatment of heart failure. 40 mg od is not a licensed dosage of finerenone.**

*6016 randomized, 6001 included in efficacy analysis[1]; †Worsening HF events defined as either an unplanned HHF or an urgent heart failure visit;

CV, cardiovascular; EF, ejection fraction; eGFR, estimated glomerular filtration rate; HF, heart failure; HHF, hospitalization for heart failure; KCCQ-TSS, Kansas City Cardiomyopathy Questionnaire Total Symptom Score; NYHA, New York Heart Association; od, once daily; R, randomisation; SBP, systolic blood pressure; TIA, transient ischemic attack; T2D, type 2 diabetes.

1. Solomon SD, et al. *N Engl J Med* 2024. doi: 10.1056/NEJMoa2407107; 2. Solomon SD, et al. *N Engl J Med* 2024. doi: 10.1056/NEJMoa2407107 (Suppl 1); 3. Bayer AG. https://clinicaltrials.gov/ct2/show/NCT04435626 [accessed August 2024]; 4. finerenone SmPC

# FINEARTS
# Primary Endpoint: Composite of Total Worsening Heart Failure Events and Death from Cardiovascular Causes




Pt-yrs Patient years

Solomon SD, et al. *N Engl J Med*. 2024;391. doi:10.1056/NEJMoa2419107

Worsening heart failure event – First or recurrent unplanned hospitalisation or urgent visit for heart failure

# Rehabilitation

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Offer a supervised group exercise-based rehabilitation programme designed for patients with heart failure

- Ensure the patient is stable and does not have a condition or device that would preclude an exercise-based rehabilitation programme
- Include a psychological and educational component in the programme
- The programme may be incorporated within an existing cardiac rehabilitation programme

NICE CKS. Heart failure – chronic: Scenario: Confirmed heart failure with reduced ejection fraction. Available at: https://cks.nice.org.uk/topics/heart-failure-chronic/management/confirmed-heart-failure-with-reduced-ejection-fraction/. Accessed May 2023.

# Care and follow-up[1,2]

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- All patients with HF require monitoring in primary care
- NICE suggests this should include:
  - a clinical assessment of functional capacity, fluid status, cardiac rhythm, and cognitive and nutritional status
  - a review of medication, including need for changes and possible side effects
  - serum urea, electrolytes and creatinine
- QOF 23/24 suggests:
  - HF007: The percentage of patients with a diagnosis of heart failure on the register, who have had a review in the preceding 12 months, including an assessment of functional capacity and a review of medication to ensure medicines optimisation at maximal tolerated doses

HF, heart failure; NICE, National Institute for Health and Care Excellence; QOF, Quality and Outcomes Framework.

1. NICE. Chronic heart failure in adults: diagnosis and management (NG106). Available at: https://www.nice.org.uk/guidance/ng106. Accessed May 2023; 2. NHS England. Quality and Outcomes Framework guidance for 2023/24. Available at: https://www.england.nhs.uk/wp-content/uploads/2023/03/PRN00289-quality-and-outcomes-framework-guidance-for-2023-24.pdf. Accessed May 2023.

# Steps in Heart Failure Identification and Management

**PREVENT - Diagnose and treat optimally HTN, DM, AF, CHD, Lipid disorders, CKD, Obesity**

**HOW - MECC - BP, pulse, weight - encourage NHS health checks - treat to targets according to guidelines**

**PREDICT - Proactive questions on HF symptoms in LTC clinics - HTN, CHD, AF, DM, CKD, Previous Stroke/TIA, Obesity**

**HOW - Template asking about oedema, breathlessness, orthopnoea and PND for all LTC - low threshold for NT proBNP**

**SUSPECT - Be aware of symptoms/signs of HF especially in predisposing conditions**

**HOW - Patient and clinician awareness through education, media, posters, campaigns**

**TEST - NT proBNP, Bloods and ECG (possible CXR)**

**HOW - Make these tests available in all GP practices**

**DETECT - Refer for echocardiogram if symptoms and signs and raised NT proBNP in line with NICE, or local cut offs (age related) ideally HF clinic or open access**

**HOW - All echocardiograms to be reviewed by a specialist and advice given on diagnosis, follow up and coding. Patient information too used - PM literature**

HFREF <40% HFmrEF 41-49% HFpEF = symptoms and signs + raised NT proBNP + evidence of LVH or LAE + diastolic dysfunction E/E' >9

**CODE - Accurate coding of HF (umbrella code), Echocardiogram (abnormal), subcategory code: HFREF, HFmrEF, HFpEF (or HFNEF in SystmOne)**

**HOW - Standard codes to be used, training of primary and secondary care staff on coding rights and wrongs, regular digital audit platform searches to pick up coding errors**

**PROTECT - Lifestyle, Rehabilitation, Start appropriate pharmacotherapy - 4 pillars for HFREF and symptomatic HFmrEF, SGLT2i and cardiac drugs for co-morbidities in HFpEF**

**HOW - Follow most recent guidelines, educate patients and clinicians, hand held records (PM), regular digital audit platform searches to check medications**

**PERFECT - Aim for maximal drug doses, sick day rules - pause if symptoms, restart as soon as improved**

**HOW - Follow most recent guidelines, educate patients and clinicians, hand held records (PM), regular digital audit platform searches to check medications**

**DE-ESCALATE - Review and assess Frailty with shared decision making to stop or reduce therapies and de-activate cardiac devices (CRT-P , CRT-D or ICD)**

**HOW – Local guidelines on Frailty assessment, MDT to discuss and de-activation policy**

# Take home messages

Primary Care Cardiovascular Society

Empowering primary care to deliver the best in cardiovascular health

- Prevent HF with good CVD prevention and treatment of HTN, DM, AF
- Accurate diagnosis and coding of HFrEF/HFmrEF/HFpEF using NT proBNP vital
- Up-titrate medications wherever possible in HFrEF - aim for ACEi/ARB or ARNI + BB + MRA + SGLT2i (4 Pillars of care)
- Dynamic diuretic dosing
- Offer SGLT2i (consider MRA) in HFpEF
- Regular review
- Use specialist HF nurses if available
- Refer if deterioration ?CRT-P ?CRT-D ?ICD
- Review Local data to drive up standards

ACEi, angiotensin converting enzyme inhibitor; AF, atrial fibrillation; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor/neprilysin inhibitor; BB, beta blocker; CRT-D, cardiac resynchronisation therapy defibrillator; CRT-P, cardiac resynchronisation therapy pacemaker; CVD, cardiovascular disease; DM, diabetes mellitus; HF, heart failure; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; HTN, hypertension; ICD, implantable cardioverter defibrillator; MRA, mineralocorticoid receptor antagonist; SGLT2i, sodium-glucose co-transporter 2 inhibitor.

# More information

- ESC HF guidelines https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Focused-Update-on-Heart-Failure-Guidelines
- ESC 2023 Heart Failure Focused updateprecis https://academic.oup.com/eurheartj/article/44/37/3627/7246292
- NICE Heart Failure Guideline 2025 update https://www.nice.org.uk/guidance/ng106/resources/chronic-heart-failure-in-adults-diagnosis-and-management-pdf-66141541311685
- British Heart Foundation https://www.bhf.org.uk/informationsupport/conditions/heart-failure
- Pumping Marvellous https://pumpingmarvellous.org/
- Primary Care Cardiovascular Society https://pccsuk.org