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HEART & VASCULAR CENTRE

Harley Street
Heart Failure Symposium:
Introduction

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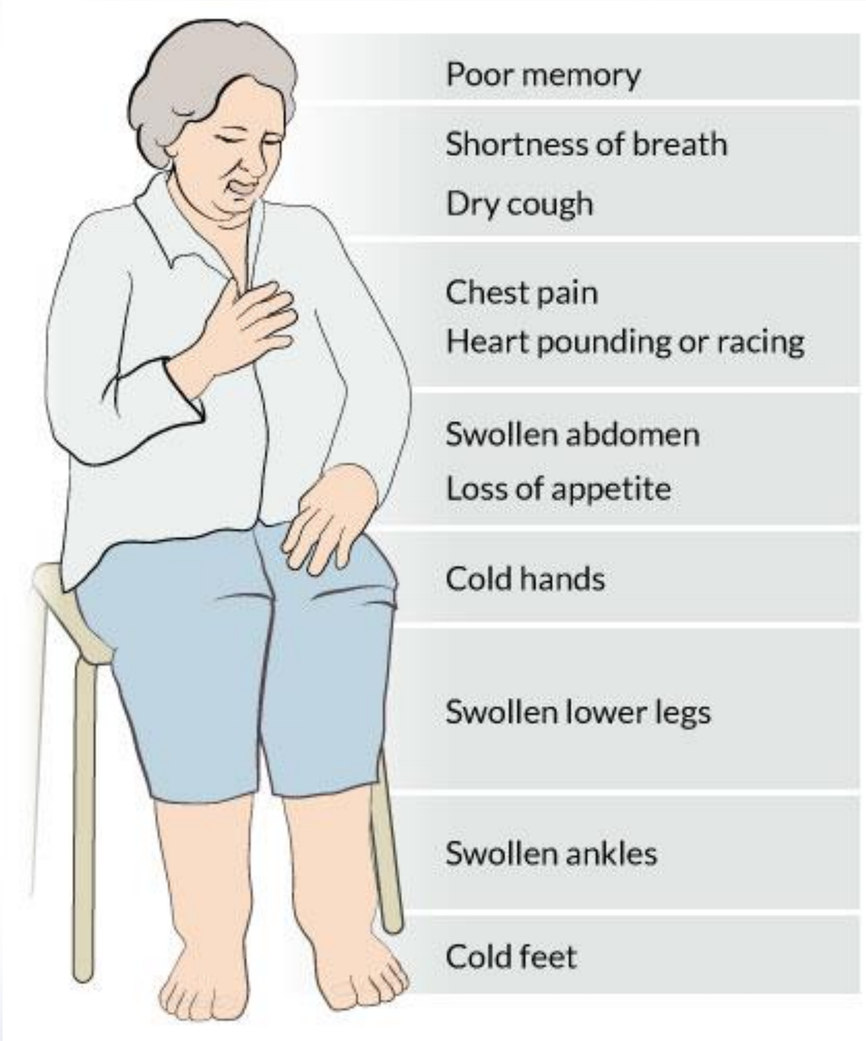
What is a typical heart failure patient?



Singaporeans suffer heart failure about 10 years earlier than Americans and Europeans: Study

THE STRAITS TIMES

PUBLISHED JUN 16, 2016, 2:09 PM SGT | UPDATED JUN 16, 2016, 6:03 PM

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European Heart Journal (2016) **37**, 3141–3153
doi:10.1093/eurheartj/ehw331

FASTTRACK CLINICAL RESEARCH
Heart failure/cardiomyopathy

Regional and ethnic differences among patients with heart failure in Asia: the Asian sudden cardiac death in heart failure registry

THE STRAITS TIMES
PUBLISHED JUN 16, 2016, 2:09 PM SGT | UPDATED JUN 16, 2016, 6:03 PM

SINGAPORE- Singaporeans suffer from heart failure at the average age of 61, about 10 years earlier than Americans and Europeans, a study on Asian patients has found.

Singaporeans also have a higher prevalence of coronary artery disease, hypertension, and diabetes, the three most common diseases that lead to heart failure, compared to Asians as a whole, Americans and Europeans.

In Singapore, 58 per cent of patients in the study had diabetes, compared to 40 per cent in Asia, and the United States and 33 per cent in Europe.

The study, involving more than 5,000 patients from the region, also found that Malays from countries such as Singapore, Malaysia and Indonesia are at the highest risk of heart failure.
It found that 62 per cent of Malays had hypertension, compared to 58 per cent of Chinese and 43 per cent of Indians.

Symptoms and signs of heart failure

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

Less typical	Less specific
Nocturnal cough Wheezing Bloated feeling Loss of appetite Confusion (especially in the elderly) Depression Palpitations Dizziness Syncope Bendopnea[53]	Weight gain (>2 kg/week) Weight loss (in advanced HF) Tissue wasting (cachexia) Cardiac murmur Peripheral oedema (ankle, sacral, scrotal) Pulmonary crepitations Reduced air entry and dullness to percussion at lung bases (pleural effusion) Tachycardia Irregular pulse Tachypnoea Cheyne Stokes respiration Hepatomegaly Ascites Cold extremities Oliguria Narrow pulse pressure

European Heart Journal (2016) **37**, 2129–2200
doi:10.1093/eurheartj/ehw128

Definition of heart failure with reduced (HFrEF), mid (HFmrEF) and preserved (HFpEF) ejection fraction

Type of HF		HFrEF	HFmrEF	HFpEF
CRITERIA	1	Symptoms ± Signs[a]	Symptoms ± Signs[a]	Symptoms ± Signs[a]
	2	LVEF <40%	LVEF 40–49%	LVEF ≥50%
	3	–	1. Elevated levels of natriuretic peptides[b]; 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction (for details see Section 4.3.2).	1. Elevated levels of natriuretic peptides[b]; 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction (for details see Section 4.3.2).

BNP = B-type natriuretic peptide; HF = heart failure; HFmrEF = heart failure with mid-range ejection fraction; HFpEF = heart failure with preserved ejection fraction; HFrEF = heart failure with reduced ejection fraction; LAE = left atrial enlargement; LVEF = left ventricular ejection fraction; LVH = left ventricular hypertrophy; NT-proBNP = N-terminal pro-B type natriuretic peptide.

[a]Signs may not be present in the early stages of HF (especially in HFpEF) and in patients treated with diuretics.

[b]BNP>35 pg/ml and/or NT-proBNP>125 pg/mL.

Stages of heart failure

ACCF/AHA stages of HF

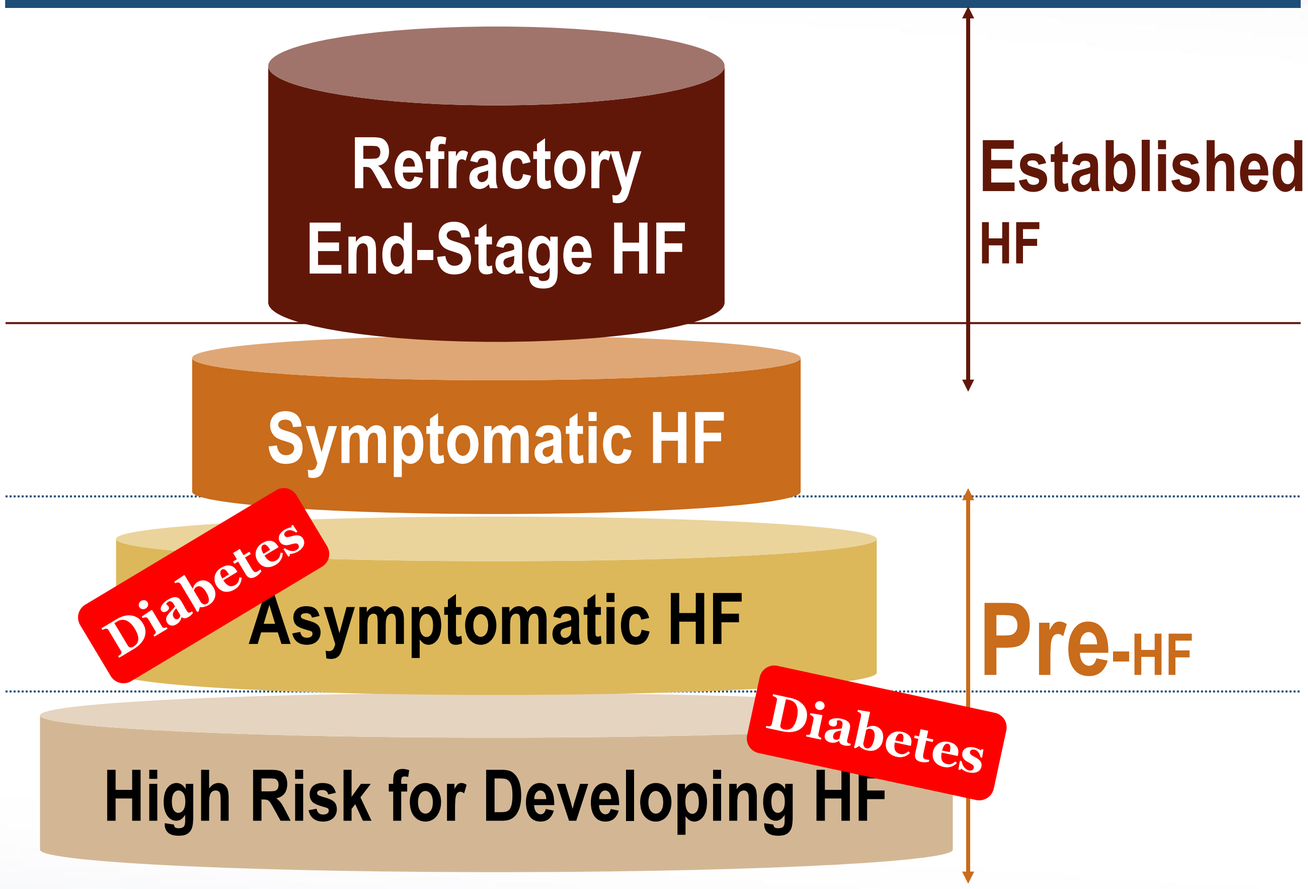
D **Refractory** HF requiring specialized interventions

C **Structural heart disease with** prior or current of HF

B **Structural heart disease** but **without signs** or symptoms of HF

A At **high risk** for HF but **without structural** heart disease or symptoms of HF

NYHA Classification



ACCF/AHA, American College of Cardiology Foundation/American Heart Association; HF, heart failure; NYHA, New York Heart Association. Yancy CW et al. Circulation. 2013;128:e240-327.

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Presentations

01.40pm	Introduction ***by Dr Reginald Liew***
01.45pm	Essentials of Diagnosis and Monitoring of Heart Failure in Primary Care ***by Dr Rohit Khurana***
02.10pm	Diabetes & Heart Failure: A Dangerous Intersection ***by Dr Michael MacDonald***
02.35pm	Overview of heart failure therapies and case studies ***by Dr Reginald Liew***
03.00pm	Questions & Answers

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Essentials of Diagnosis and Monitoring of Heart Failure in Primary Care

Dr. Rohit Khurana

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FRCP (UK), FESC, FACC
Senior Consultant Cardiologist

2016 ECS/HFA definition of heart failure:

A **clinical syndrome** characterized by typical **symptoms**

that may be accompanied by **signs** caused by

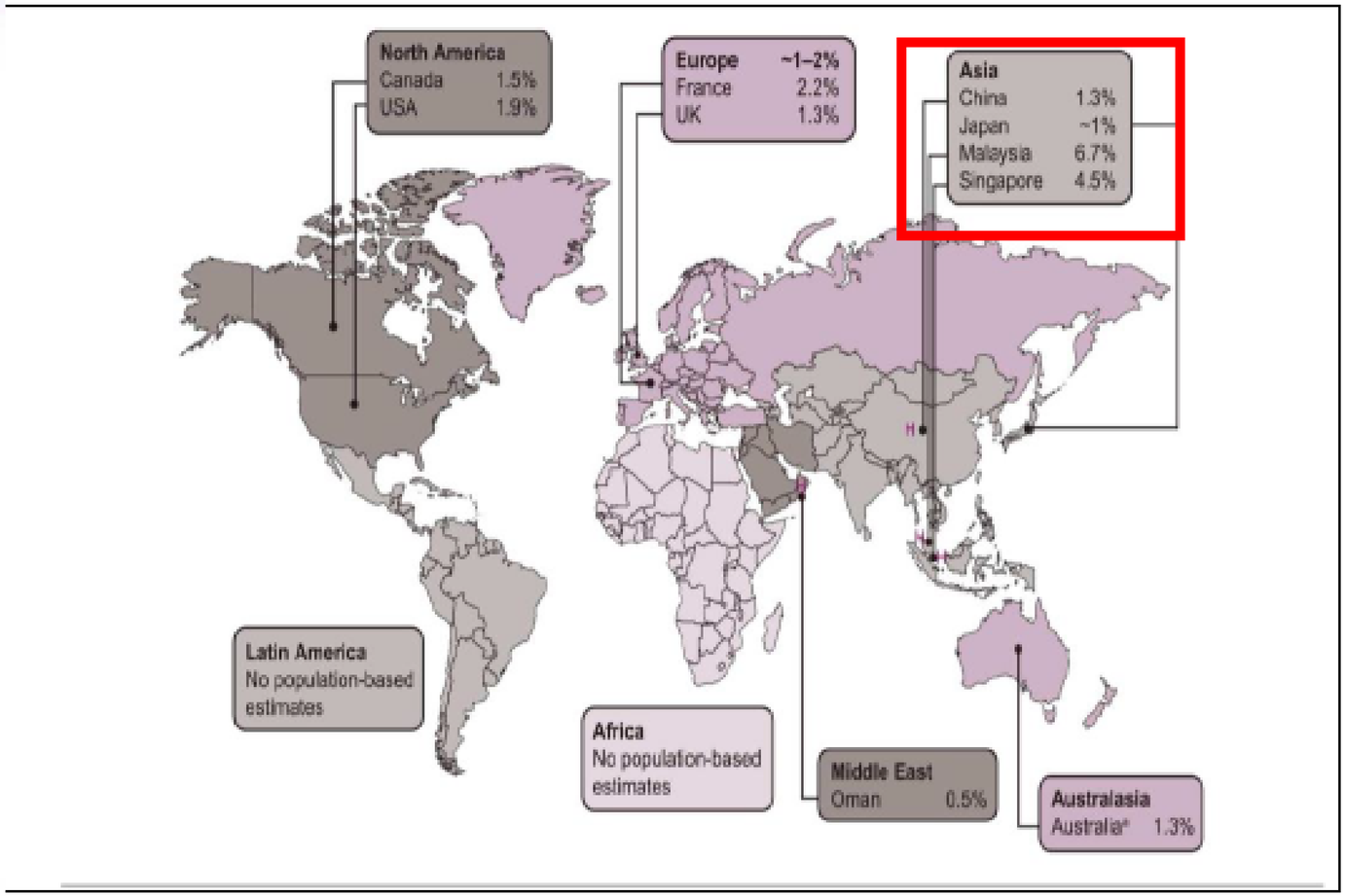
a **structural and/or functional cardiac abnormality**,

resulting in a **reduced cardiac output and/or**

elevated intracardiac pressures at rest or during stress.

Ponikowski et al. Eur Heart J. 2016;37:2129-2200

Heart Failure in SE Asia: Facts and Numbers

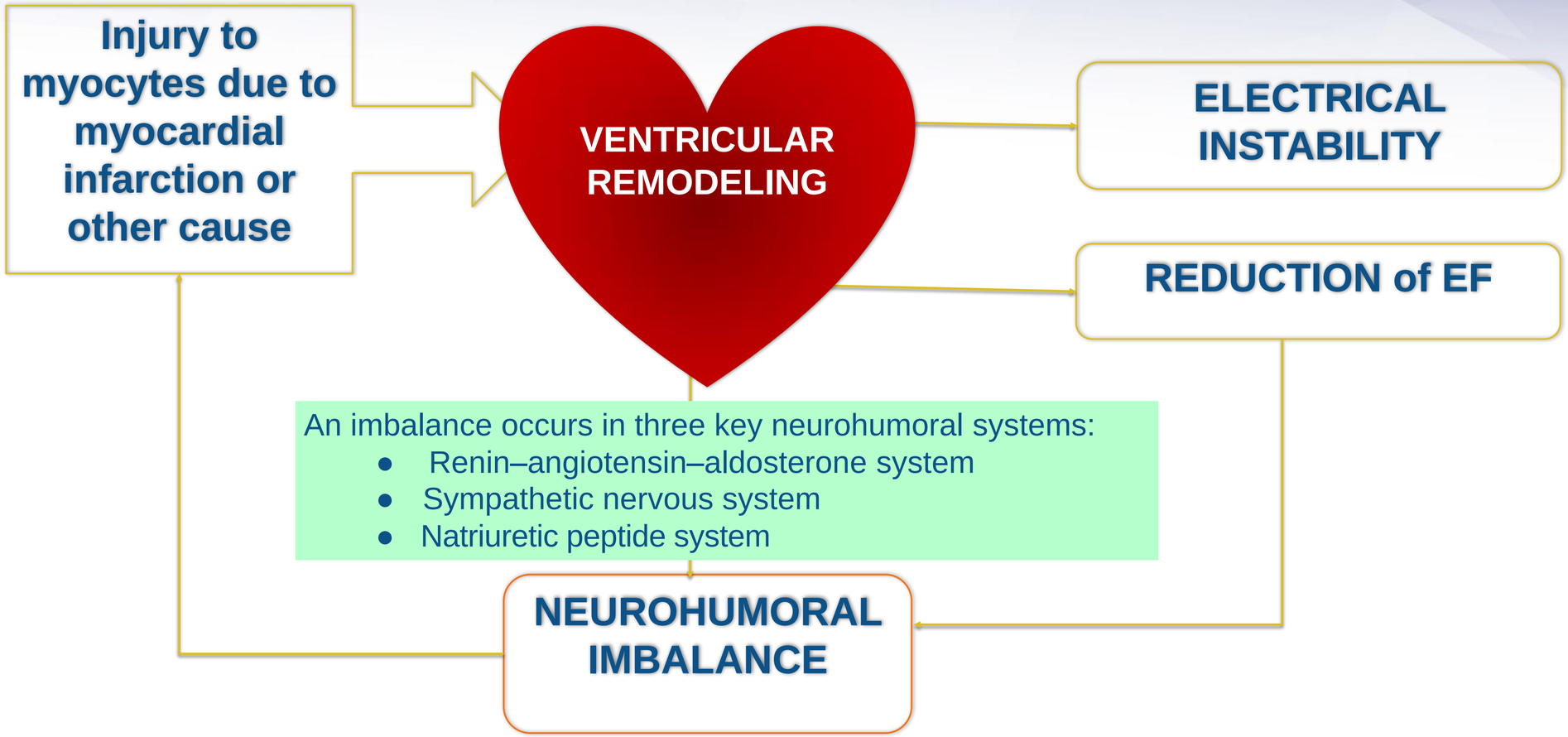


Proportion of the population living with heart failure in individual countries across the globe

Adapted from: Carolyn S.P. Lam, ESC Heart Failure 2015; 2: 46–49

- **Prevalence of HF in Southeast Asian countries is higher compared with countries in the rest of the world (4.5–6.7% vs. 0.5–2% respectively)**
- **Southeast Asian patients present with acute HF at a younger age (54 years) compared with USA patients (75 years) but**
  - **have more severe clinical features, higher rates of mechanical ventilation,**
  - **longer lengths of stay (6 vs. 4.2 days) and**
  - **higher in-hospital mortality (4.8 vs. 3.0%)**
- **Under-usage of disease-modifying HF therapies was reported in the ADHERE Asia-Pacific cohort,**
  - **with ACEi or ARBs prescribed upon discharge in 63%,**
  - **β-blockers in 41% and MRAs in 31% of patients.**
- **Important inter-ethnic differences exist, wherein Malay patients appear to fare worse than Indian or Chinese patients, for reasons that are poorly understood**

Pathophysiology of HF



The systemic responses in the renin–angiotensin–aldosterone and sympathetic nervous systems cause further myocardial injury, and have detrimental effects on the blood vessels, and various organs, thereby creating a pathophysiological ‘vicious cycle’. The natriuretic peptide system has a protective function, which can counterbalance these detrimental effects.

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1.McMurray JJ. N Engl J Med 2010;362:228–238
2.Shah AM. Lancet 2011;378:704–712

DIAGNOSING HEART FAILURE

Early detection and intervention is essential

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Principles of diagnosis of HF

All diagnostic steps are equally important

- **Consider:** *Medical history, signs, symptoms*
- **Confirm:** *Natriuretic peptides, Echocardiography*
- **Classify phenotype**: *HFrEF vs. HFpEF*
- **Assess etiology:** *Angiography (CT/Invasive), cMRI, Biopsy (?)*
- **Risk stratification**
- **Work-up for targeted therapies**

Ponikowski et al. 2016 ECS/HFA Guidelines for the diagnosis and treatment of acute and chronic heart failure
Eur Heart J. 2016;37:2129-2200.

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How Patients Present

- Clinical Symptoms

Dyspnoea (100% sensitivity)
Swelling/Dependent oedema
Fatigue, Weight gain

- Risk Factors:
  - *Traditional CV Risk factors [Hypertension, Obesity, Smoking, Physical inactivity, Diabetes], Renal impairnment*

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Heart Failure

Symptoms
Typical
Breathlessness
Orthopnea
Paroxysmal nocturnal dyspnea
Reduced exercise tolerance
Fatigue, tiredness, increased time to recover after exercise
Ankle swelling
Less typical
Nocturnal cough
Wheezing
Weight gain (>2 kg/week)
Bloated feeling
Confusion (especially in the elderly)
Palpitations
Syncope

Adapted from McMurray JJ, et al. *Eur Heart J.* 2012;33(14):1787-1

Suspect HF when…

- Hx of CAD, diabetes, hypertension

- Atrial fibrillation

- Chest infection/URTI that is persistent

- COPD that is deteriorating fast

- Unexplained fatigue or fluid retention in the elderly

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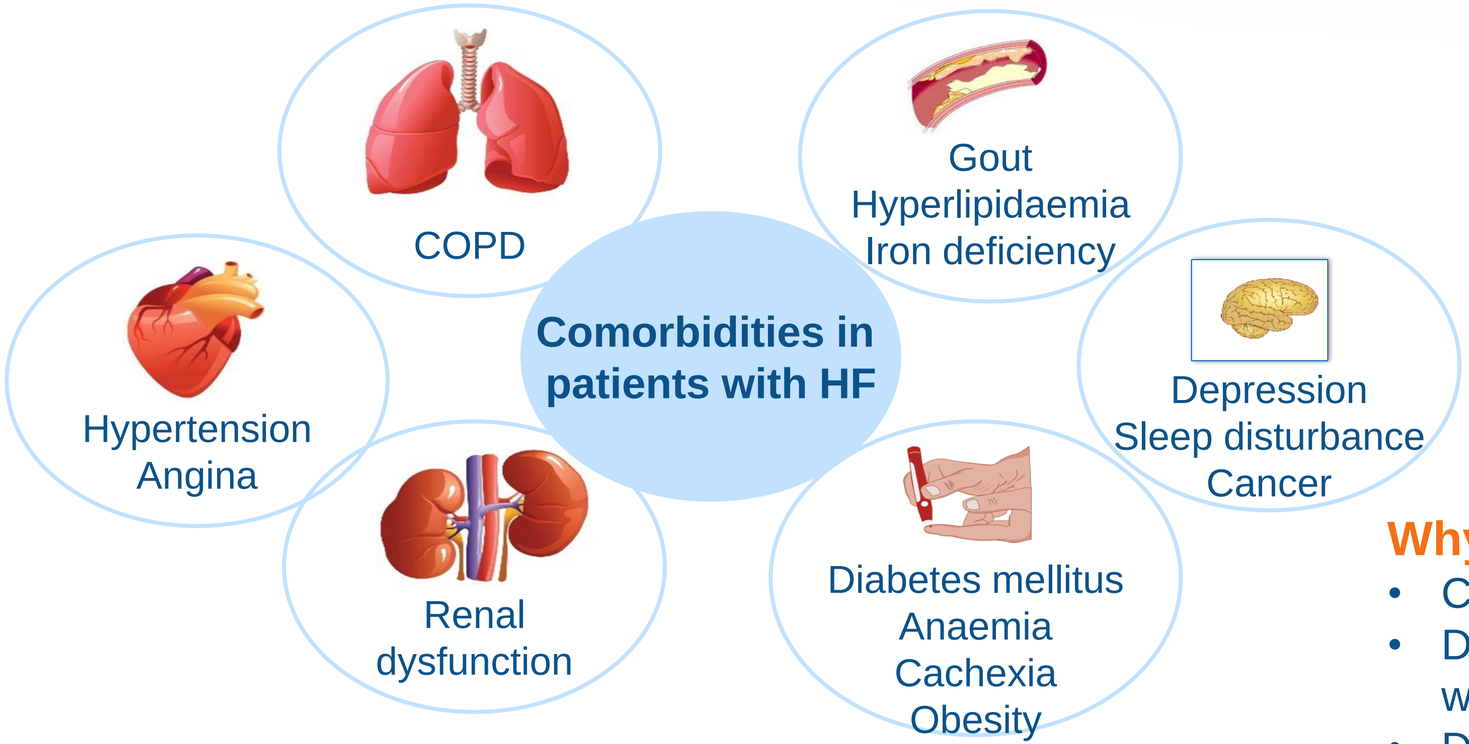
Comorbidities in HF

Comorbidities impact prognosis in patients with HF[1,2]



Why comorbidities are relevant in HF[1]:

- Comorbidities may affect the use of treatments for HF
- Drugs used to treat comorbidities may cause worsening of HF
- Drugs used to treat HF and comorbidities may interact and reduce patient adherence
- Most comorbidities are associated with worse clinical status and are predictors of poor prognosis in HF

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1. McMurray et al. Eur Heart J 2012;33:1787–847
2. Ennezat et al. Nephrol Dial Transplant 2011;26:3908-13

Evidence of volume overload is a common physical finding of heart failure

- **Neck exam**
  - Elevated jugular venous pressure
- **Auscultation of the lungs**
  - Rales or crackles
- **Auscultation of the heart**
  - Third or fourth heart sound (S3 or S4) sometimes called a gallop rhythm
  - Murmur
- **Edema in dependent areas**
  - Sacrum
  - Feet/ankles/lower legs

Elevated jugular venous pressure

Pitting edema of the ankle

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1. McMurray JJ, et al. *Eur Heart J.* 2012;33(14):1787-1847. **2.** Yancy CW, et al. *J Am Coll Cardiol.* 2013;62(16):1495-1539. **3.** Hunt SA, et al. *J Am Coll Cardiol.* 2005;46(6):e1-82. **4.** Jessup M, Brozena S. *N Engl J Med.* 2003;348(20):2007-2018.

Initial Diagnostic Tests

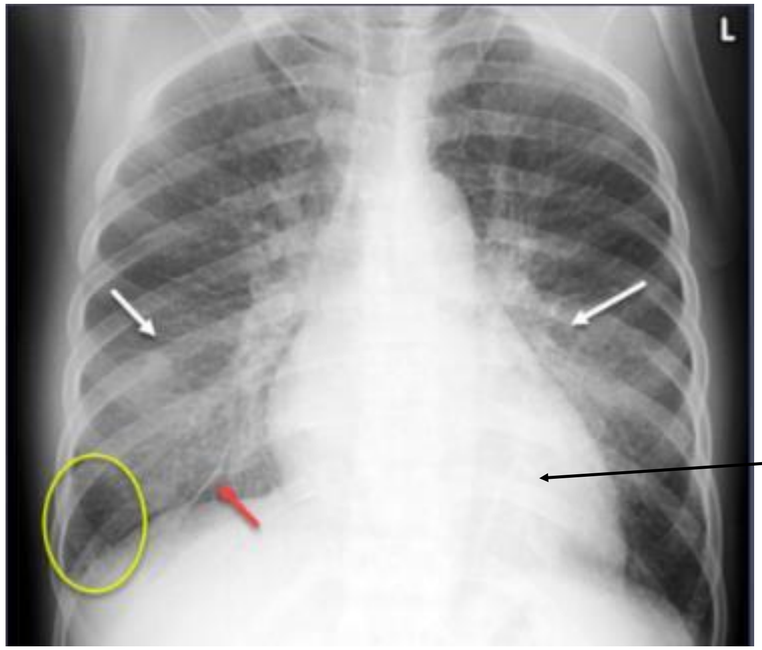
ECG can identify potential causes of HF:

- Arrhythmias (irregular heart rhythms)
- Past myocardial infarctions (MIs)
- Left ventricular hypertrophy

Chest X-ray can identify:

- Size and shape of the cardiac silhouette
- Evidence of fluid accumulation in the lungs

Chest X-ray showing evidence of heart failure



Enlarged cardiac silhouette (black arrow), perihilar congestion (white arrows), fluid in the inferior accessory fissure (red arrow), and Kerley B lines (yellow oval).

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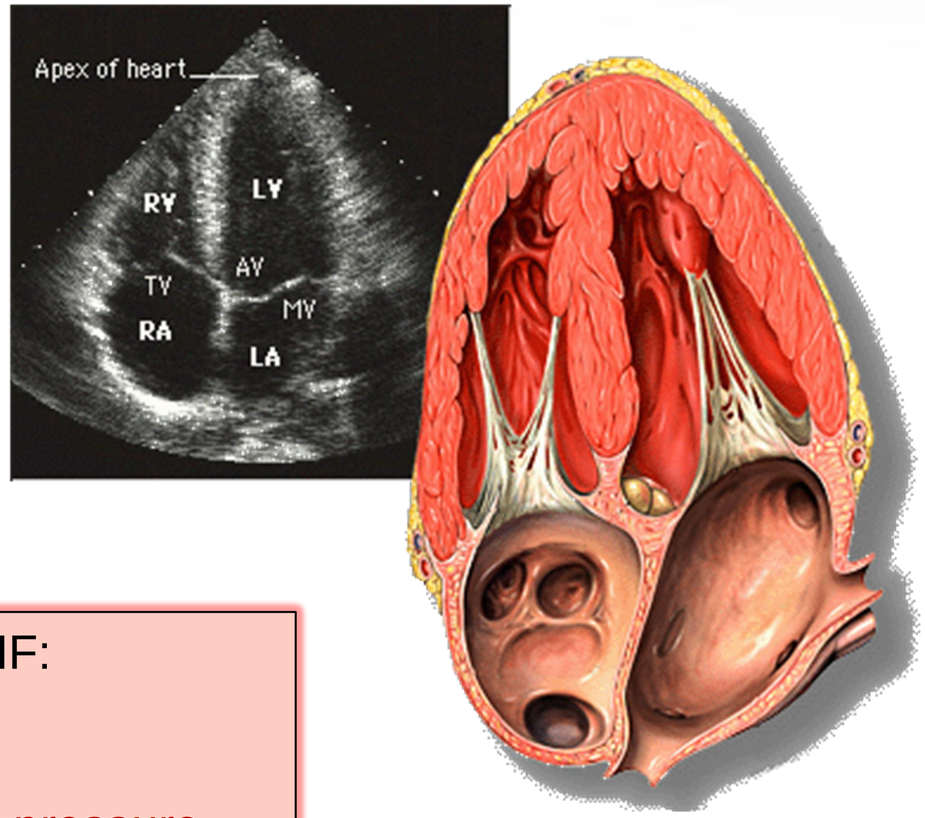
1. McMurray JJ, et al. *Eur Heart J.* 2012;33(14):1787-1847. **2.** Yancy CW, et al. *J Am Coll Cardiol.* 2013;62(16):1495-1539.

Guidelines recommend echocardiography as the single most useful diagnostic test

Transthoracic echocardiography (TTE) is the preferred method for documentation of cardiac dysfunction[1]

- **Echocardiograms reveal[1,2]**
  - Chamber size
  - Right and left ventricular function
  - Regional wall motion abnormalities (evidence of MI)
  - Evidence of impaired LV filling (ie, stiffness of the walls), a feature of diastolic dysfunction
  - Valvular heart disease
  - Diseases of the pericardium
  - Ejection fraction

2D echocardiogram



ECHO criteria for HF:
↑ *E/e'*
↑ *LA volume index,*
↑ *Pulmonary artery pressure*

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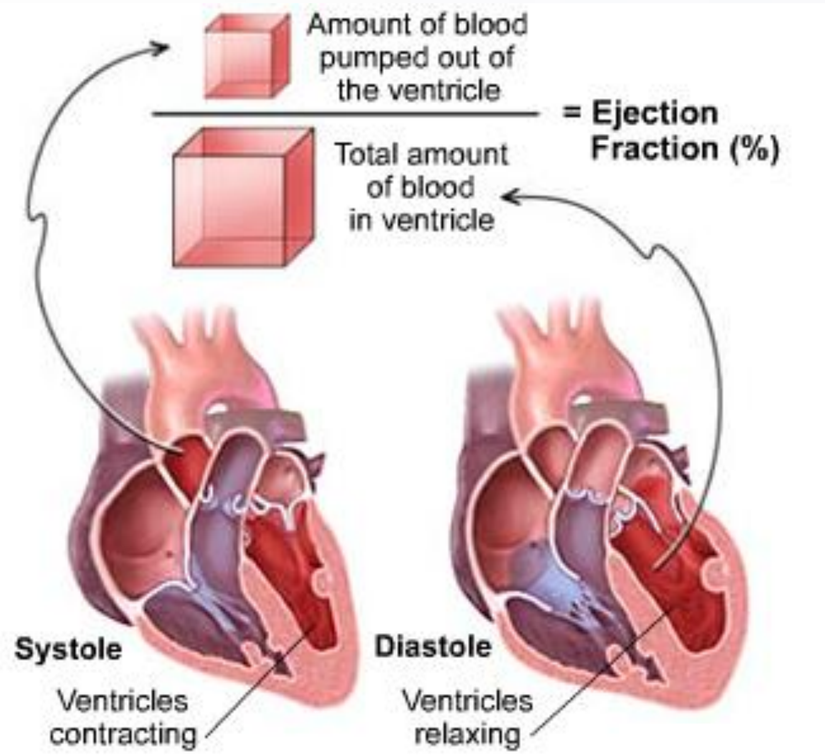
1. Swedberg K, et al. *Eur Heart J.* 2005. 26(11):1115-1140. **2.** Hunt SA, et al. *J Am Coll Cardiol.* 2005;46(6):e1-82.

Ejection fraction (EF) is a key criterion in heart failure management

- The ejection fraction, commonly referred to as **EF**, is the percentage of blood that is pumped out of the heart during each beat
- A **normal EF** is ≥50%
- Heart failure with an EF ≤40% is known as **heart failure with reduced ejection fraction** (HFrEF)
- Heart failure in the setting of a normal EF is known as **heart failure with preserved ejection fraction** (HFpEF)



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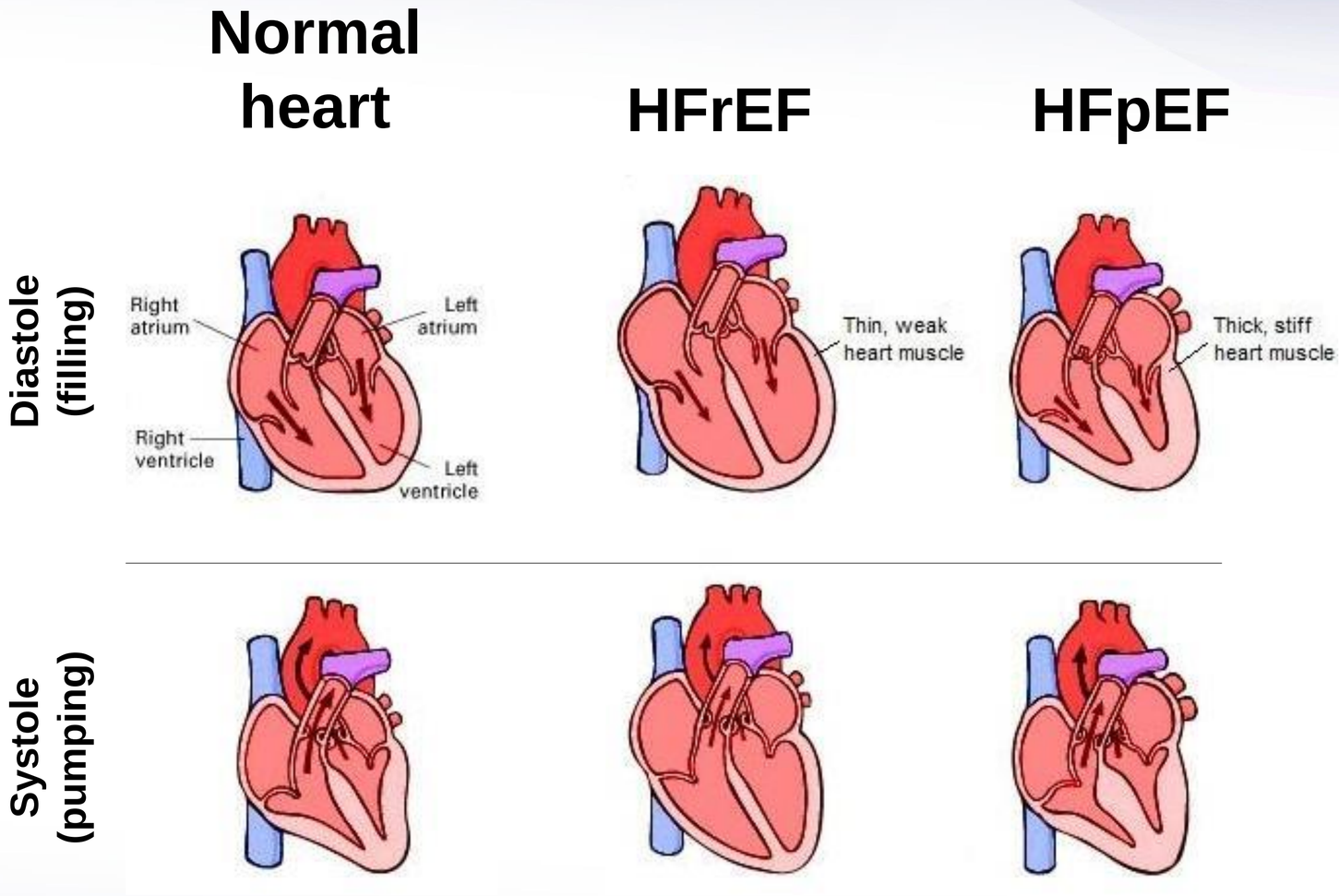
Yancy CW, et al. *Circulation.* 2013;62(16):1495-1539.

While HFrEF and HFpEF are both “heart failure”, the pathophysiology is different

- In **HFrEF,** the LV is unable to eject an adequate amount of blood during systole

- In **HFpEF,** less blood is able to fill the LV in diastole, due to myocardial stiffness. Thus the LV has less blood to eject during systole



HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; LV, left ventricle.

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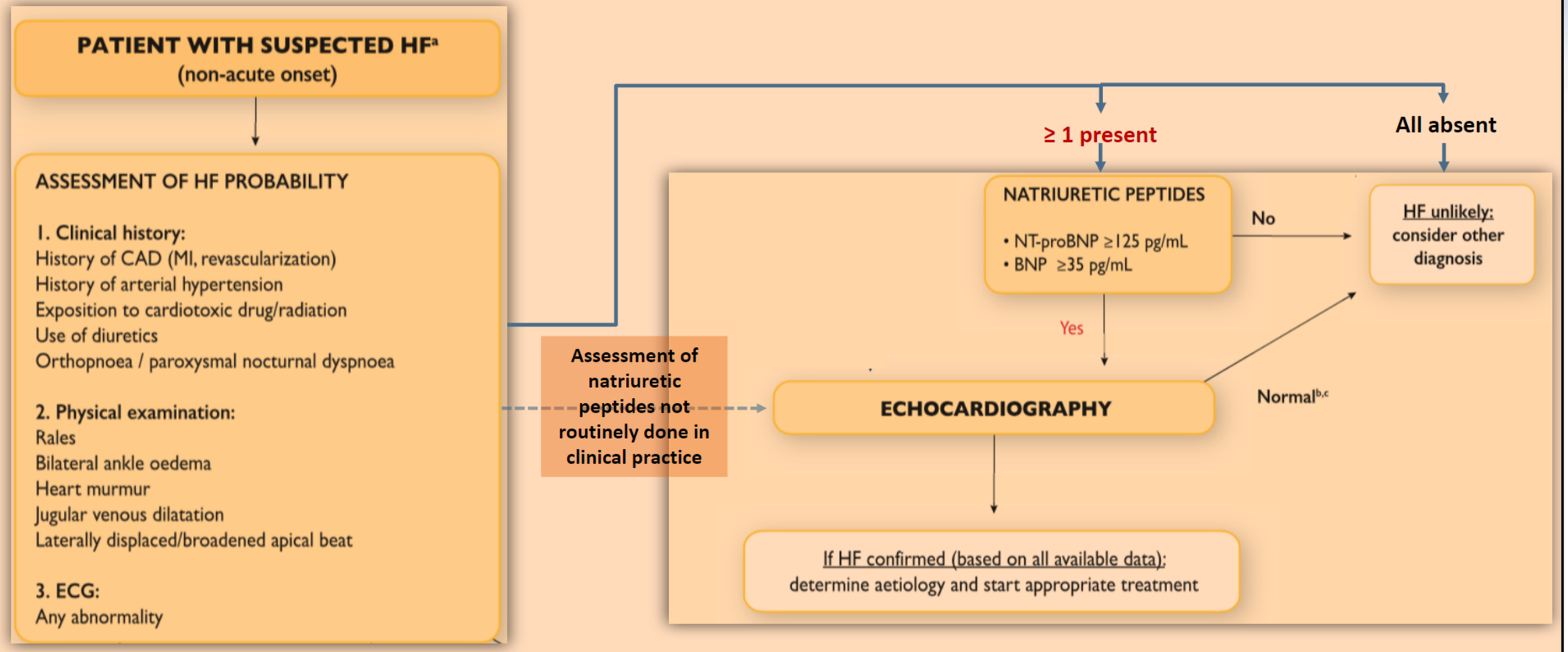
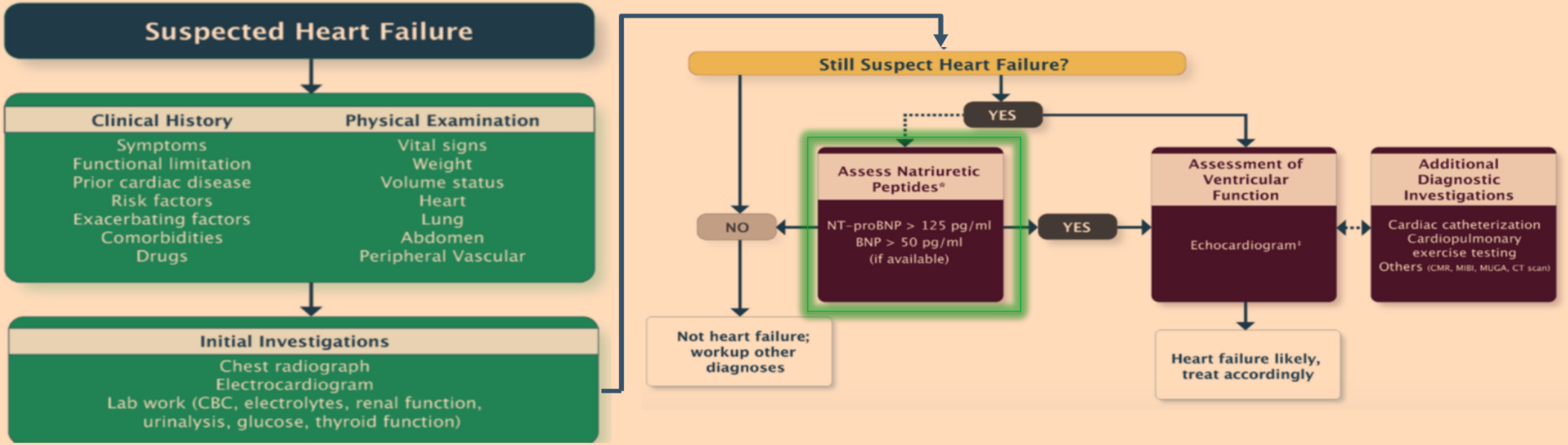
Jessup M, Brozena S. *N Engl J Med.* 2003;348(20):2007-2018.

Algorithm for the diagnosis of heart failure



Ponikowski et al. 2016 ECS/HFA Guidelines for the diagnosis and treatment of acute and chronic heart failure. Eur Heart J. 2016;37:2129-2200.

2017 Canadian CS Guidelines for the management of heart failure



Ezekowitz J et al. Canadian Journal of Cardiology 33 (2017) 1342e1433

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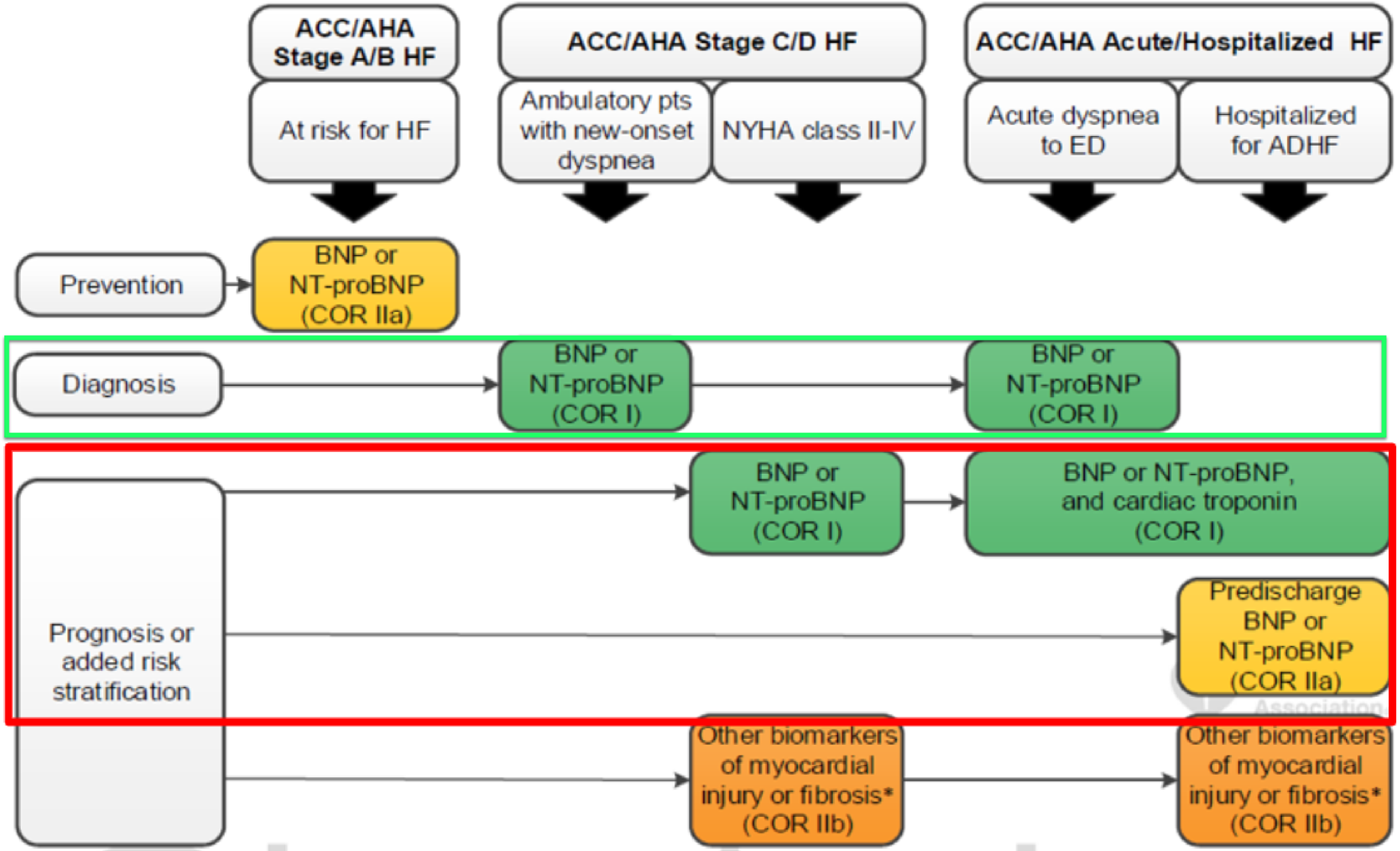
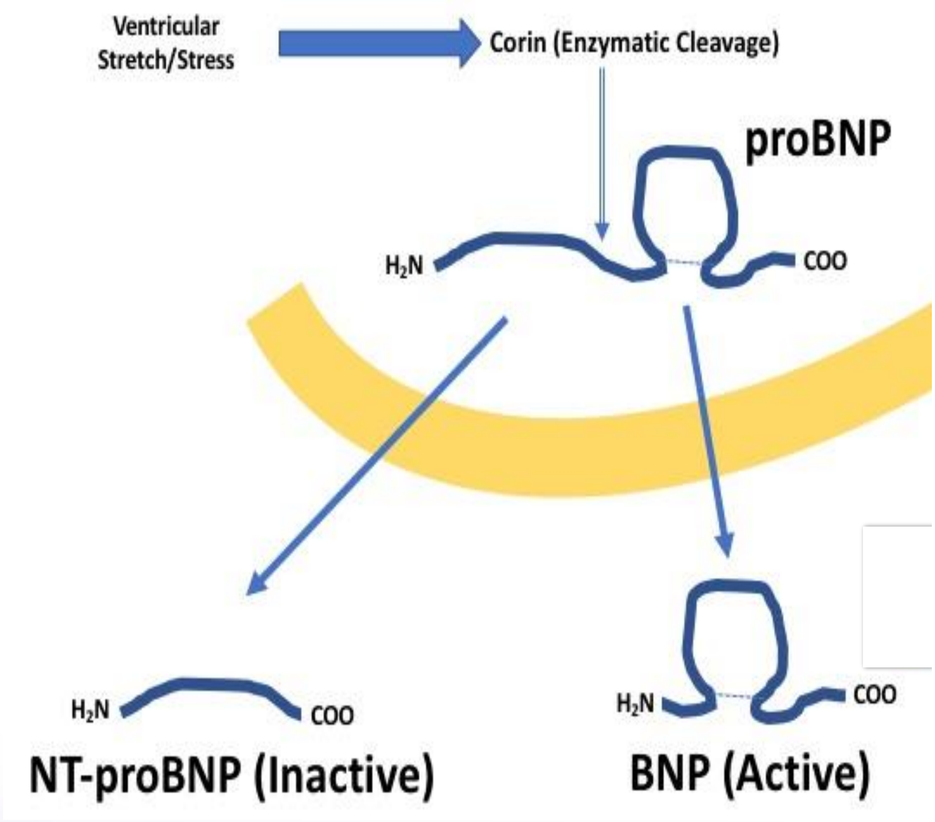
2017 ACC/AHA HF Guideline



Yancy, et. al. 2017 ACC/AHA Heart Failure Focused Update

BNP, NT-proBNP



- Equally good sensitivity/specificity in diagnosing CHF
- BNP = < 125 unlikely CHF and > 300 likely CHF
- Increases with age, renal disease/arrhythmia, sepsis, CAD
- Decreased in obesity

- Acute HF: predictor of mortality and cardiovascular events when >200

- Limited evidence in serial monitoring in outpatient setting
  - *Support clinical decision making*
  - *Establish prognosis and disease severity*

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Particular relevance of BNP

- Diagnosis
- Staging
- Risk stratification
- Monitor/titrate therapy
- Admission/discharge decisions:
  > rule out symptomatic LV dysfunction

A normal natriuretic peptide level in an untreated patient virtually excludes significant cardiac disease
Consider different cut-off values in various clinical situations

Classification of heart failure: Heart failure phenotypes

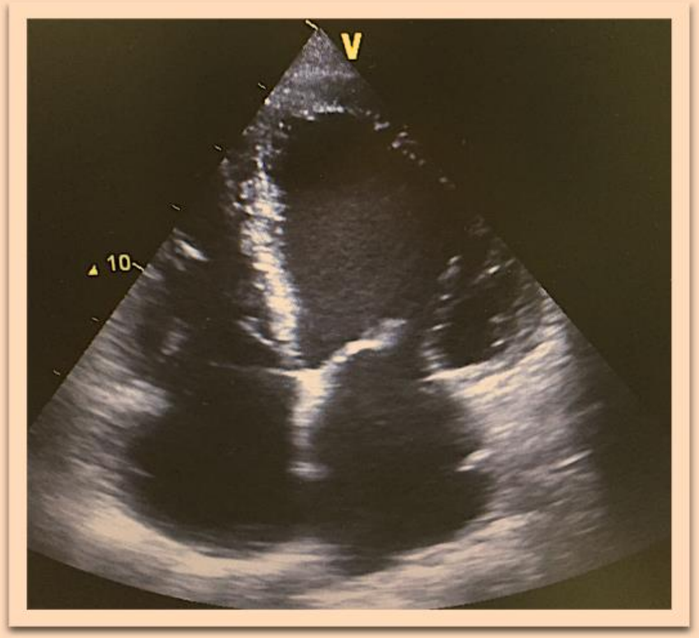
Type of HF		HFrEF	HFmrEF	HFpEF
CRITERIA	1	Symptoms ± Signs[a]	Symptoms ± Signs[a]	Symptoms ± Signs[a]
	2	LVEF <40%	LVEF 40–49%	LVEF ≥50%
	3	–	1. Elevated levels of natriuretic peptides[b]; 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction (for details see Section 4.3.2).	1. Elevated levels of natriuretic peptides[b]; 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction (for details see Section 4.3.2).

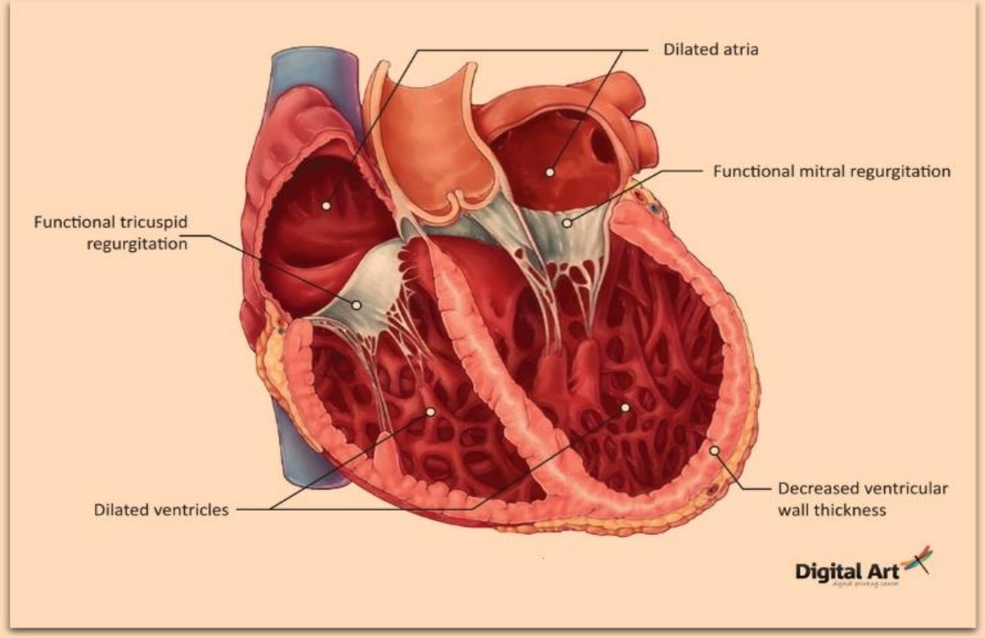
[a]Signs may be absent in the early stages
[b]BNP ≥ 35 pg/mL and/or NT-proBNP ≥125 pg/mL.

Ponikowski et al. Eur Heart J. 2016;37:2129-2200.

Heart failure with reduced ejection fraction

Signs / symptoms and LVEF <40%





Normal heart

Typical features of HFrEF:

Reduced contractile function.
Dilated LV, dilated atria.
Functional MR.

HFrEF is usually not a diagnostic challenge.

Ponikowski et al. Eur Heart J. 2016;37:2129-2200.
Seferović, PM et al. Eur J Heart Fail; 2019; 21: 553-

Heart failure with preserved ejection fraction

Signs / symptoms +

"Preserved" LVEF / diastolic dysfunction and/or elevated NTs

Ejection fraction:

- LVEF ≥50%

Structural abnormalities:

- LAVI >34 mL/m^2 or
- LVMI ≥ 115 mg/m^2 (male)
  ≥ 95 mg/m^2 (female)

Functional abnormalities:

- E/e' ≥13
- e' (mean septal and lateral) <9 cm/s

Natriuretic peptides:

- NT-pro BNP > 125 pg/mL
- BNP >35 pg/mL

Normal heart

HFpEF
Normal contractile function
Normal LV dimensions.
LV hypertrophy, dilated atria

The diagnosis of HFpEF is often challenging!

Ponikowski et al. Eur Heart J. 2016;37:2129-220

Diagnosing HF

The diagnosis of HFpEF is more difficult than the diagnosis of HFrEF

The diagnosis of HFrEF requires three conditions to be satisfied
1. Symptoms typical of HF
2. Signs typical of HF
3. Reduced LVEF

The diagnosis of HFpEF requires four conditions to be satisfied
1. Symptoms typical of HF
2. Signs typical of HF
3. Normal or only mildly reduced LVEF and LV not dilated
4. Relevant structural heart disease (LV hypertrophy/LA enlargement) and/or diastolic dysfunction

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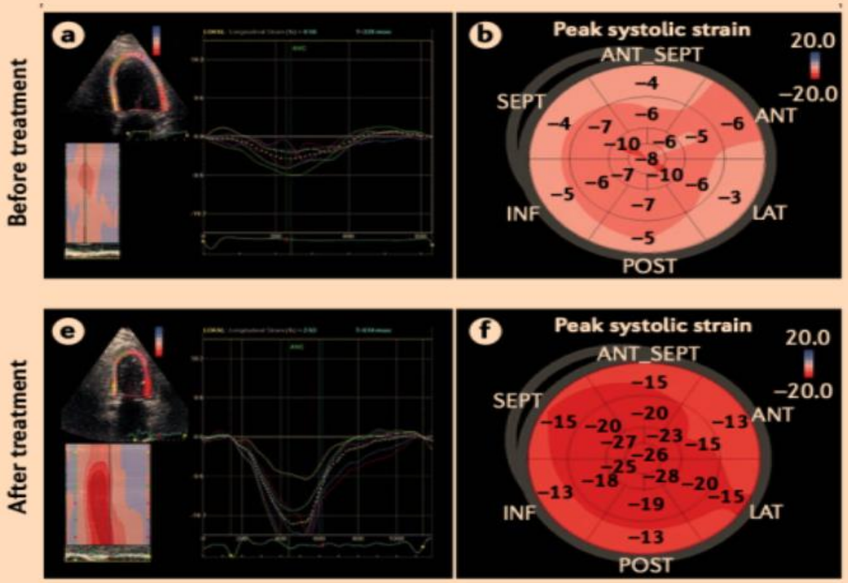
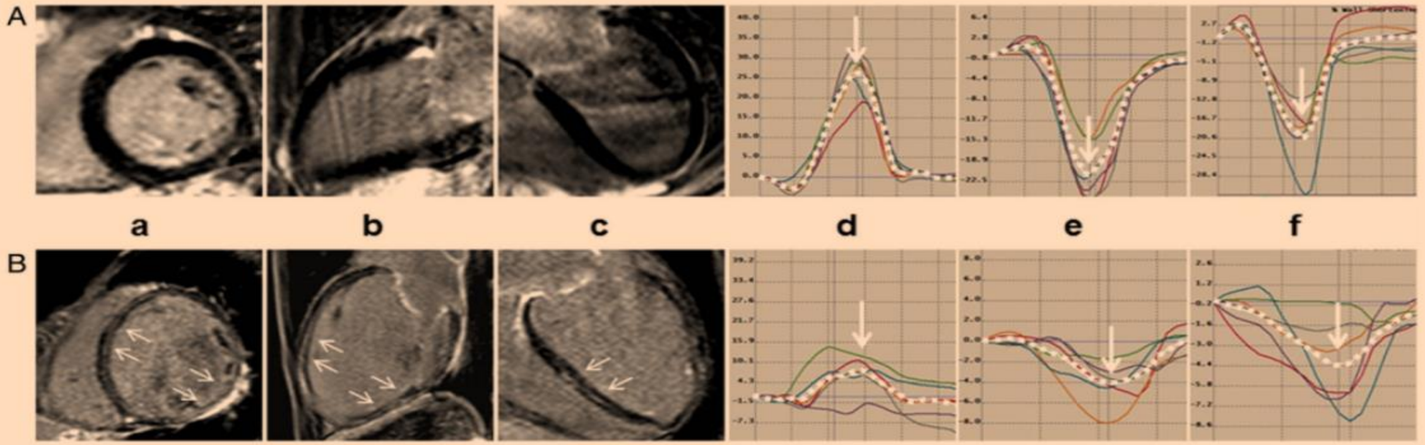
McMurray et al. Eur Heart J 2012;33:1787–847

Refinement of diagnostic assessment in heart failure

Echocardiography: Global longitudinal strain





Speckle-tracking echocardiographic images:
A) at baseline (before treatment).
F) Follow-up of LV functional recovery with treatment.

Schultheiss HP et al. Nat Rev Dis Primers. 2019;5:32

Combining global longitudinal strain and LGE could be useful in the assessment of SCD risk and probability for LV functional recovery

Chimura M et al. Heart. 2017;103:679-686

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The diagnosis of HF is a staged process

A	Risk assessment at preclinical stage	• Clinical assessment/Comorbidities • ECG, CXR • Biomarkers (Cardiac +EOD) • Echocardiography
	Initial diagnostic workup in symptomatic patients	
B	Detailed workup in case of uncertainity	• Stress echocardiography • Invasive tests & hemodynamics • Cardiac MRI • Comorbidities
C	Underlying patho-physiology & aetiology	• Cardiac MRI • Biopsy • Nuclear imaging

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Aetiology of HF

VALVULAR HEART DISEASE
- Mitral
- Aortic
- Trisuspid
- Pulmonary

MYOCARDIAL DISEASE
- Coronary artery disease
- Hypertension
- Cardiomyopathy

PERICARDIAL DISEASE
- Constrictive pericarditis
- Pericardial effusion

ENDOCARDIAL DISEASE
- With/without hypereosinophilia
- Endocardial fibroelastosis

HIGH OUTPUT STATES
- Anaemia
- Sepsis
- Thyrotoxicosis
- Paget‘s disease
- Arteriovenous fistula

ARRHYTHMIA
- Tachyarrhythmia
- Atrial
- Ventricular
- Bradyarrhythmia
- Sinus node dysfunction

CONDUCTION DISORDERS
- Atrioventricular block

VOLUME OVERLOAD
- Renal failure
- Iatrogenic (e.g. post-operative fluid infusion

CONGENITAL HEART DISEASE

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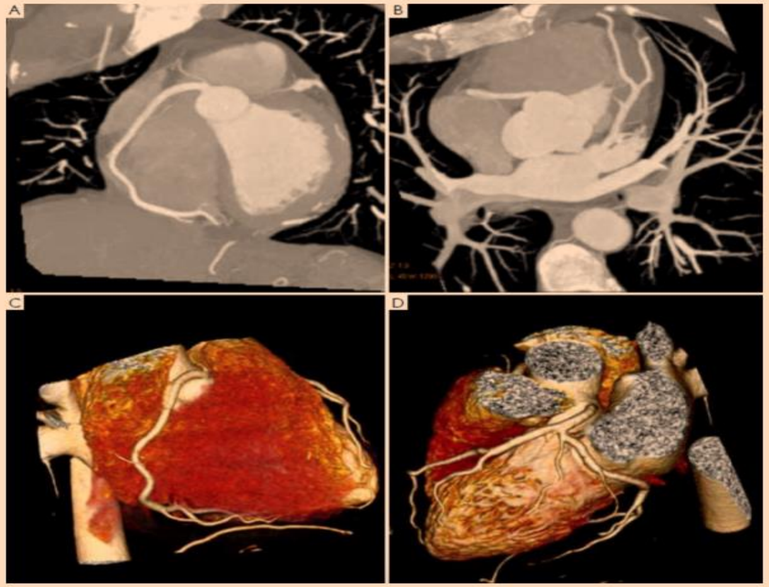
McMurray et al. Eur Heart J 2012;33:1787–847

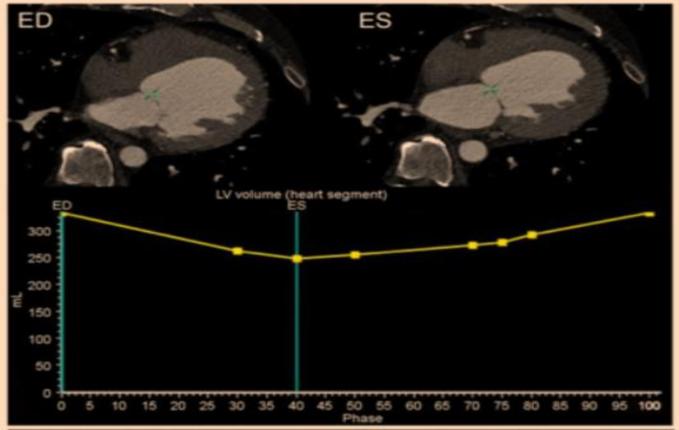
Refinement of diagnostic assessment in heart failure

Cardiac CT angiography

Etiological clarification

- Ischaemic vs. non-ischaemic CM
- LV non-compaction
- Hypertrophic CM
- Arrhytmogenic right ventricular CM
- LV functional recovery





Based on heart segmentation	Left	Right
ES ventricular volume (phase 40%)	248.1 mL	115.7 mL
ED ventricular volume (phase 0%)	333.4 mL	178.3 mL
Ventricular stroke volume	85.3 mL	62.6 mL
Ventricular ejection fraction	25%	35%
Ventricular cardiac output	6823.9 mL/min	5005.6 mL/min
LV wall muscle mass	266.8 g	
HR (mean)	80 bpm	

Levine A et. Al. J Nucl Med 2015; 56:46S–51S

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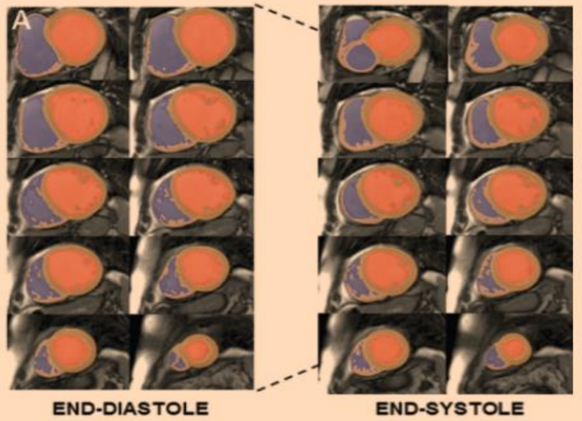
Refinement of diagnostic assessment in heart failure

Cardiac magnetic resonance

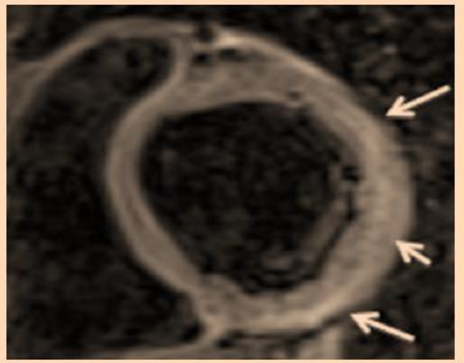
- Assessment of LV and RV volumes and ejection fraction.
- Assessment of LA volume.
- T2-weighted assessment of oedema (myocarditis).
- LGE-CMR and T1-weighted detection of replacement fibrosis.
- Tissue characteristics (sarcoidosis, amyloidosis).
- T2*-weighted detection of myocardial iron overload.

Volumes and function

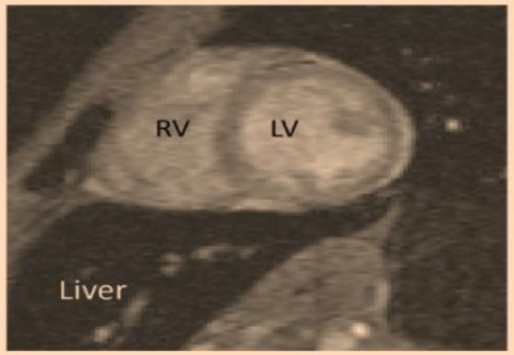


Fibrosis

Oedema



Iron overload



Fancone M. ISRN Radiol. 2014; 2014: 365404.
Peterzan MA et al. Card Fail Rev; 2016;2:115–22
Japp AG et al. J Am Coll Cardiol 2016;67:2996–3010

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Severity of heart failure: classification

ACC/AHA stages of HF (based on mrophology and symptoms)		NYHA functional classification (based on symptoms or physical limitation)	
Stage A	At high risk for HF, but without structural or functional abnormality No signs or symptoms	**Class I**	No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation or dyspnoea
Stage B	Developed structural heart disease strongly associated with development of HF, but without signs or symptoms	**Class II**	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in HF symptoms
Stage C	Symptomatic HF associated with underlying structural heart disease	**Class III**	Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity results in HF symptoms
Stage D	Advanced structural heart disease and marked symptoms of HF at rest, despite maximal medical therapy	**Class IV**	Symptoms of HF present at rest. If any physical activity is undertaken, discomfort is increased

Diagnosis of Heart failure (HF): Summary

- Global burden of HF is increasing in number and complexity, due to an aging patient population, often with multiple comorbidities. Reducing readmissions can limit the burden for healthcare systems.
- Many causes of HF that result in ventricular remodeling, reduction of the left ventricular ejection fraction, and neurohumoral imbalance. HF is a silently progressive condition.
- Many of the symptoms of HF are non-specific. HF severity can be classified based on structure and damage to heart (ACC/AHA) or based on symptoms or physical activity (NYHA).
- Adequate diagnosis of HF requires confirming the clinical suspicion with objective diagnostic measures, and identifying the underlying phenotype and aetiology
- HFrEF and HFpEF may present similarly within the clinical syndrome of HF. The diagnosis of HFpEF is more difficult than the diagnosis of HFrEF because it is largely one of exclusion
- Measuring natriuretic peptide levels can help diagnosis. A normal natriuretic peptide level virtually excludes significant cardiac disease

Thank you

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Diabetes and Heart Failure: A Dangerous Intersection

Dr Michael Ross MacDonald

MB ChB, BSc (Hons), MD (Res)
MRCP (UK), FESC (Europe)
Senior Consultant Cardiologist

Conflicts of Interest

- None

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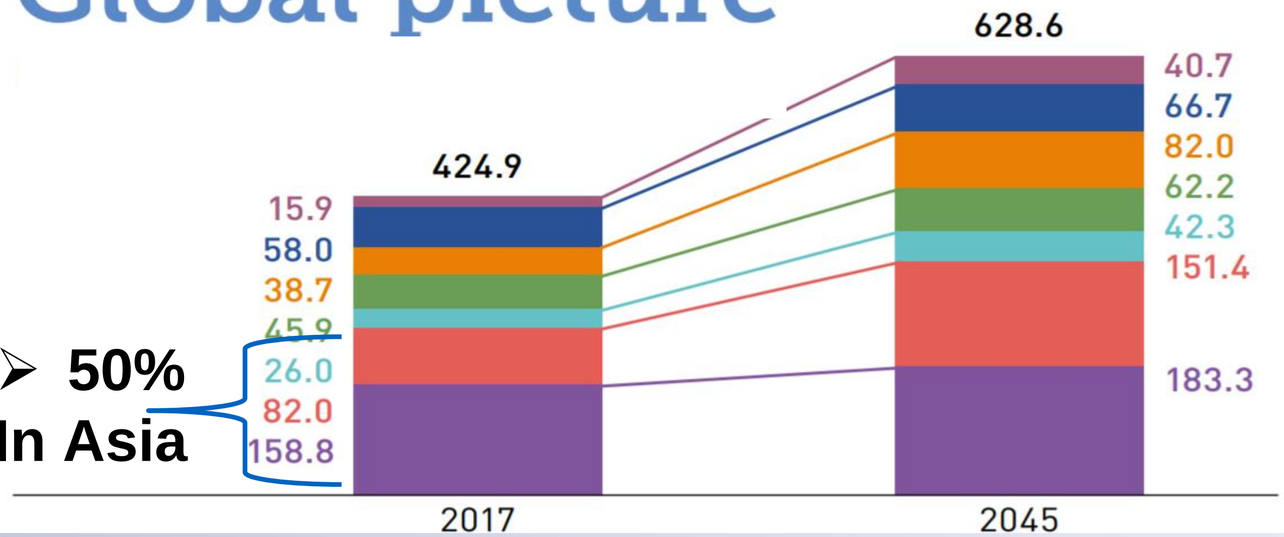
The Diabetes Epidemic

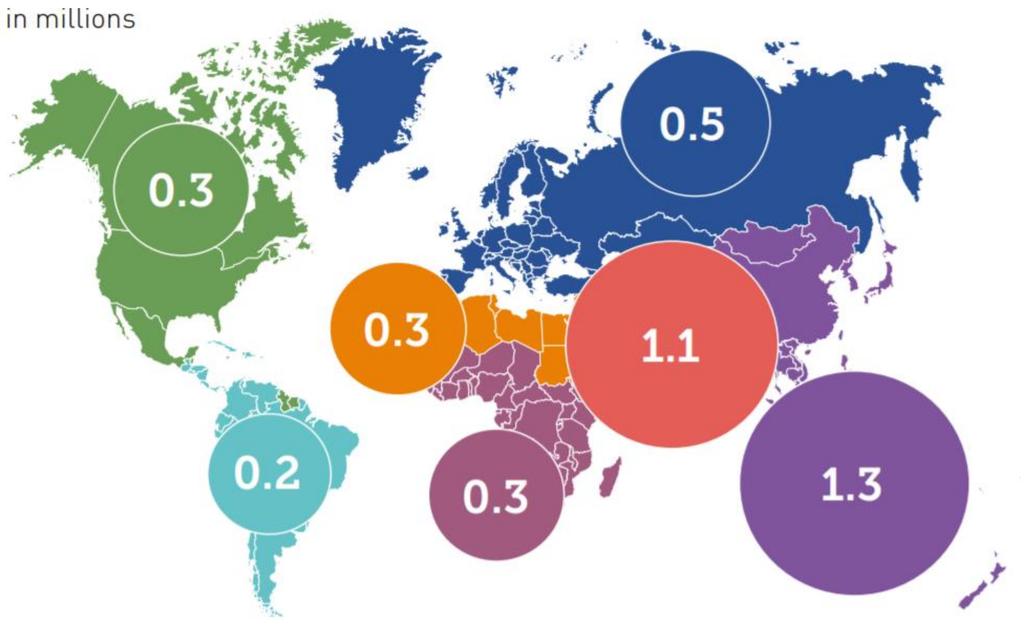
1980 – 108million diabetics
2017 – 424 million
2045 – 628 million

Global picture



➢ **50% In Asia**

Deaths Due To Diabetes 2017



*Numbers expressed in millions

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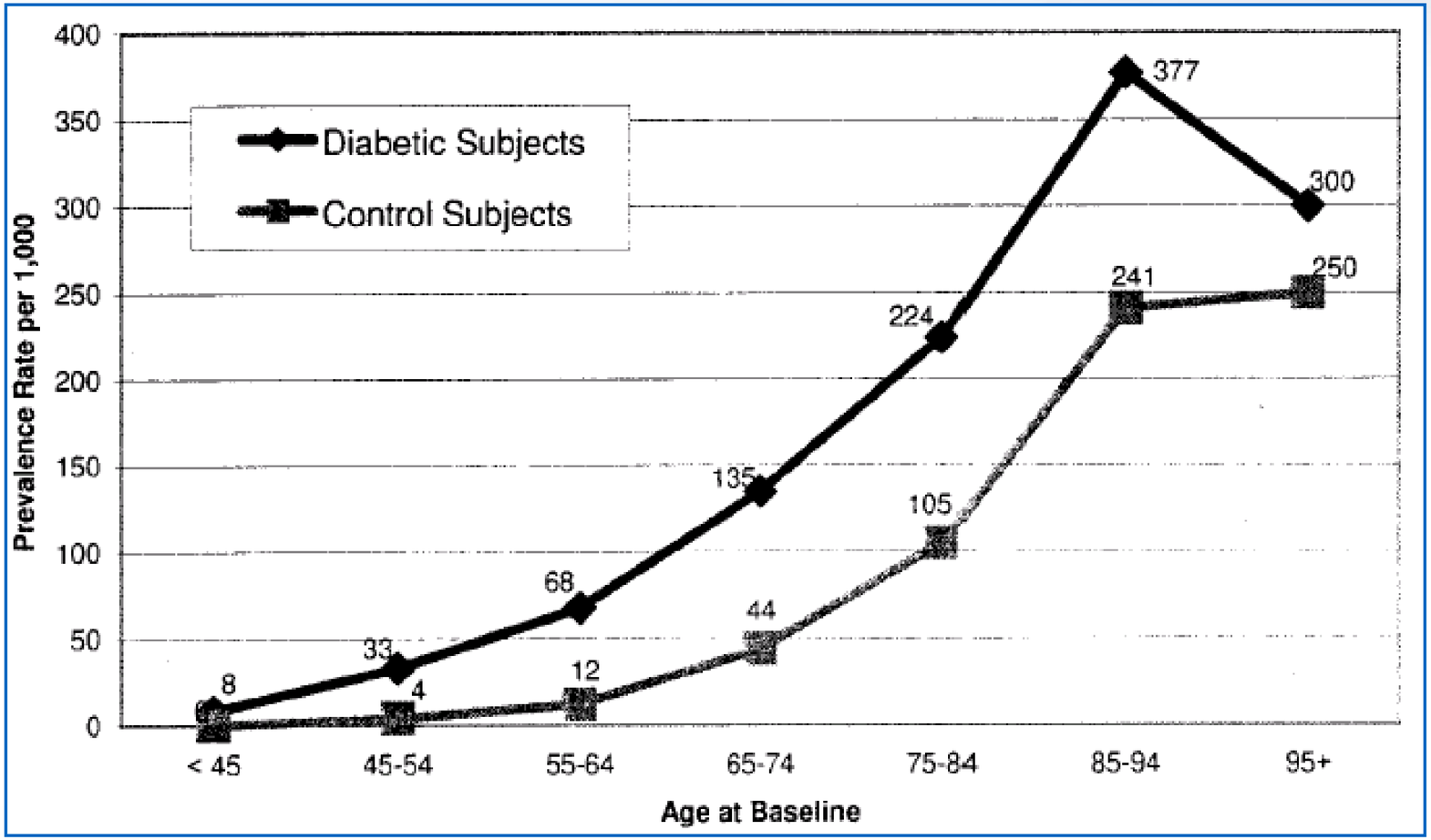
Patients with diabetes are 2 to 5 X more likely to develop HF



The overall prevalence of HF in diabetes is between 10-30%

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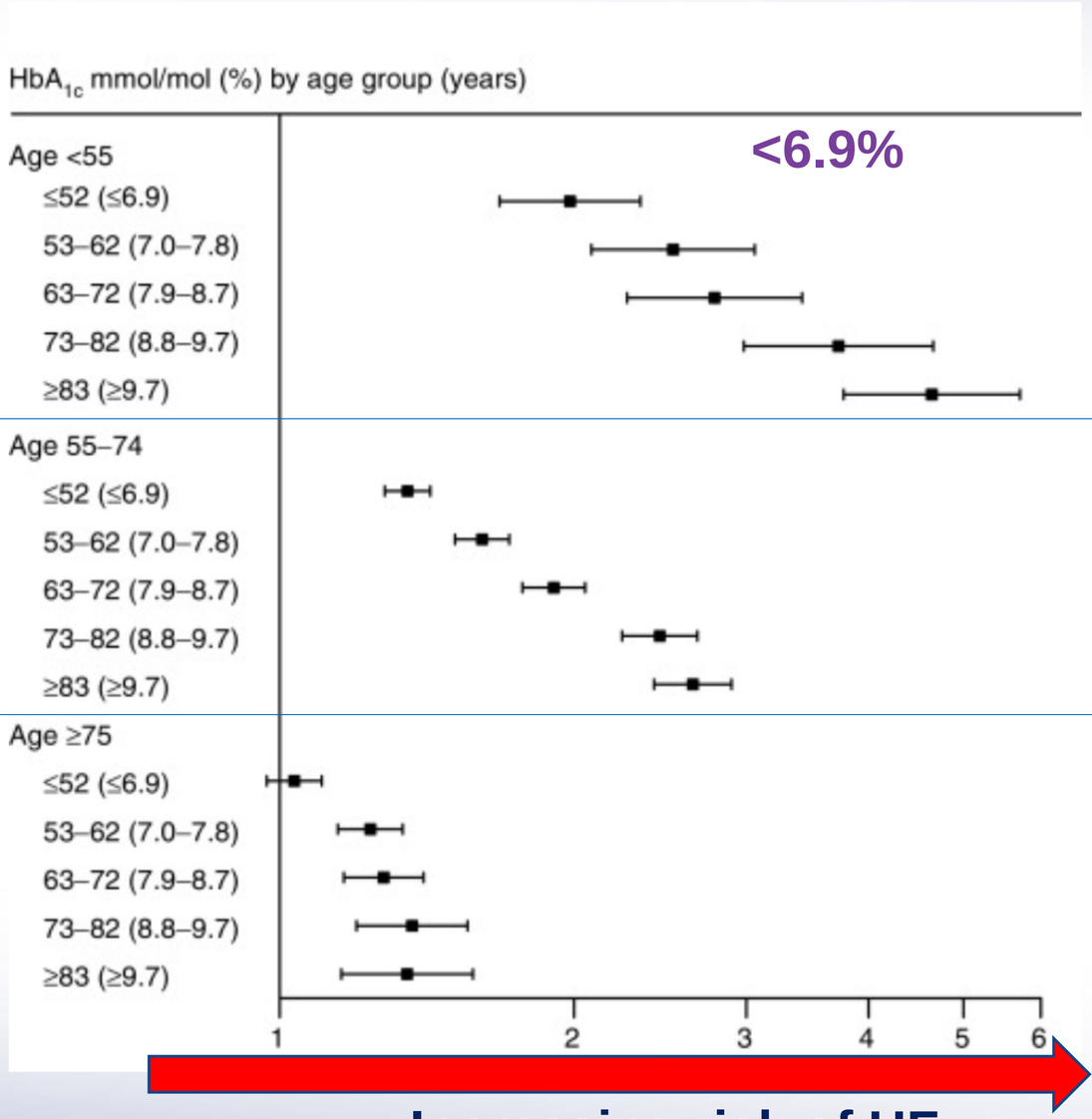
Nichols et al Diabetes Care 2001, 2004

The Risk of HF Rises with HBA1c in Young Patients

< 55 yrs

55-74

>75



<6.9%

>9.7%

Increasing risk of HF

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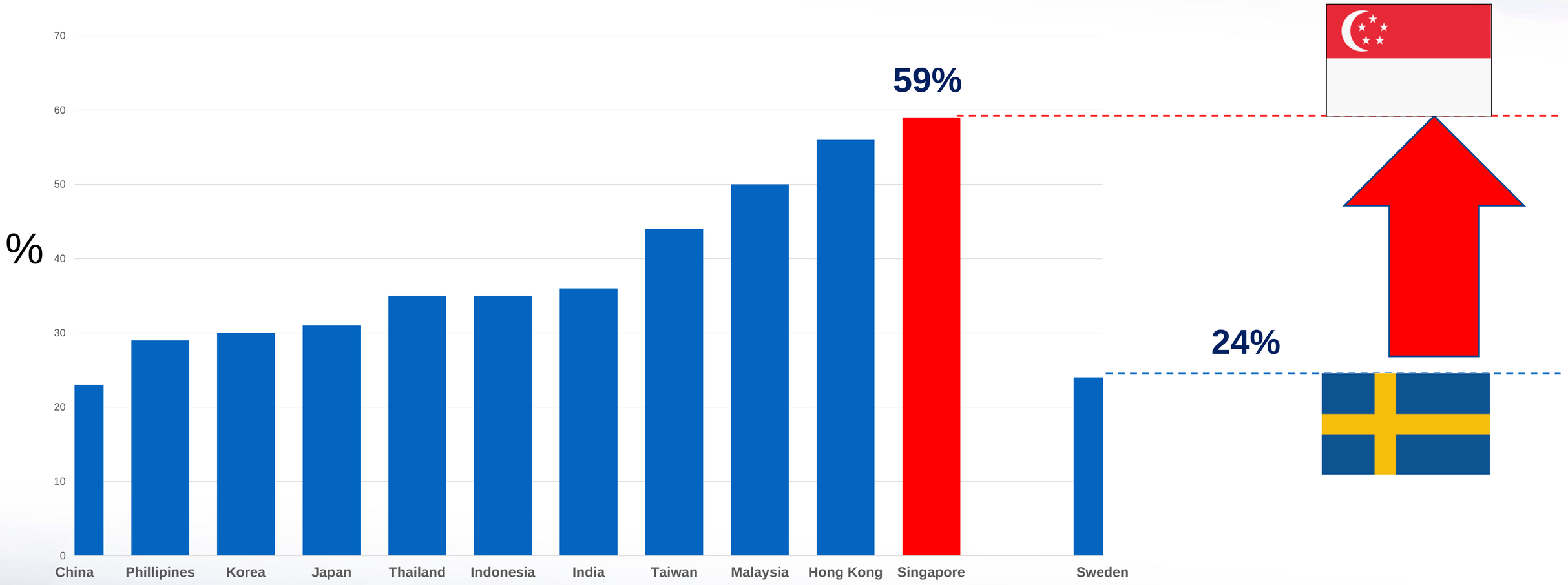
Swedish HF registry

The Prevalence of Diabetes in Asian HF patients



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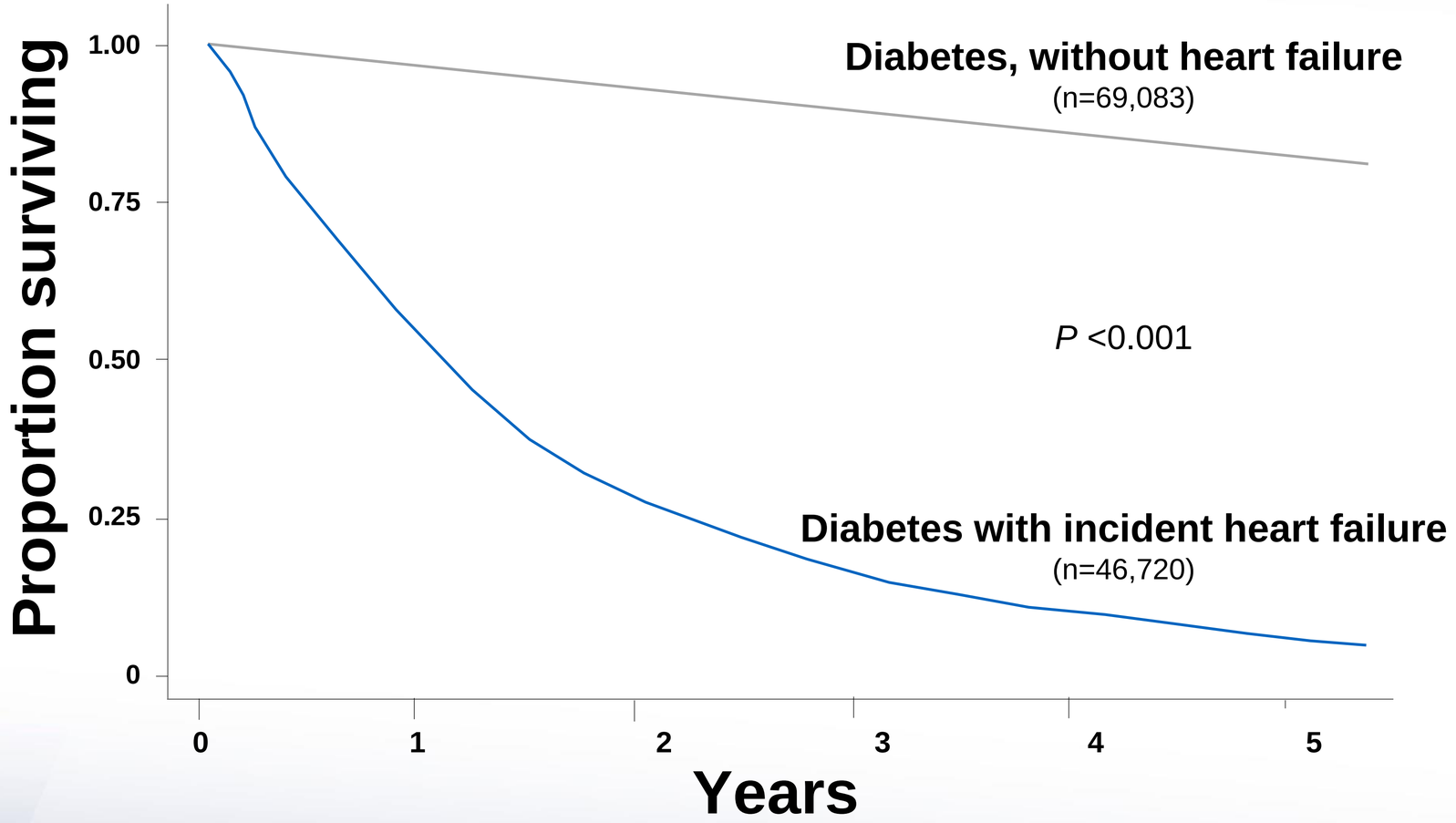
Bank et al JACC HF 2017, ASIAN – HF registry

The Presence of HF in Patients with Diabetes is Associated with an Increase in Death



- Medicare data
- n = 115,803
- >65 years

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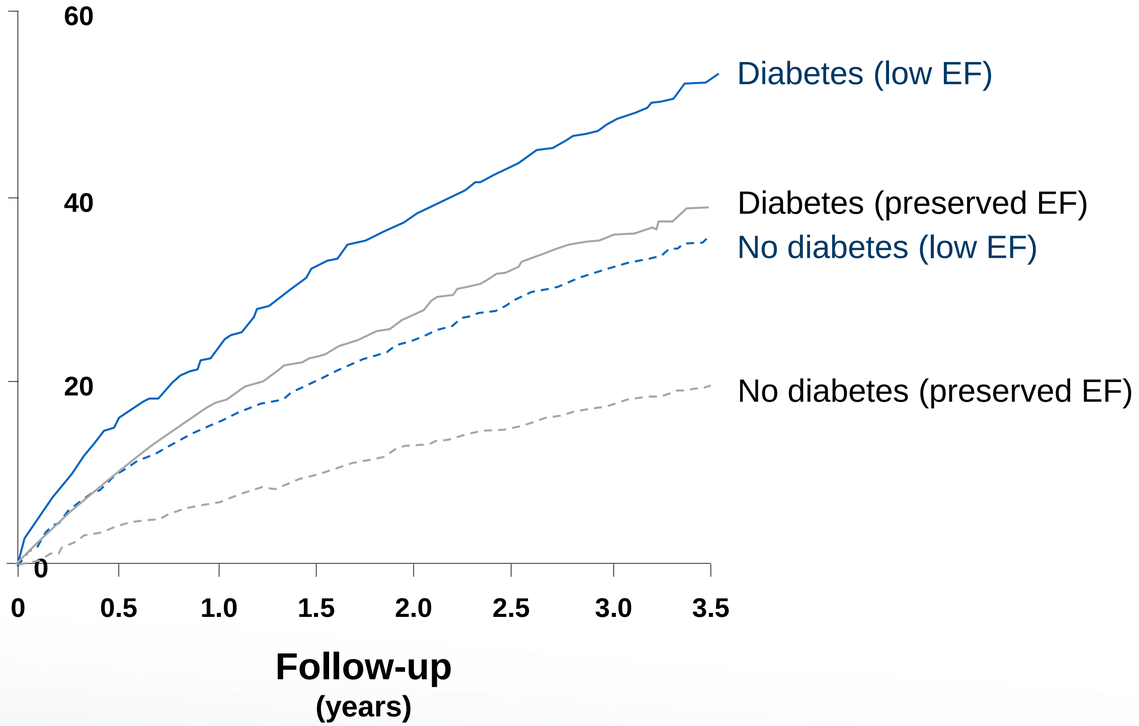
Bertoni AG, et al. *Diabetes Care.* 2004

The Presence of Diabetes Increases the Risk of Death and HF Hospitalisation in HFrEF and HFpEF

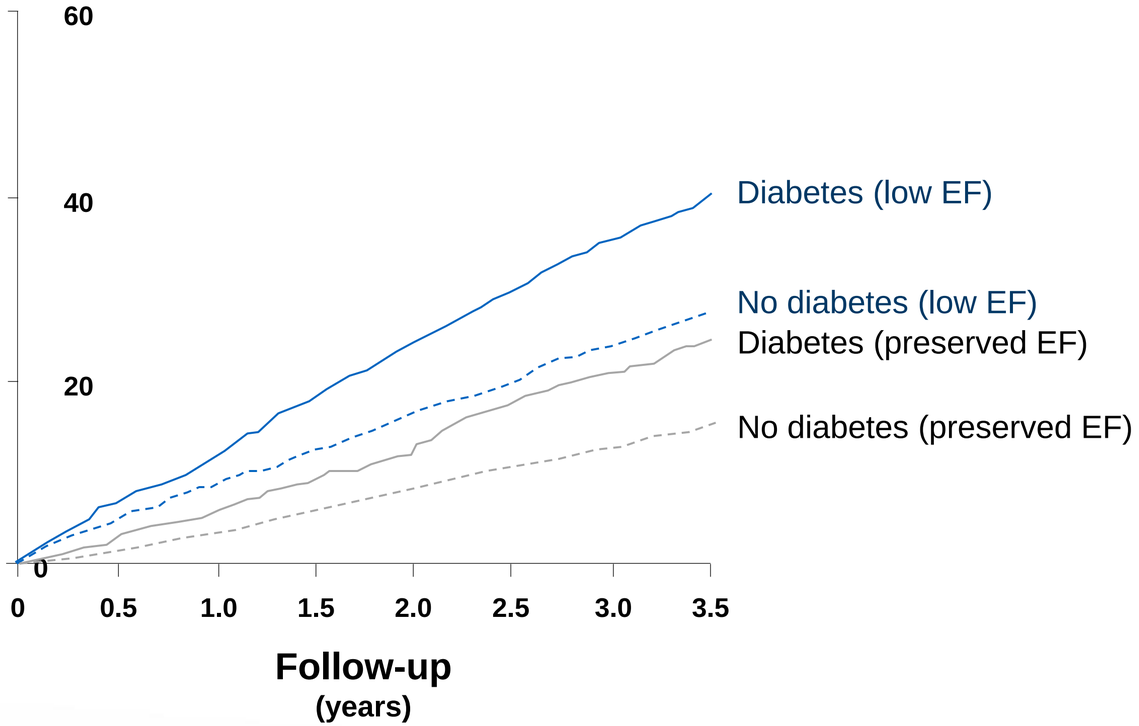
CV death or hospitalisation due to HF

(Cumulative incidence, %)



All-cause mortality

(Cumulative incidence, %)



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Data from the CHARM study, MacDonald et al EHJ 2008

Patients with both diabetes and HF

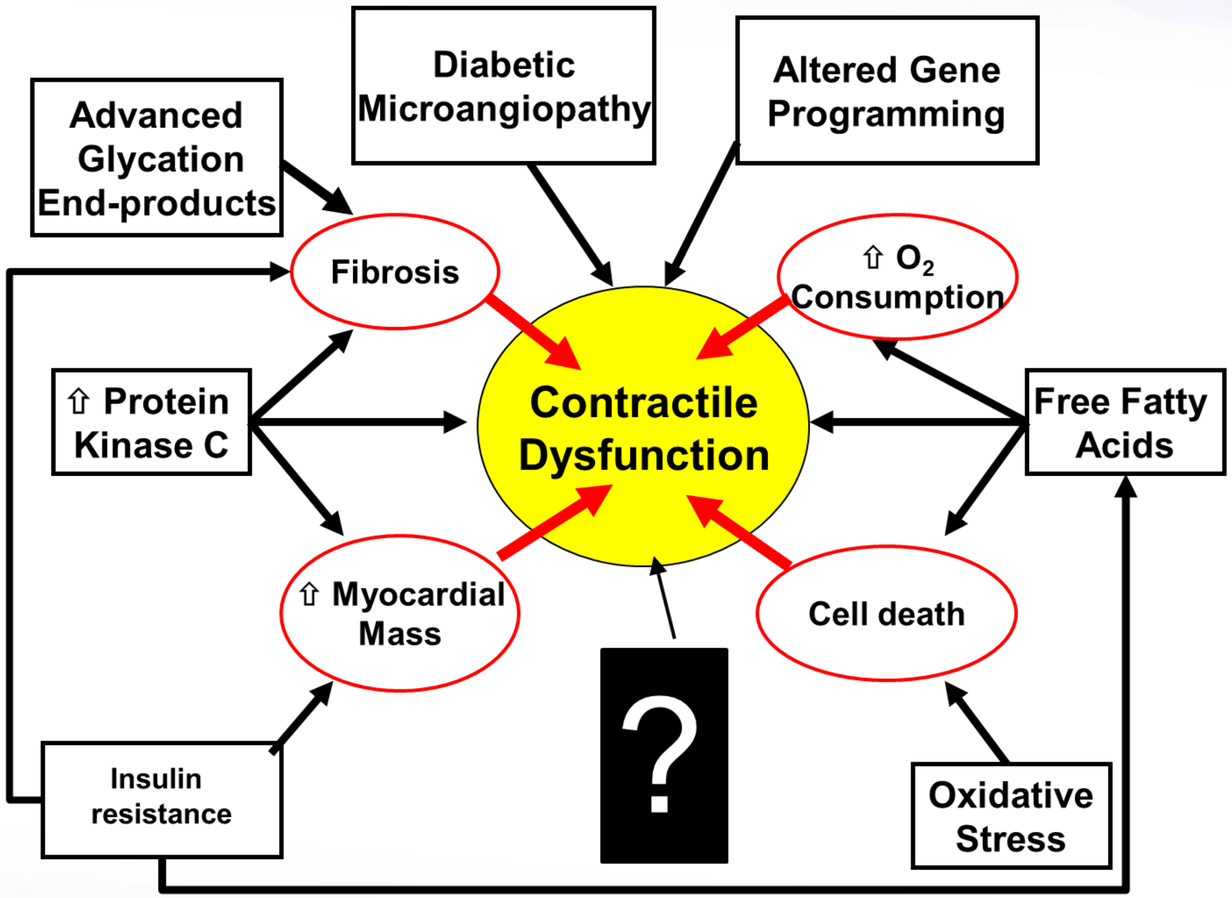
Die earlier

Have more symptoms

End up in hospital more often

Why does Diabetes Cause Heart Failure?

- **Hypertension**
  Better control reduces risk of developing HF
- **Coronary artery disease**
  Often accelerated, severe, diffuse and silent
- **Diabetes may have a direct effect on the myocardium**



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MacDonald et al EHJ

Screening

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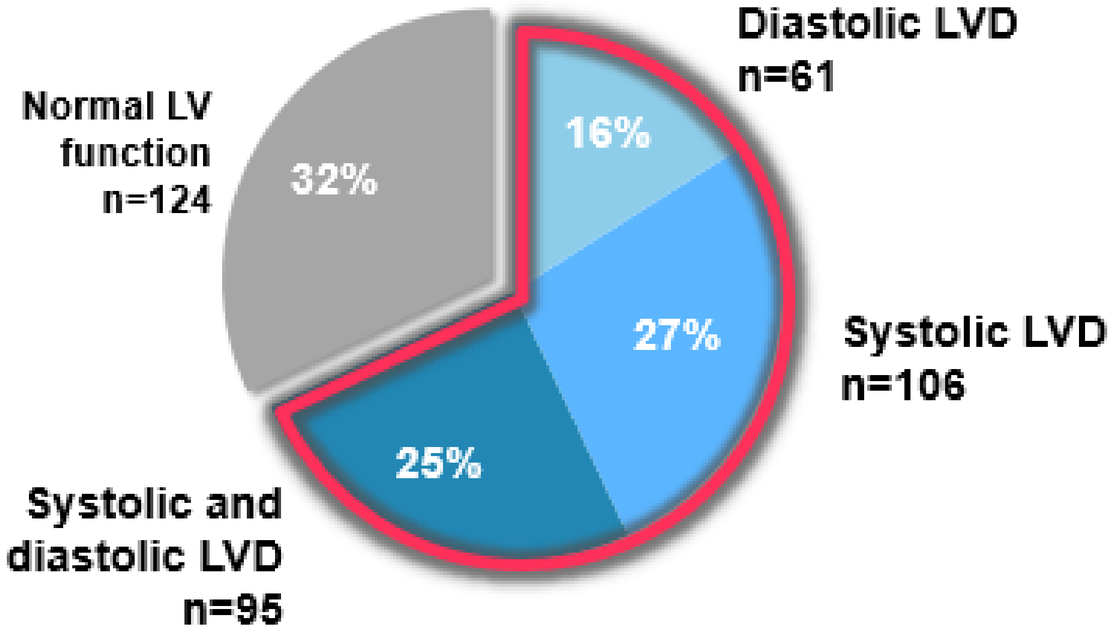
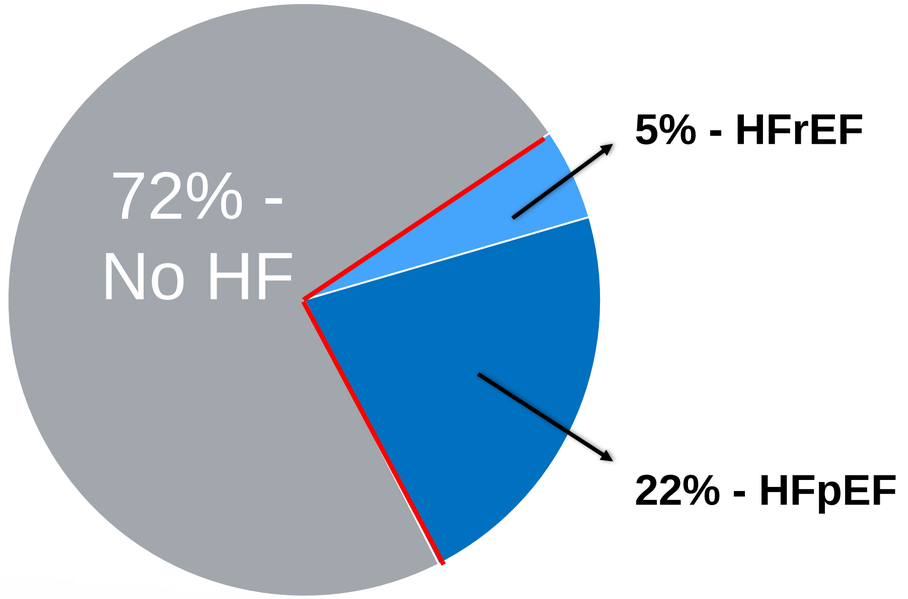
It is Common for Diabetics to Have Unrecognized HF and Cardiac Dysfunction

386 DM without CVD

68% of patients with T2D had evidence of LV dysfunction 5 years after T2D diagnosis[1]



605 DM without known HF
HbA1c 6.7%



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Should We Screen Patients with Diabetes for HF?

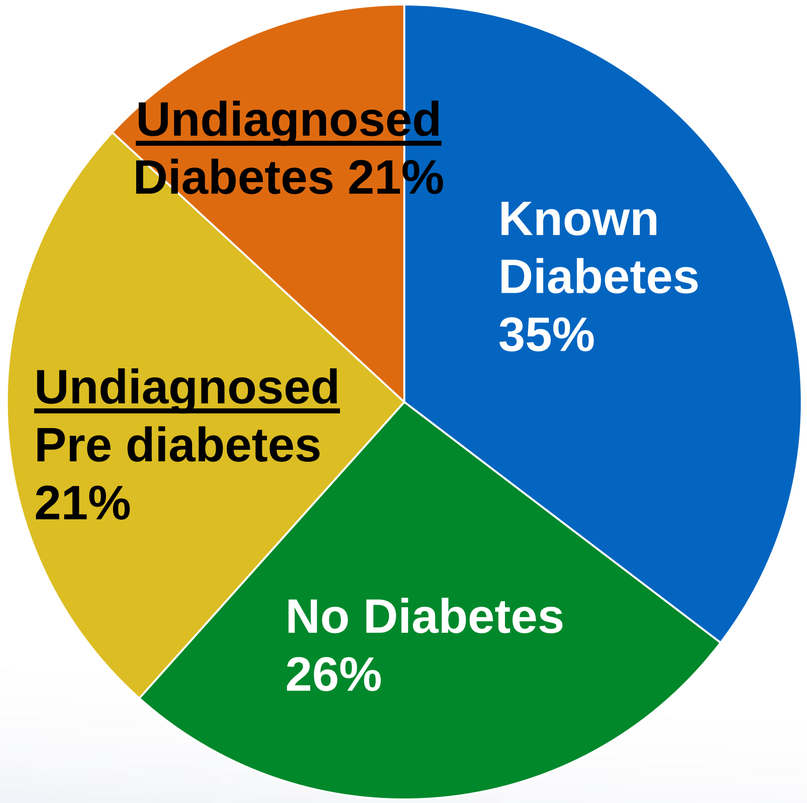
The HF Association of the ESC recommends

Consider screening with Echocardiography/NTproBNP in higher risk groups

- Older patients
- history of IHD/TIA or stroke
- Dyspnea
- Increased BMI
- Laterally displaced apex beat

Glucose Abnormalities are Commonly Undiagnosed in Patients with HF

42%
Undiagnosed



We need to regularly screen HF patients for Diabetes

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PARADIGM HF Trial

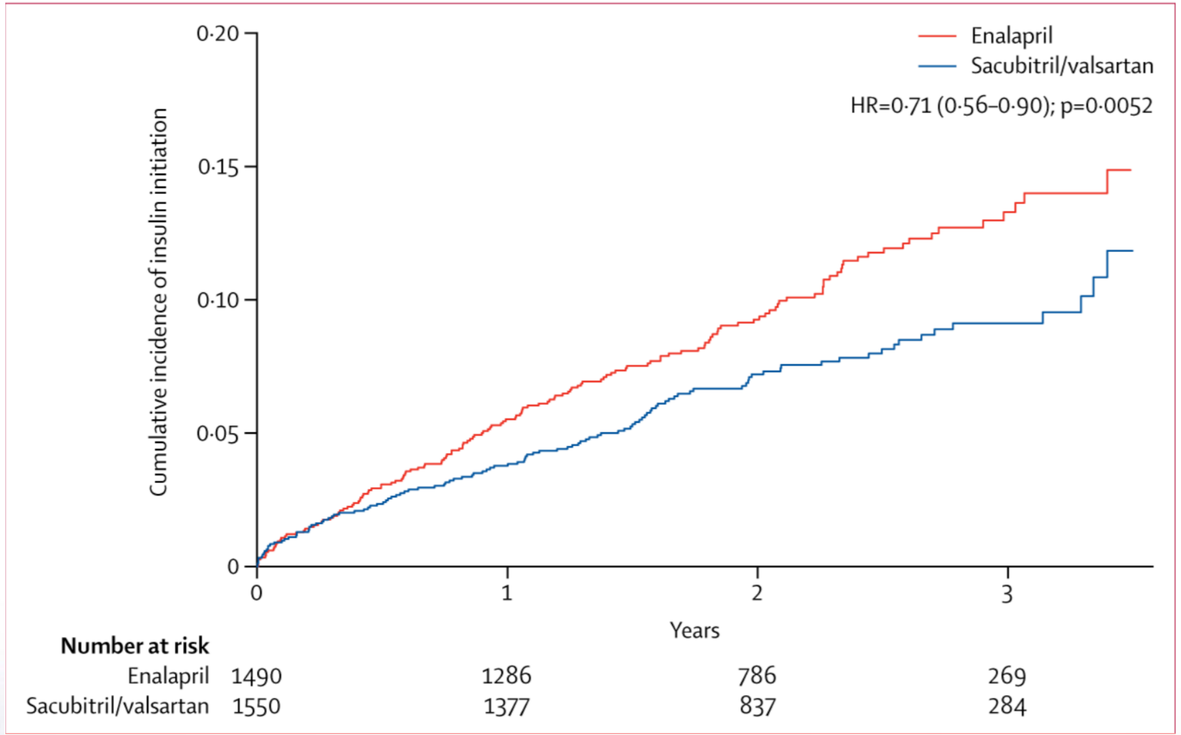
Treatment

Treatment of HF in Diabetes Patients

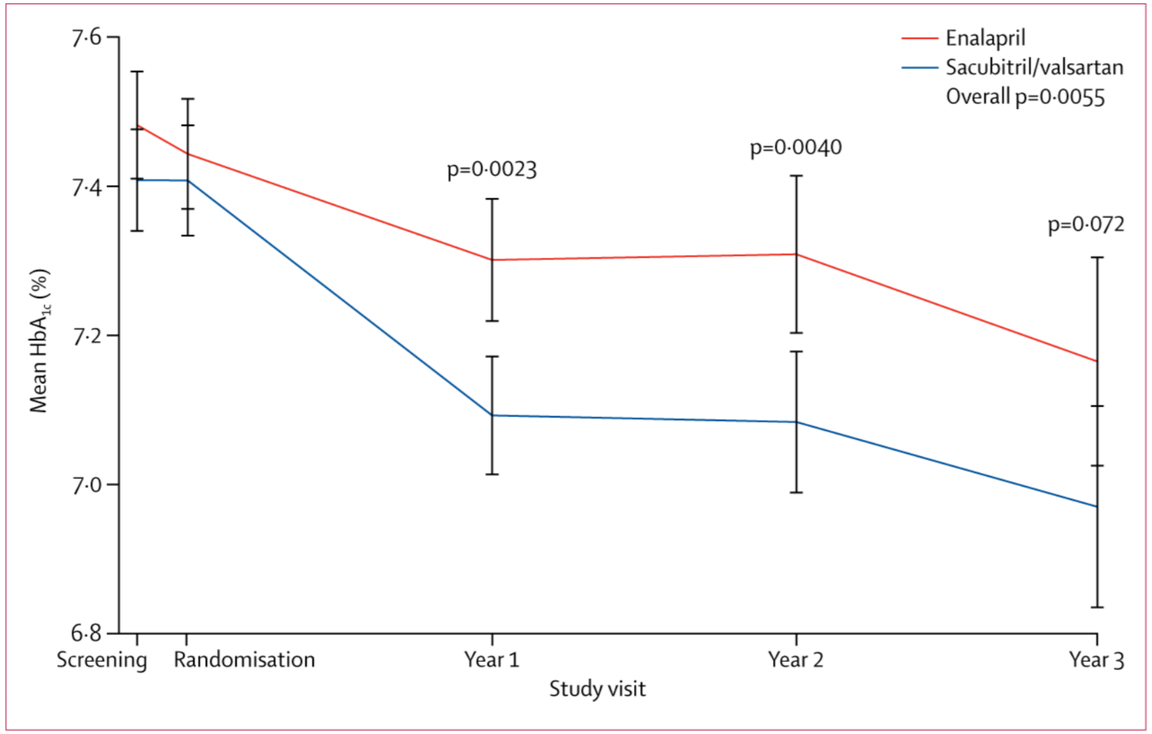
All standard HF drugs/devices work equally well in diabetics and non-diabetics

Entresto may have benefits on glycemia

Less conversion to insulin



Greater reduction in HbA1c



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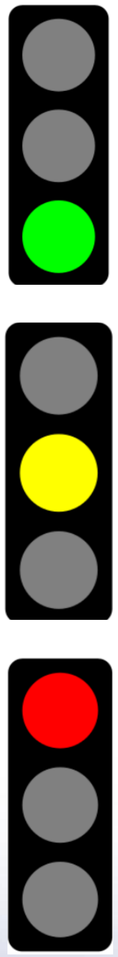
Seferovic et al Lancet Diabetes Endocrin 2017

Antidiabetic Drugs in HF



Potential beneficial effect on the risk of HF

Neutral effect on HF risk

Unfavorable effects in HF risk

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Antidiabetic Drugs in HF: Metformin

34000 Patient Meta-analysis: Observational Studies

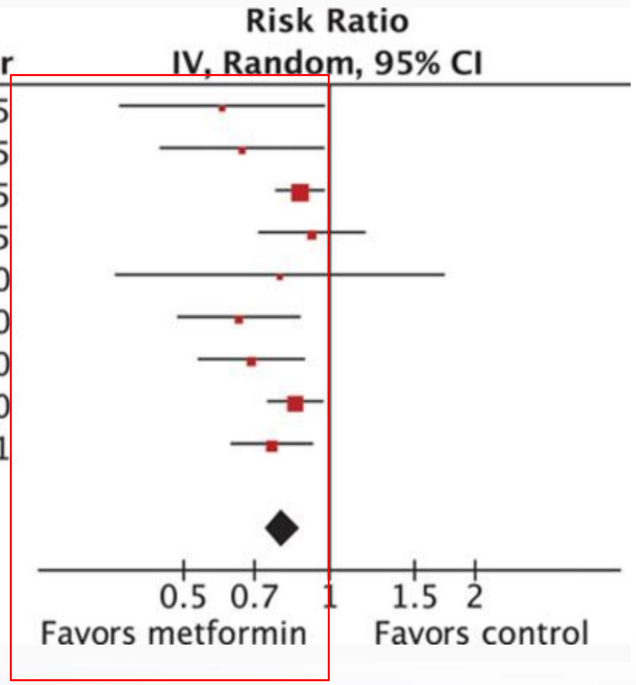
Reduction in Mortality

Metformin appears to have a favourable effect on outcomes in patients with HFrEF

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Random, 95% CI	Year
Evans	-0.5108	0.25	2.6%	0.60 [0.37, 0.98]	2005
Eurich	-0.4156	0.2	4.1%	0.66 [0.45, 0.98]	2005
Masoudi	-0.1393	0.06	29.0%	0.87 [0.77, 0.98]	2005
Inzucchi	-0.0834	0.13	8.9%	0.92 [0.71, 1.19]	2005
Shah	-0.2357	0.4	1.1%	0.79 [0.36, 1.73]	2010
MacDonald	-0.4308	0.15	6.9%	0.65 [0.48, 0.87]	2010
Roussel	-0.3711	0.13	8.9%	0.69 [0.53, 0.89]	2010
Andersson	-0.1625	0.0682	24.6%	0.85 [0.74, 0.97]	2010
Aguilar	-0.2744	0.1	13.9%	0.76 [0.62, 0.92]	2011
Total (95% CI)			**100.0%**	**0.80 [0.74, 0.87]**	

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 9.45$, df = 8 (P = 0.31); $I^2 = 15\%$

Test for overall effect: Z = 5.35 (P < 0.00001)



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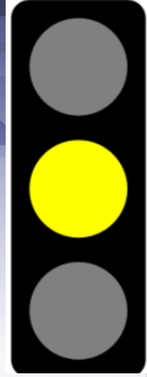
Eurich et al Circ Heart Failure 2013

Antidiabetic Drugs in HF: Sulfonylureas



Early data
UKPDS, ADOPT – No increased HF signal

Recent Observational Data in non-HF populations

VAD database in USA
Sulfonylureas associated with increased HF-related and CV mortality compared with metformin

Canadian observational Study
Signal for increased mortality and CV risk particularly in South Asian and Chinese Patients

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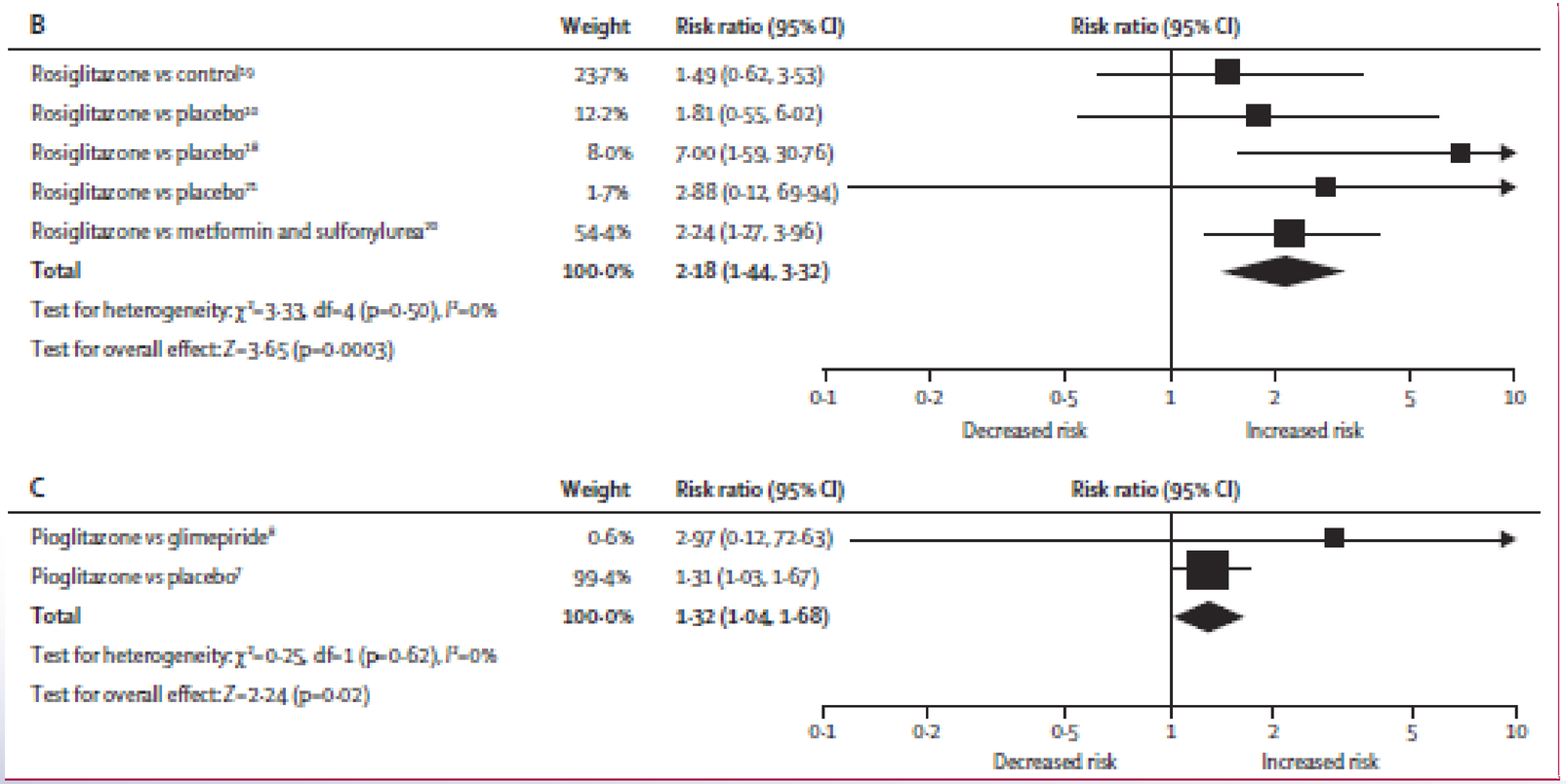
Roumie et al JAHA 2017, Ke et al Can J Diabetes 2017

Antidiabetic Drugs in HF: Thiazolidinediones

TZDs increase the risk of HF hospitalization

In RECORD – patients that developed HF had a higher risk of death

CONTRAINDICATED IN HEART FAILURE



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Lago et al Lancet 2017

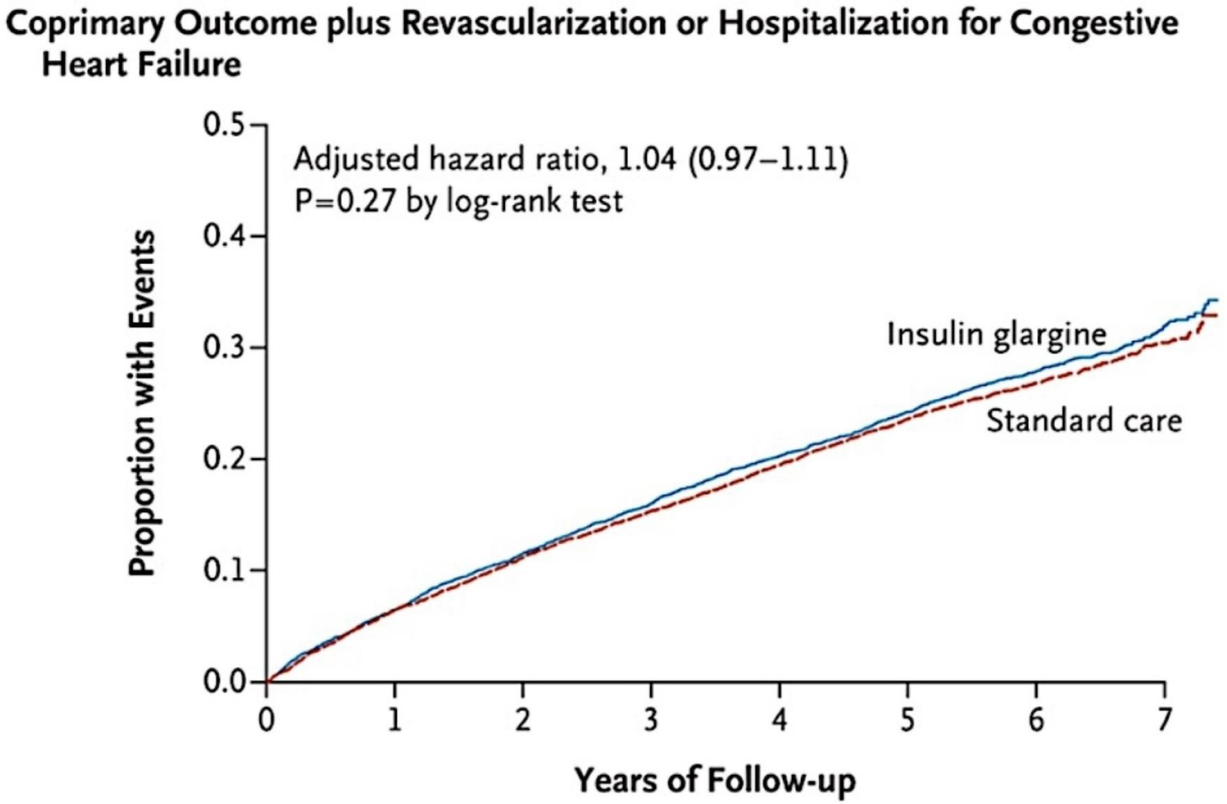
Antidiabetic Drugs in HF: DPP4 Inhibitors

Medication	RCT	Patients, n	Patients with HF	Median follow-up (years)	HR (95% CI)
Saxagliptin	SAVOR TIMI 53	8,280	13%	2.1	**1.27 (1.07–1.51)**
Alogliptin	EXAMINE	2,701	28%	1.5	1.07 (0.79–1.46)
Sitagliptin	TECOS	7,257	18%	3.0	1.00 (0.83–1.20)
Vildagliptin	VIVIDD	254	All patients NYHA class I-III HF and EF <40%	1.0	No effect on LVEF; an increase in LV volumes
Linagliptin	CARMELINA	6,979	27%	2.2	0.90 (0.74 – 1.08)

Green JB et al. N Engl J Med. 2015;373:232-42;
Scirica BM et al. N Engl J Med. 2013;369:1317-26;
White WB et al. N Engl J Med. 2013;369:1327-35;
McMurray JJR et al. JACC Heart Fail. 2018;6:8-17
Rosenstock J et al. JAMA. 2019;321:69-79.

Antidiabetic Drugs in HF: Insulin

ORIGIN Trial: RCT of Insulin on CV outcomes
12537 Patients without HF but at increased CV risk



Insulin Glargine had a neutral effect on risk of HF hospitalization

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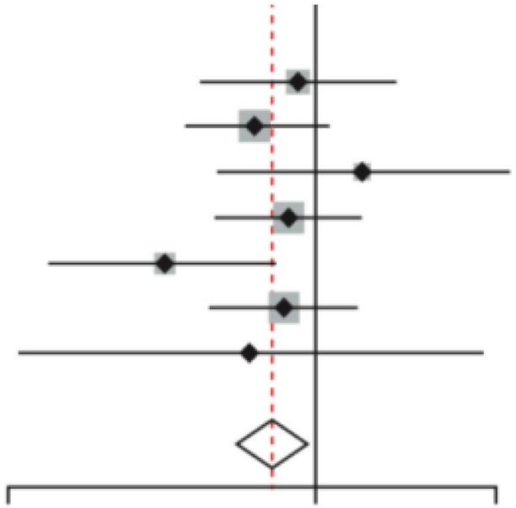
NEJM 2012

Antidiabetic drugs in HF: GLP-1 agonists

Meta – Analysis 56000 patients
GLP – 1 significantly reduced CV Death, Stroke and MI by 12%

9% reduction in HF hospitalisation versus placebo

Hospital admission for heart failure					
ELIXA	122/3034 (4%)	127/3034 (4%)	0·96 (0·75–1·23)		0·75
LEADER	218/4668 (5%)	248/4672 (5%)	0·87 (0·73–1·05)		0·14
SUSTAIN-6	59/1648 (4%)	54/1649 (3%)	1·11 (0·77–1·61)		0·57
EXSCEL	219/7356 (3%)	231/7396 (3%)	0·94 (0·78–1·13)		0·51
Harmony Outcomes	79/4731 (2%)	111/4732 (2%)	0·71 (0·53–0·94)		<0·0001
REWIND	213/4949 (4%)	226/4952 (5%)	0·93 (0·77–1·12)		0·46
PIONEER 6	21/1591 (1%)	24/1592 (2%)	0·86 (0·48–1·44)		0·59
Overall (I^2=0·0%, p=0·595)	**936/27 977 (3%)**	**1016/28 027 (4%)**	**0·91 (0·83–0·99)**	**312 (165 to 2810)**	**0·028**



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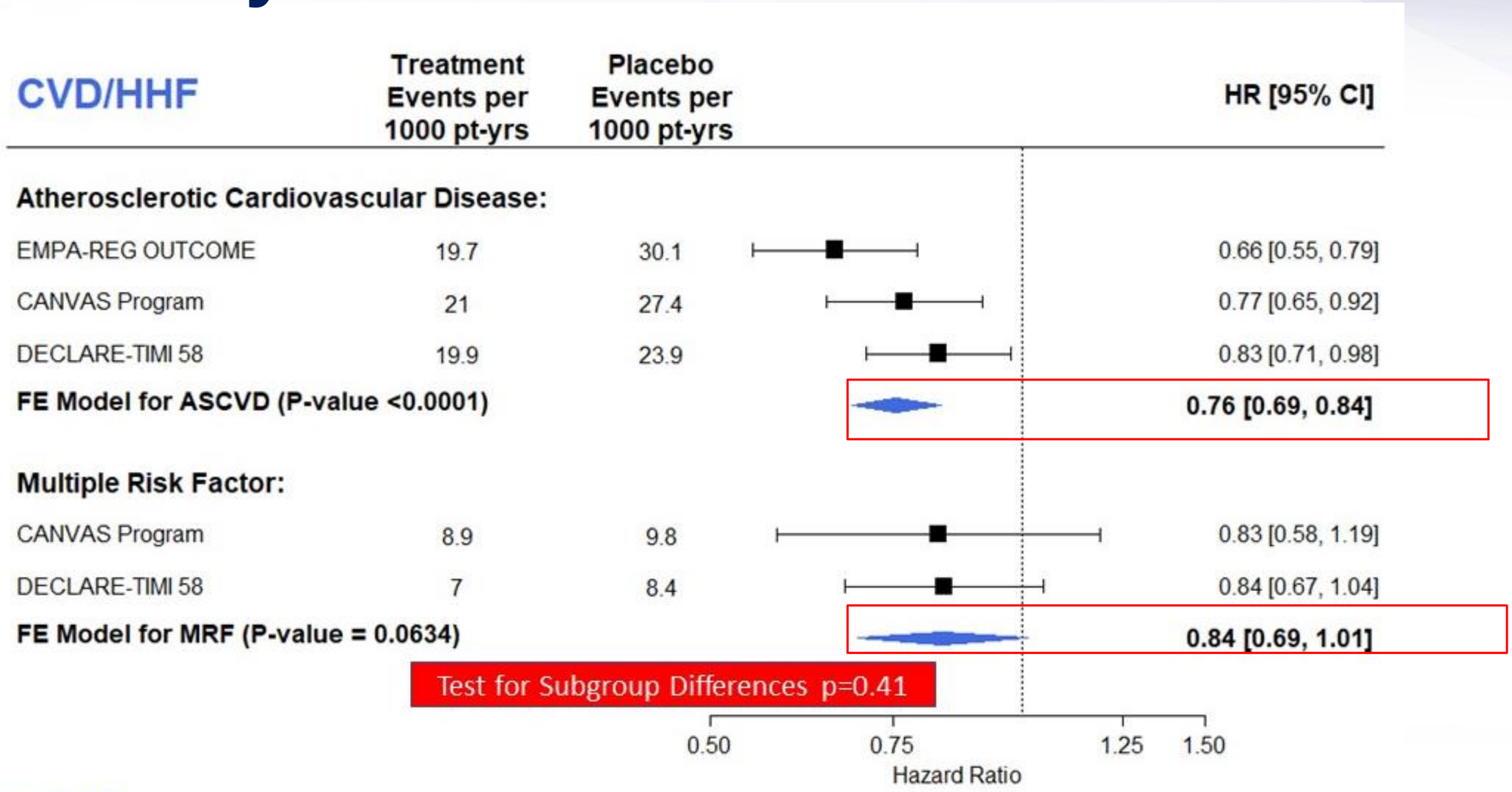
Kristensen et al Lancet Diabetes Endocrinol 2019

Antidiabetic drugs in HF: SGLT2
Meta – Analysis of CVOTs: CVD and HHF



BRIGHAM HEALTH
BRIGHAM AND WOMEN'S HOSPITAL
HARVARD MEDICAL SCHOOL TEACHING HOSPITAL

Zelniker TA, Wiviott SD...Sabatine MA, Lancet 2018

Antidiabetic drugs in HF: SGLT2
Risk reduction for HF Hospitalisation

Medication	RCT	Patients, n	Characteristics	History of HF	Follow-up (years)	HF hospitalisation (HR, 95% CI)
Empagliflozin	EMPA-REG OUTCOME®	7,020	CVD (100%)	10.2%	3.1	**0.65 (0.50-0.85)**
Canagliflozin	CANVAS Program	10,142	CVD (66%); CV risk factors (34%)	14.4%	3.2	**0.67 (0.52–0.87)**
Canagliflozin	CREDENCE	4,401	Albuminuric CKD CVD (50%)	14.9%	2.6	**0.61 (0.47–0.80)**
Dapagliflozin	DECLARE TIMI-58 TIMI STUDY GROUP/HADASSAH MEDICAL ORG Dapagliflozin Effect on Cardiovascular Events	17,160	CVD (41%) CV risk factors (59%)	10.0%	4.2	**0.73 (0.61-0.88)**

Zinman B, et al N Engl J Med. 2015;373:2117-28.
Neal B, et al. N Engl J Med. 2017;377:644-57.

Perkovic V et al. N Engl J Med. 2019;380:2295-2306
Wiviott, S. D., et al. N Engl J Med 2019; 380: 347-357.

Just Presented At ESC – Published 20 Sept 2019

DAPA – HF Trial – 4744 Patients

- Dapagliglozin 10mg V Placebo
- In patients with heart failure and reduced ejection fraction (HFrEF) both ***with and without*** T2D
- LVEF ≤40%
- Symptomatic
- Raised NT-pro BNP

Key exclusions: *Egfr <30 ml/min/1.73 m^2*

Primary endpoint: Worsening HF or CV Death

This is **new data** and dapagliflozin can not currently be endorsed as a standard treatment for heart failure.

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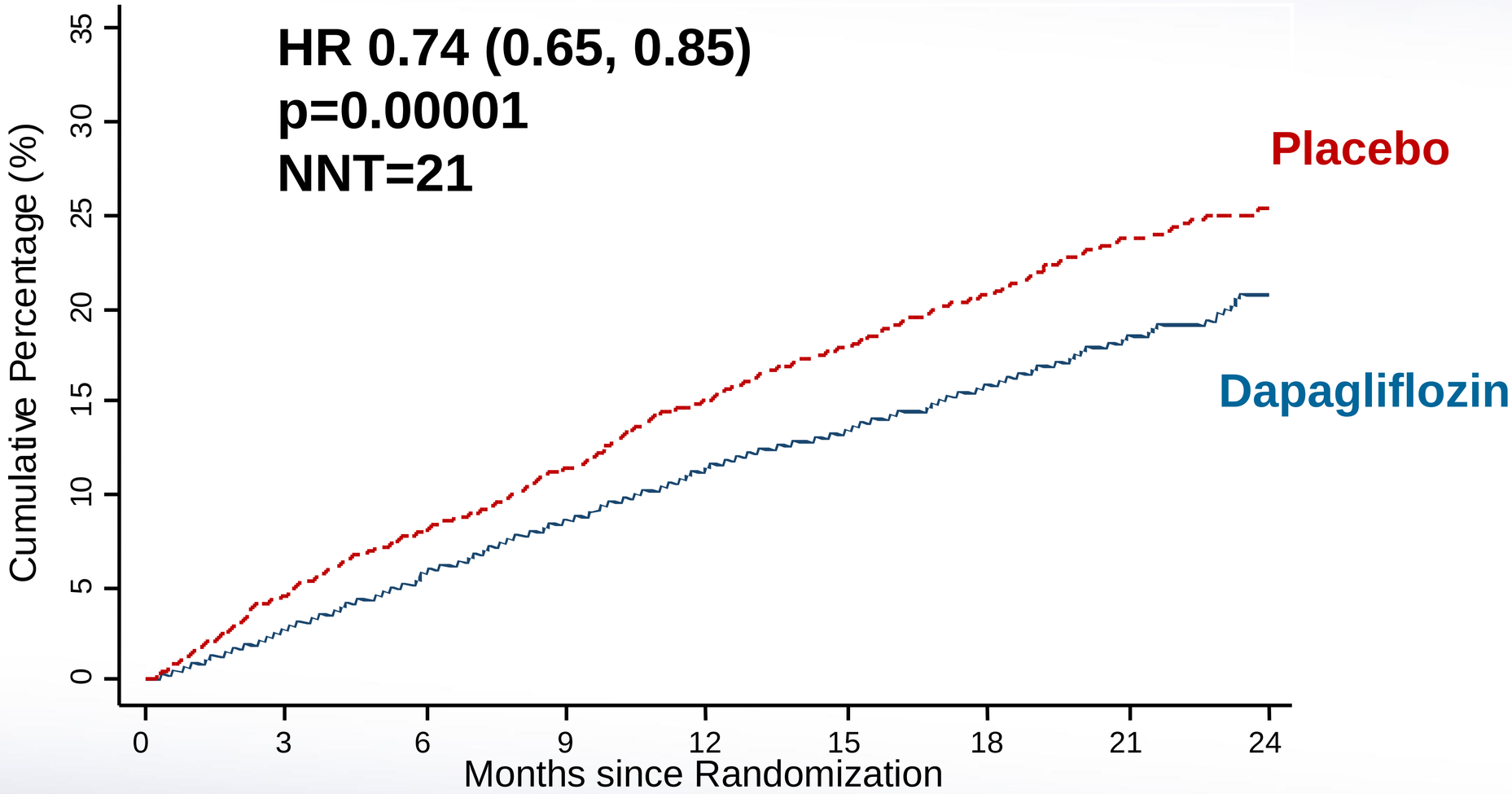
Primary composite outcome

CV Death/HF hospitalization/Urgent HF visit



Number at Risk

Dapagliflozin	2373	2305	2221	2147	2002	1560	1146	612	210
Placebo	2371	2258	2163	2075	1917	1478	1096	593	210

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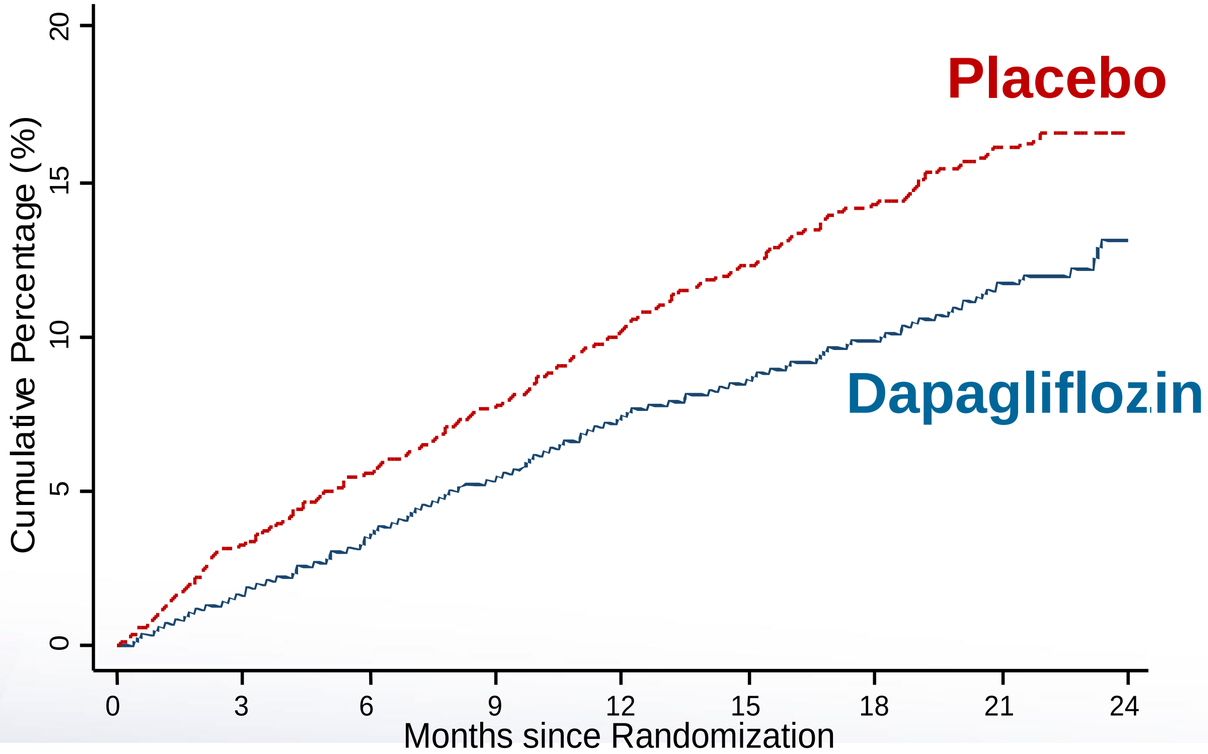
Components of primary outcome

Worsening HF event

HR 0.70 (0.59, 0.83); p=0.00003

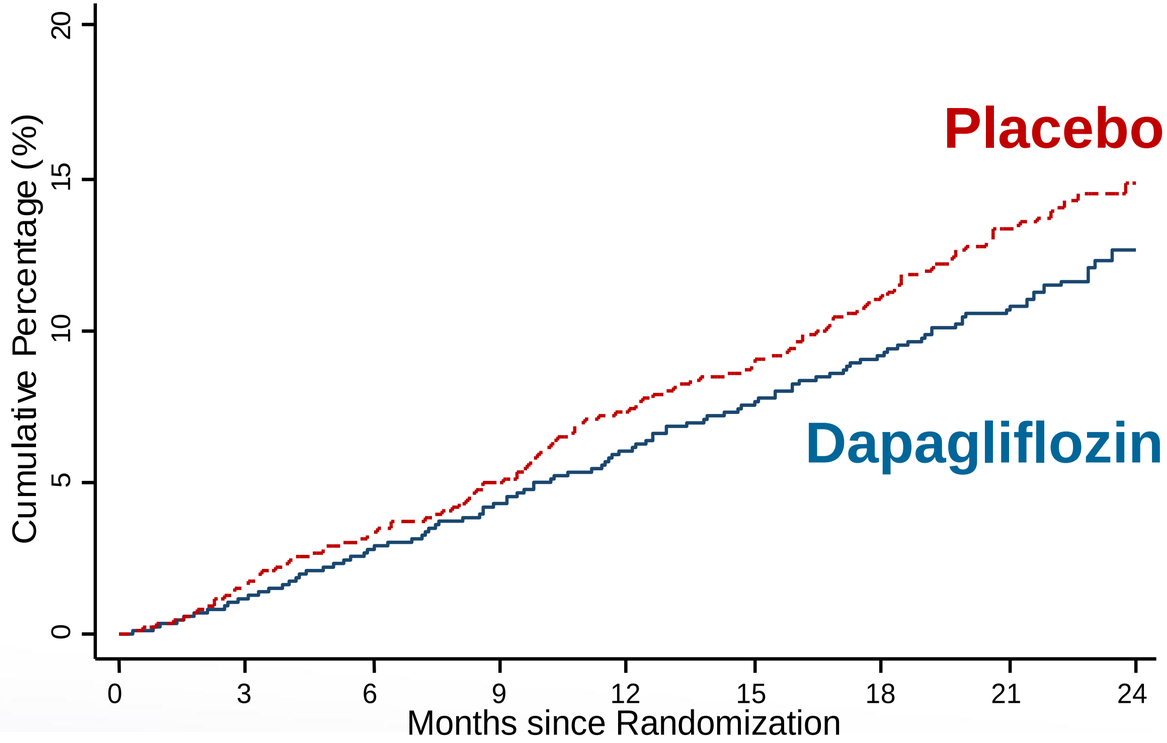


Number at Risk

Dapagliflozin	2373	2305	2221	2147	2002	1560	1146	612	210
Placebo	2371	2258	2163	2075	1917	1478	1096	593	210

Cardiovascular death

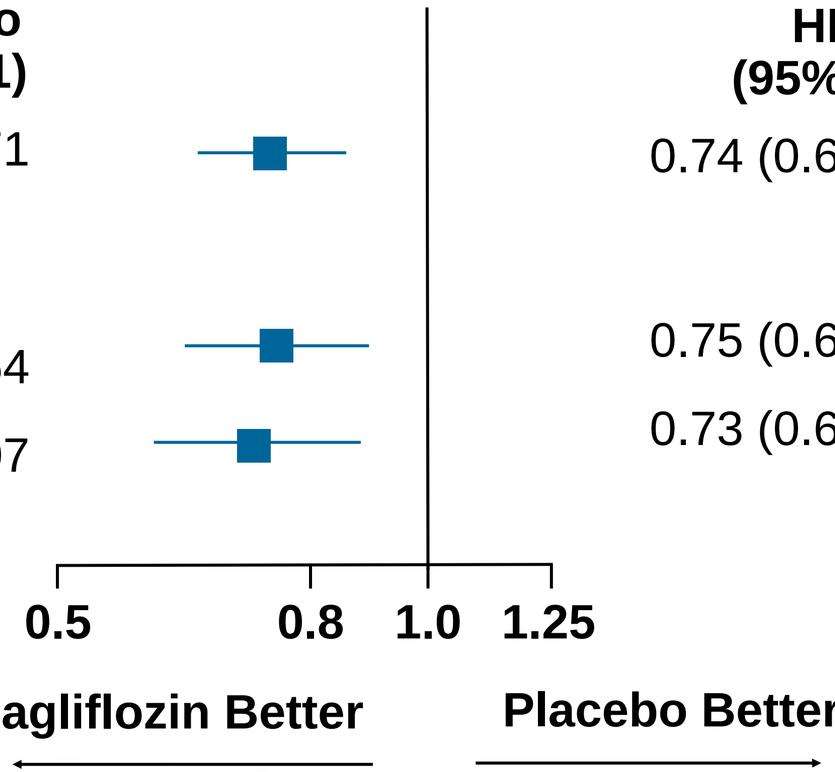
HR 0.82 (0.69, 0.98); p=0.029



	2373	2339	2293	2248	2127	1664	1242	671	232
	2371	2330	2279	2230	2091	1636	1219	664	234

No diabetes/diabetes subgroup: Primary endpoint

	Dapagliflozin (n=2373)	Placebo (n=2371)	HR (95% CI)
All patients	386/2373	502/2371	0.74 (0.65, 0.85)
Type 2 diabetes at baseline*			
Yes	215/1075	271/1064	0.75 (0.63, 0.90)
No	171/1298	231/1307	0.73 (0.60, 0.88)



*Defined as history of type 2 diabetes or HbA1c ≥6.5% at both enrollment and randomization visits.

Guidelines

2019 ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD

Recommendations for the treatment of patients with diabetes to reduce HF risk

SGLT2 inhibitors (empagliflozin, canagliflozin, and dapagliflozin) are associated with a lower risk of HF hospitalization in patients with DM, and are recommended.[306,311,496]	I	A
Metformin should be considered for DM treatment in patients with HF, if the eGFR is stable and >30 mL/min/1.73 m^2.[484,485]	IIa	C
GLP1-RAs (lixisenatide, liraglutide, semaglutide, exenatide, and dulaglutide) have a neutral effect on the risk of HF hospitalization, and may be considered for DM treatment in patients with HF.[158,176,297,299,300,303,498,499]	IIb	A
The DPP4 inhibitors sitagliptin and linagliptin have a neutral effect on the risk of HF hospitalization, and may be considered for DM treatment in patients with HF.[293,294]	IIb	B
Insulin may be considered in patients with advanced systolic HFrEF.[500]	IIb	C
Thiazolidinediones (pioglitazone and rosiglitazone) are associated with an increased risk of incident HF in patients with DM, and are not recommended for DM treatment in patients at risk of HF (or with previous HF).[279,491–493]	III	A
The DPP4 inhibitor saxagliptin is associated with an increased risk of HF hospitalization, and is not recommended for DM treatment in patients at risk of HF (or with previous HF).[291]	III	B

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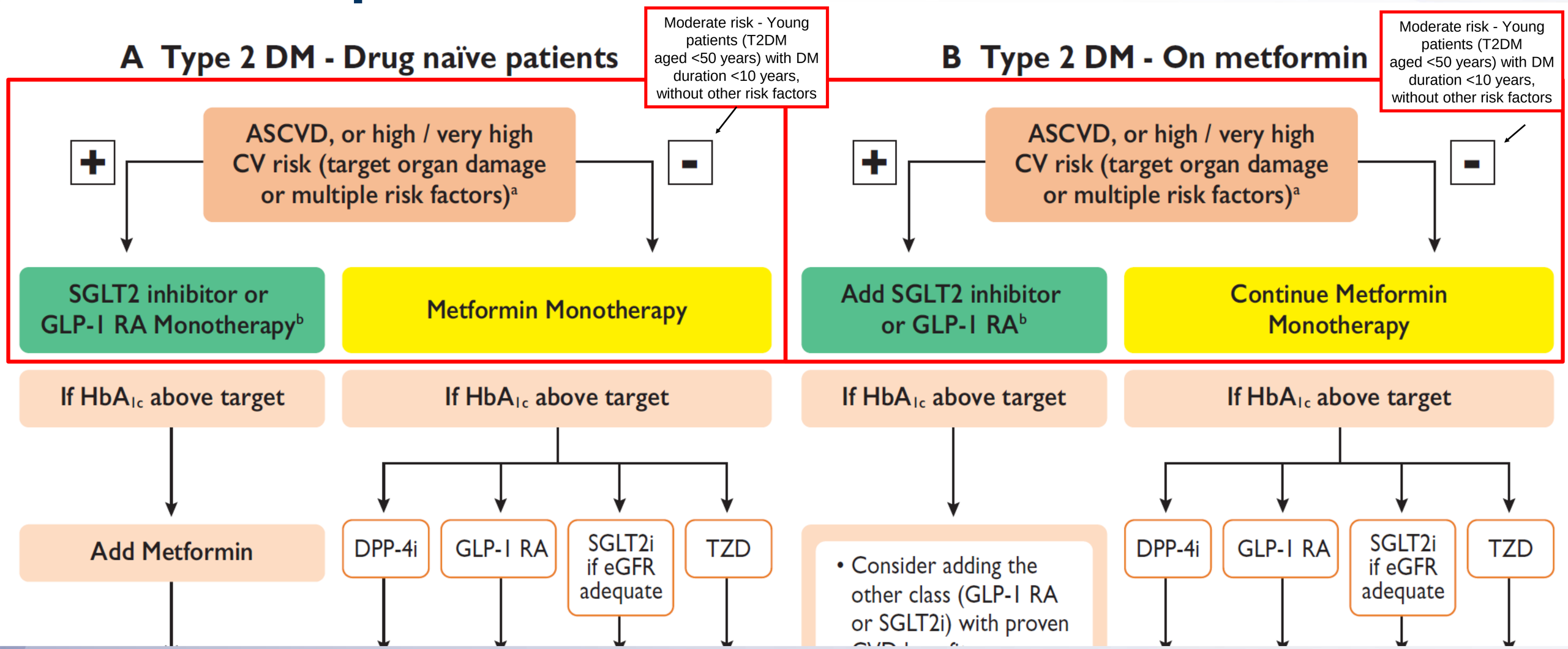
2019 ESC Guidelines on diabetes, pre-diabetes and cardiovascular diseases developed in collaboration with the EASD



Recommendations for glucose-lowering treatment for patients with diabetes

Recommendations	Class[a]	Level[b]
SGLT2 inhibitors		
Empagliflozin, canagliflozin, or dapagliflozin are recommended in patients with T2DM and CVD, or at very high/high CV risk,[c] to reduce CV events.[306,308,309,311]	I	A
Empagliflozin is recommended in patients with T2DM and CVD to reduce the risk of death.[306]	I	B
GLP1-RAs		
Liraglutide, semaglutide, or dulaglutide are recommended in patients with T2DM and CVD, or at very high/high CV risk,[c] to reduce CV events.[176,299–300,302–303]	I	A
Liraglutide is recommended in patients with T2DM and CVD, or at very high/high CV risk,[c] to reduce the risk of death.[176]	I	B
Biguanides		
Metformin should be considered in overweight patients with T2DM without CVD and at moderate CV risk.[146,149]	IIa	C
Insulin		
Insulin-based glycaemic control should be considered in patients with ACS with significant hyperglycaemia (>10 mmol/L or >180 mg/dL), with the target adapted according to comorbidities.[260–262]	IIa	C
Thiazolidinediones		
Thiazolidinediones are not recommended in patients with HF.	III	A
DPP4 inhibitors		
Saxagliptin is not recommended in patients with T2DM and a high risk of HF.[291]	III	B

Conclusions

- Diabetes is increasing globally with dramatic increases in Asia

- DM increases the risk of HF and vice versa

- When DM and HF are present together, patients:
- Feels worse
- End up in hospital more
- Die earlier

- We should screen for DM in all HF patients

- We should screen for HF in select diabetic patients:
Increasing Age; symptoms; IHD; BMI; displaced apex beat

- ***Treatment***
- *SGLT2/Metformin*
- *GLP1*
- *Avoid – TZDs and Saxagliptin*

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Thank you

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Overview of heart failure therapies and case studies

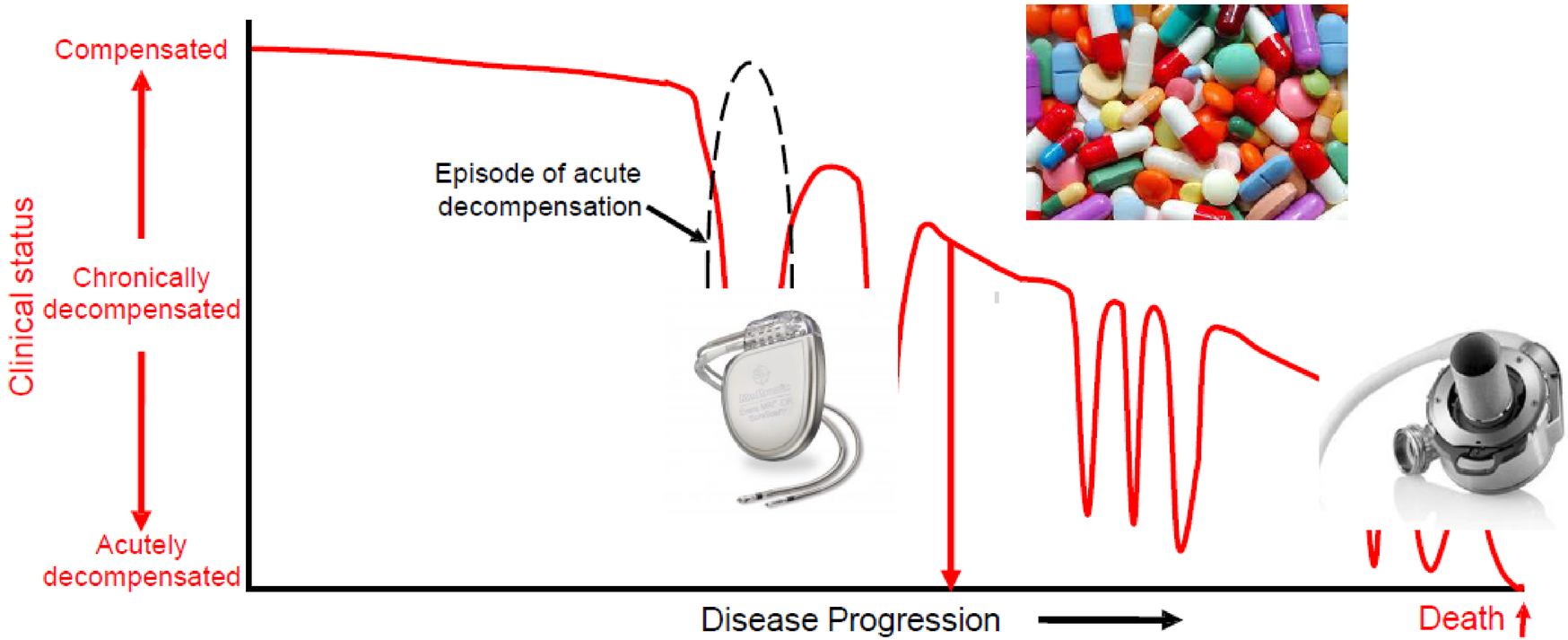
Dr. Reginald Liew

MA (Camb), MBBS (Hons), PhD (Lond), FRCP (UK), FESC, FACC, FAsCC, FAMS

Senior Consultant Cardiologist

Heart failure is a progressive disease whereby cardiac structure and function continue to deteriorate

- Increasing frequency of acute events with disease progression leads to high rates of hospitalization and increased risk of mortality[1–7]



Adapted from Gheorghiade et al. 2005[2]

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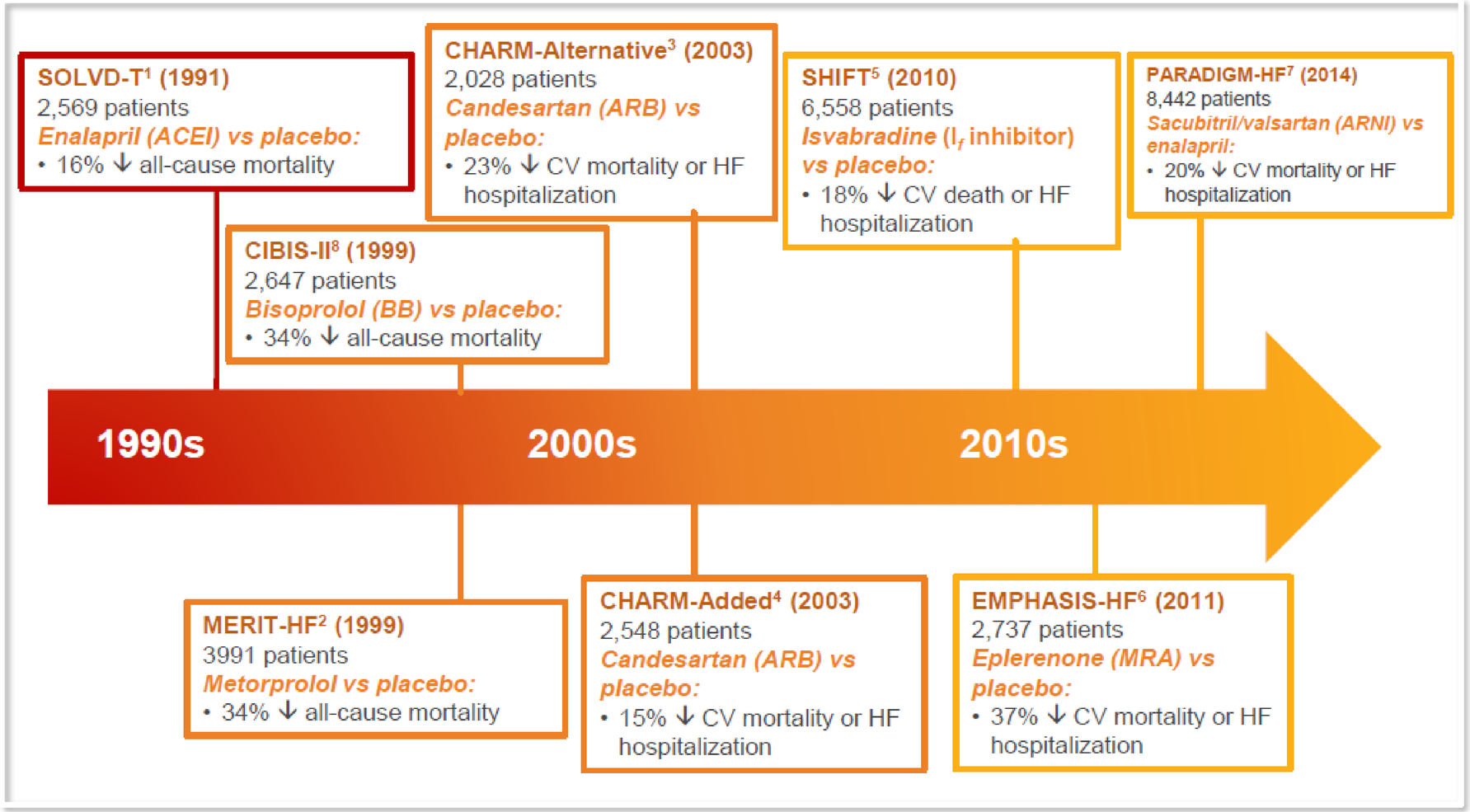
Landmark trials in patients with HFrEF



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European Heart Journal (2016) **37**, 2129–2200
doi:10.1093/eurheartj/ehw128

ESC GUIDELINES

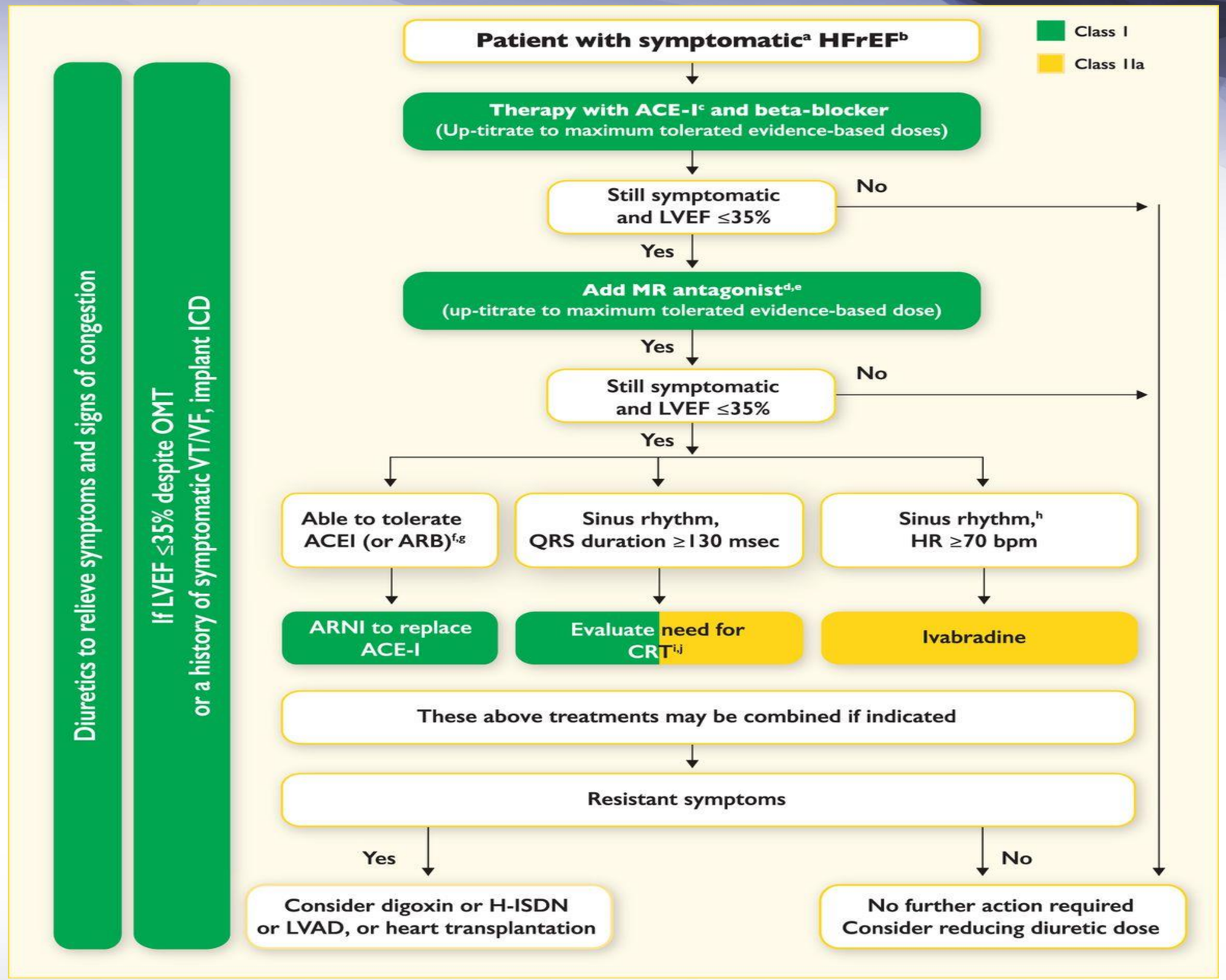
2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)

Developed with the special contribution of the Heart Failure Association (HFA) of the ESC

2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Failure Society of America



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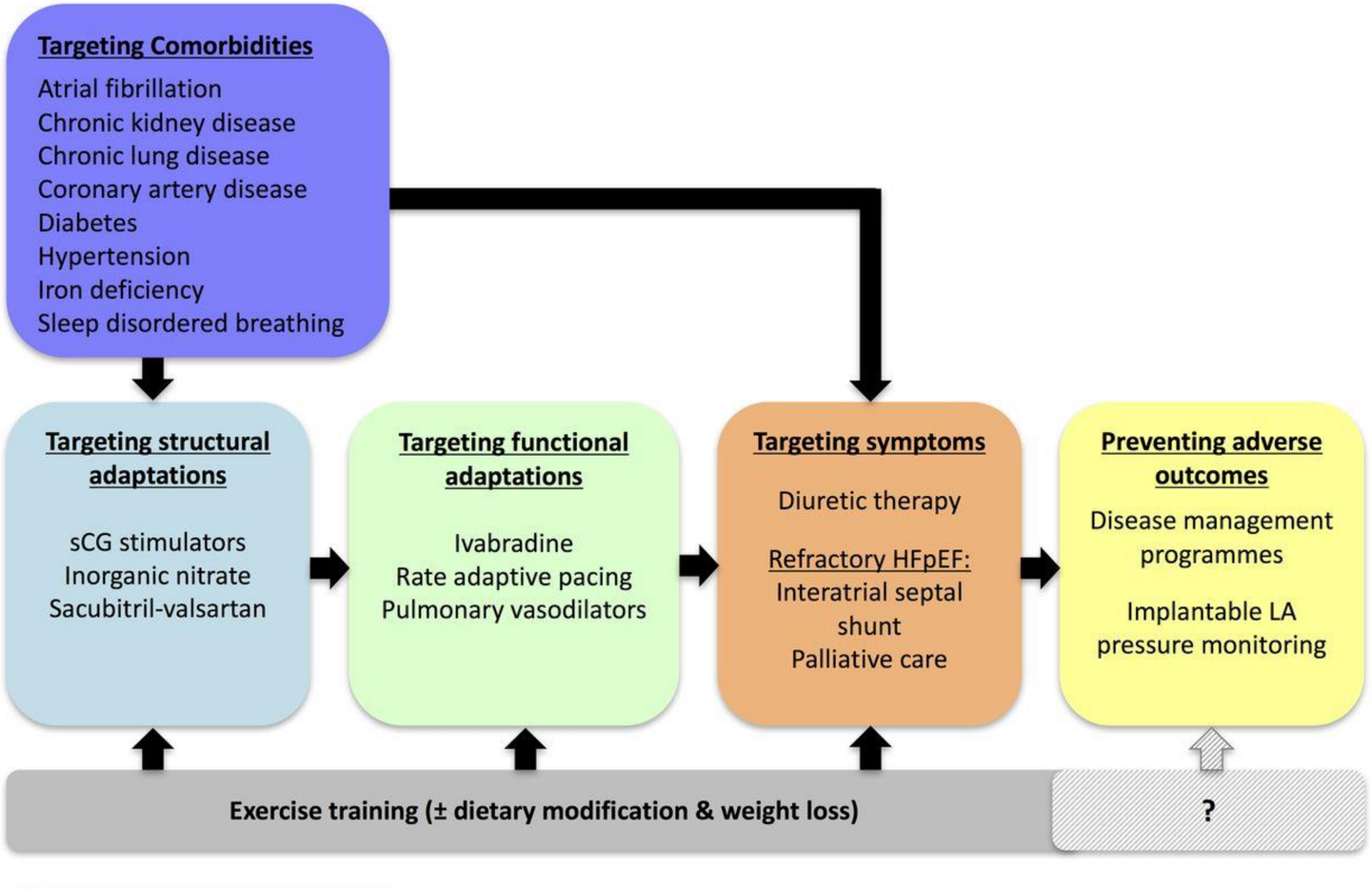
European Heart Journal, Volume 37, Issue 27, 14 July 2016, Pages 2129–2200

HFpEF treatment strategies



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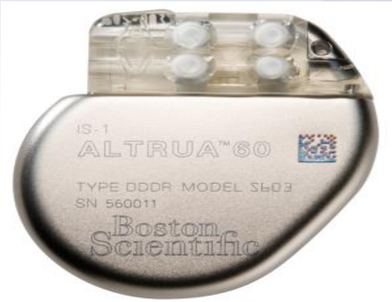
Zakeri and Cowie, *Heart 2018,* Mar;104(5):377-384

Use of implantable devices in heart failure

Permanent pacemakers

- Bradycardia 2ry to SN disease, conducting tissue disease, drugs
- AF with pauses
- AVN ablation + PPM



Implantable cardioverter defibrillators (ICDs)

- 1ry prevention
- 2ry prevention
- No benefit on HF symptoms (shocks may be detrimental)

Cardiac resynchronization therapy (CRT)

- Resynchronization therapy
- May improve HF symptoms and survival
- Currently indicated for pts with NYHA class III-IV symptoms with wide QRS complex
- May be combined with ICD (CRT-D)

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Clinical practice update on heart failure 2019: pharmacotherapy, procedures, devices and patient management. An expert consensus meeting report of The Heart Failure Association of the European Society of Cardiology.

Specific new recommendations have been made based on the evidence from major trials published since 2016, including SGLT2 inhibitors in type 2 diabetes mellitus; MitraClip for functional mitral regurgitation; atrial fibrillation ablation in HF; tafamidis in cardiac transthyretin amyloidosis; rivaroxaban in HF; ICD's in non-ischaemic HF; and telemedicine for HF. In addition, new trial evidence from smaller trials and updated meta-analyses have given us the chance to provide refined recommendations in selected other areas.

Dapagliflozin reduces death and hospitalisation in patients with heart failure

DAPA-HF trial presented in a Hot Line Session today at ESC Congress 2019 together with WCC

01 Sep 2019

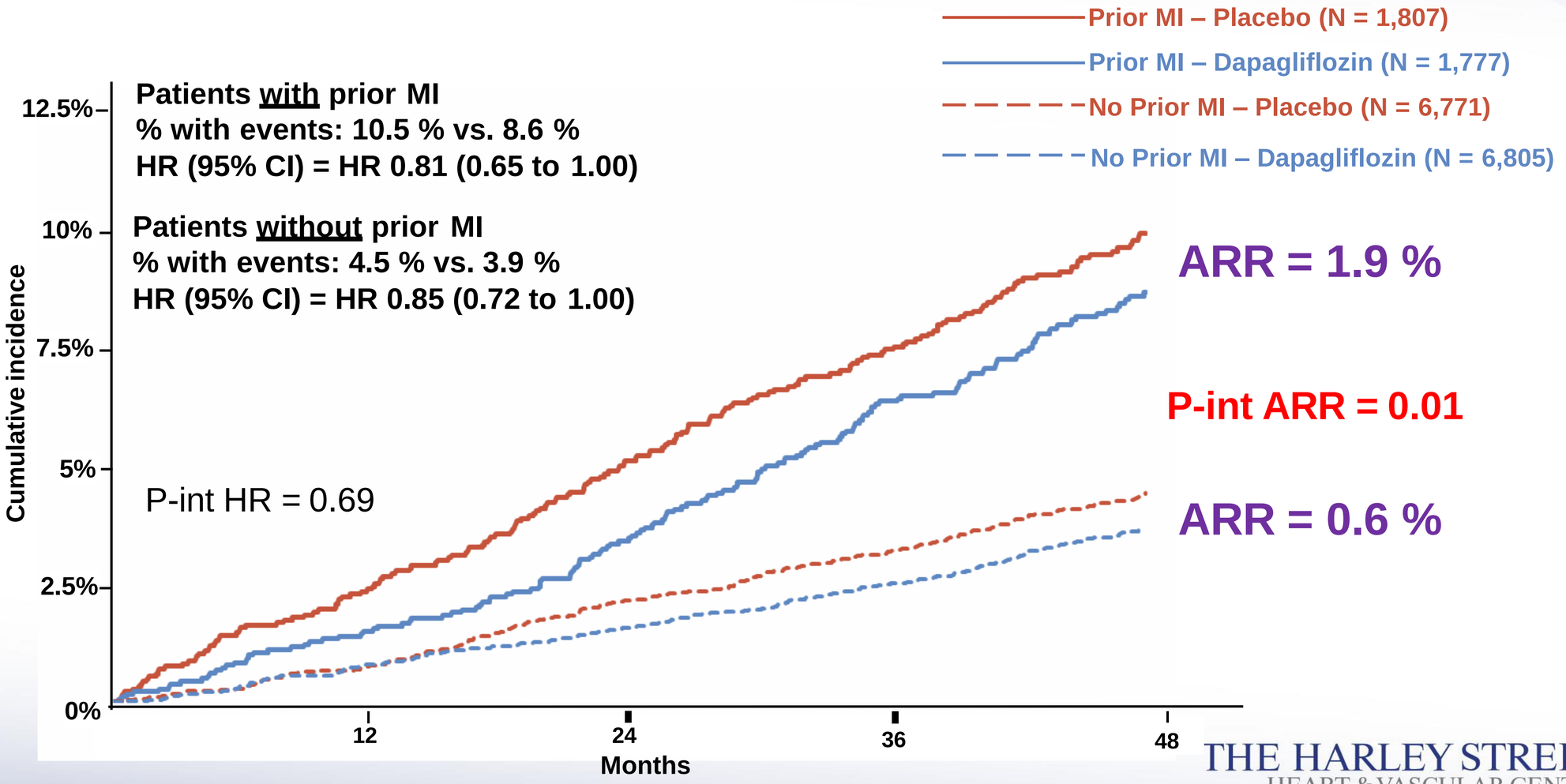
Topic(s): *Diabetes and the Heart; Heart Failure;*

Paris, France – 1 Sept 2019: Dapagliflozin reduces death and hospitalisation in patients with heart failure and reduced ejection fraction with and without diabetes. The late breaking results of the DAPA-HF trial are presented in a Hot Line Session today at ESC Congress 2019 together with the World Congress of Cardiology(1).

> Principal investigator Professor John McMurray of the University of Glasgow, UK said: "The most important finding of all is the benefit in patients without diabetes. This is truly a treatment for heart failure and not just a drug for diabetes."

CV outcomes with dapagliflozin

CVD or HF hospitalization



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Wiviott SD et al. *N Engl J Med*. 2019 Jan 24;380(4):347-357

DECLARE results are key to the updated ACC/AHA CV Disease Primary Prevention Guideline in T2D in 2019

ACC/AHA Guideline on Primary Prevention of CV Disease

"Three RCTs have shown a significant reduction in ASCVD events and HF with the use of an SGLT2 inhibitor. Although most patients studied had established ASCVD at baseline, the reduction in heart failure has been shown to extend to primary prevention populations."

- Recommendations are expanding from secondary prevention to primary prevention
- HF prevention benefit is acknowledged in primary prevention population, citing DECLARE data to support this statement
- SGLT2 inhibitors and GLP-1 receptor agonists may be initiated in patients with T2D and additional ASCVD risk factors requiring glucose-lowering therapy despite initial metformin therapy

ACC = American College of Cardiology; AHA = American Heart Association; ASCVD = atherosclerotic cardiovascular disease; CV = cardiovascular; GLP-1 RA = glucagon-like peptide-1; HF = heart failure; RCT = randomized controlled trials; SGLT2 = sodium-glucose co-transporter 2; T2D = type 2 diabetes.

Arnett DK et al. Online ahead of print. *J Am Coll Cardiol*. 2019.

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ABCs of heart failure drugs

A- ACEIn/ ARB/ ARNI

B- Beta- blockers

C- Cholesterol meds (for CAD)

D- Digoxin/ Diuretics/ Dilators (Hydralazine/ Nitrates)

E- Eplerenone (MRA)/ Spironolactone

F- I*f* funny channel blocker (ivabradine/ coralan)

G- SGLT2 inhibitors (recent evidence with dapagliflozin)

Case 1

- 52 year old Chinese man presented to GP with cough and mild breathlessness for two weeks
- History of type II diabetes, smoker (2 packs a day)
- Works in construction industry- usually fit and active
- Medication- metformin, plavix

- Examination – BMI 26.3, HR 72 regular; BP 130/80mmHg
  - Heart sounds normal; JVP not elevated, lungs clear, no pitting oedema

- How would you manage this patient?

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Case 1- initial assessment

- **Differential diagnoses for cause of symptoms:**
  - Chest infection
  - COPD/ asthma
  - Coronary artery disease
  - Heart failure
- **Investigations-**
  - Useful initial tests that can be done in primary care:
    - Bloods- FBC, renal and thyroid function, NT-proBNP
    - Chest X-ray/ spirometry
  - More specialised tests: Echo, stress test, CT coronary angiogram or diagnostic angiogram

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Case 1- results and diagnosis

Initial tests (done in primary care):

- FBC –normal Hb, increased WCC; renal and thyroid function normal
- Fasting glucose 7.3mmol/L, HbA1c 6.8%
- Chest Xray- mild venous congestion; old areas of lung fibrosis

- **NT proBNP 850ng/L**

Specialised tests:

- Echo- Severely impaired cardiac function (LVEF 30-35%), diastolic dysfunction, mild MR, normal PASP, anterior hypokinesia
- Diagnostic coronary angiogram- mild coronary artery disease; no significant stenoses
- CT lung- patchy ground glass densities in both lower lobes; likely pneumonitis

Diagnoses:

Chest infection ; HFrEF secondary to dilated cardiomyopathy

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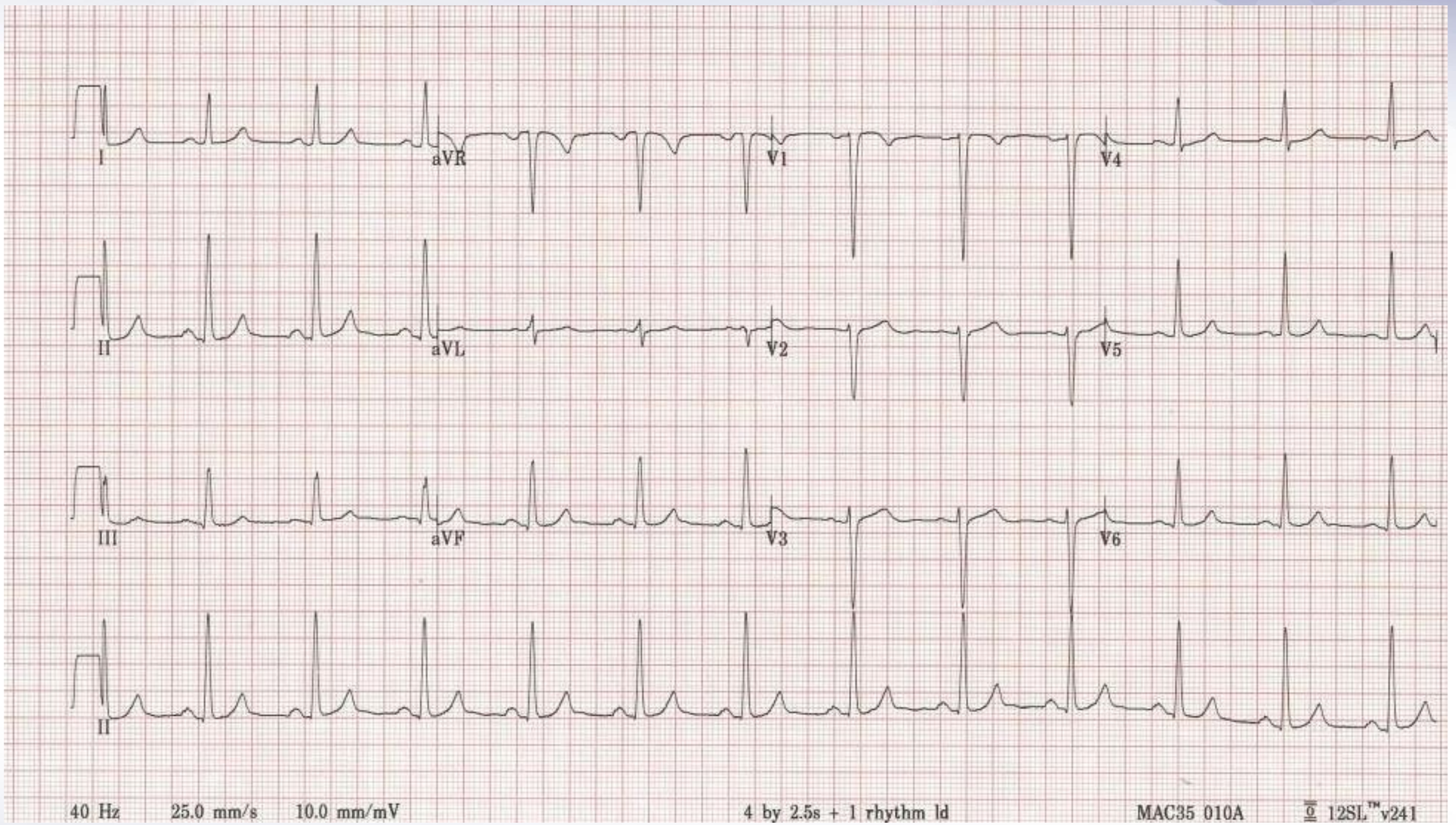
Case 1 - ECG



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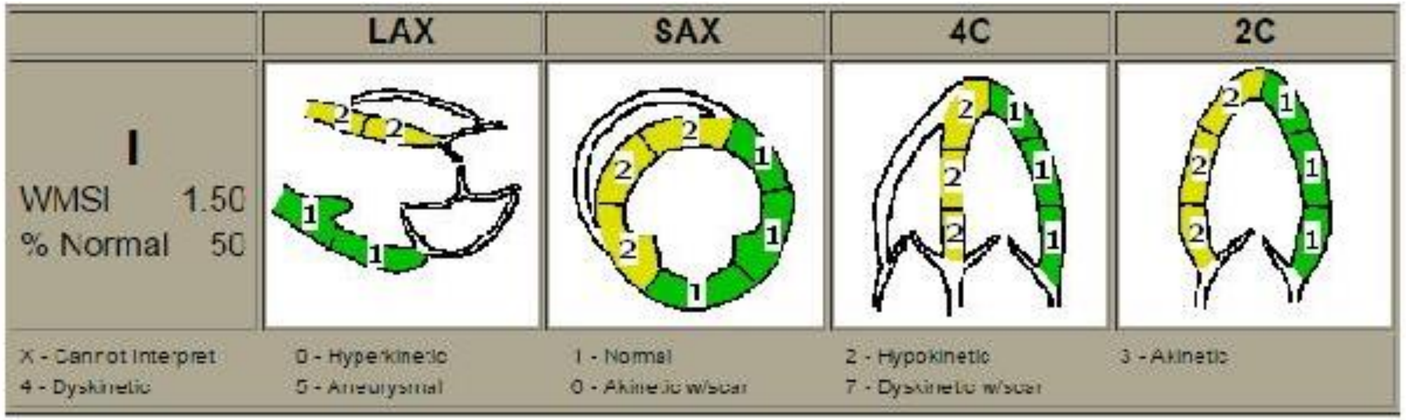
Case 1- initial echo

- Normal LV size with severely impaired systolic function (LVEF 30-35%); + RWMA
- LVIDD 5.7cm
- Dilated LA size
- Trivial MR and TR; PASP 21 + 5mmHg



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Case 1- management

- Given course of antibiotics
- Started oral heart failure medication as outpatient as clinically stable:

  Lasix, concor, entresto
  Dapagliflozin added to Metformin
  Heart failure medication slowly uptitrated over next 2-3 months

- Review 4 months later:

  Patient well with no further SOB; able to do usual activities
  Echo showed markedly improved LVEF to 50-55%
  LA normal size
  NT proBNP 158

Case 2

- 49 year old Australian woman presented to her GP with 6 week history of tiredness, shortness of breath, cough and reduced appetite
- Treated with 2 courses of antibiotics (azithromycin and doxycycline) with no improvement

- Father died of a cardiomyopathy in his 70s and mother underwent CABG surgery
- Usually fit and active, travels regularly

•How would you manage this patient?

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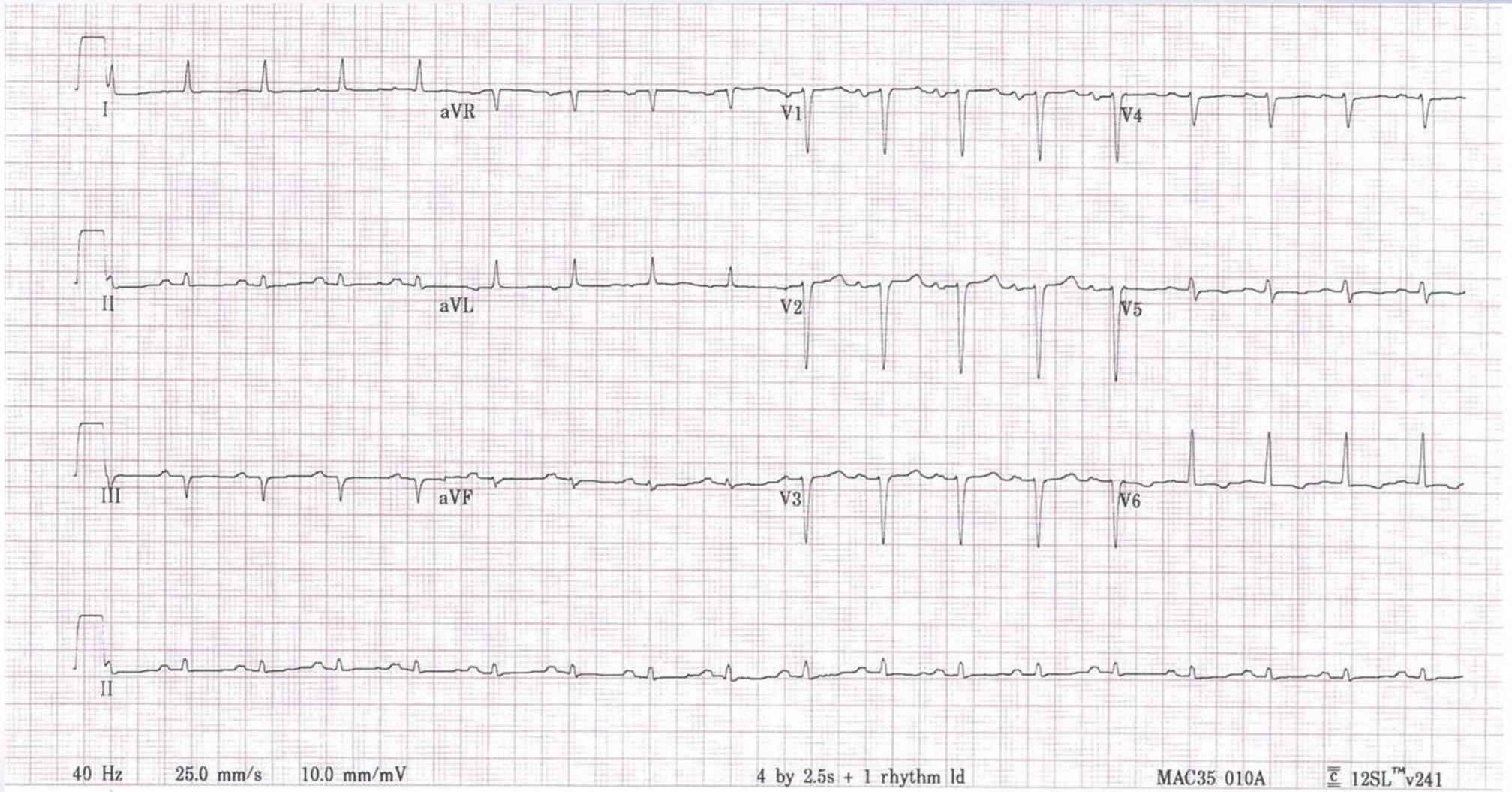
Case 2 - ECG



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Case 2

- Chest X-ray (requested by GP): showed an enlarged heart and signs of cardiac decompensation

- Examination:

  BP 100/60mmHg
  Heart rate 105bpm
  Heart sounds – normal first and second sounds, gallop rhythm
  Lung fields clear, no ankle oedema

Case 2- blood tests

- FBC, renal function, thyroid function –normal
- Increased liver function tests (ALT 227, AST 80, GGT 158)

NT-proBNP : 7022ng/L

NT-proBNP Reference
Range : 0 – 125 ng/L **Age Dependent** 125 ng/L under 75 years 450 ng/L 75 years + over

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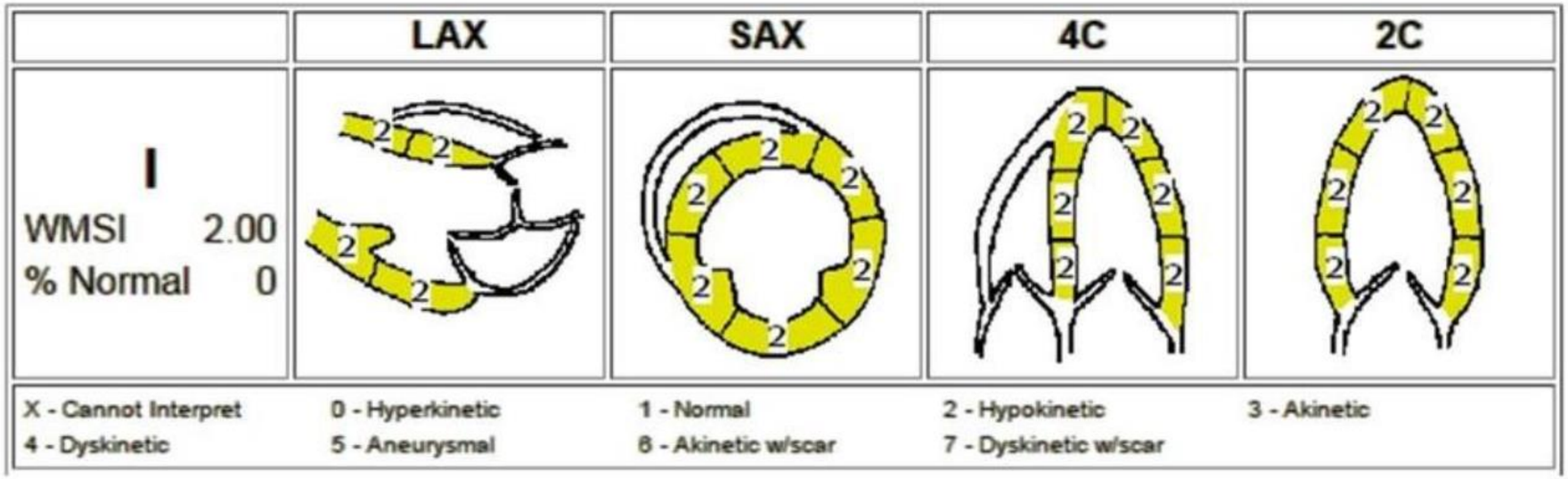
Case 2- initial echo

- Moderately dilated LV size with severely impaired systolic function (LVEF 20%); mildly impaired RV function
- Mild to moderately dilated LA
- Moderate MR and mild TR; PASP 47mmHg



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Case 2- management

- Admitted for diuresis and to start heart failure medication:
  Lasix, concor, digoxin, coralan aldactone, entresto (started later as BP improved)
- Diagnostic coronary angiogram- normal coronaries
- Cardiac MRI scan- severe LV systolic dysfunction (LVEF 19.8%) with global hypokinesia, no evidence of myocardial scar or intracardiac thrombus; moderate MR

- Good diuresis after 3 days of iv lasix and oral medication
- ICD inserted prior to discharge

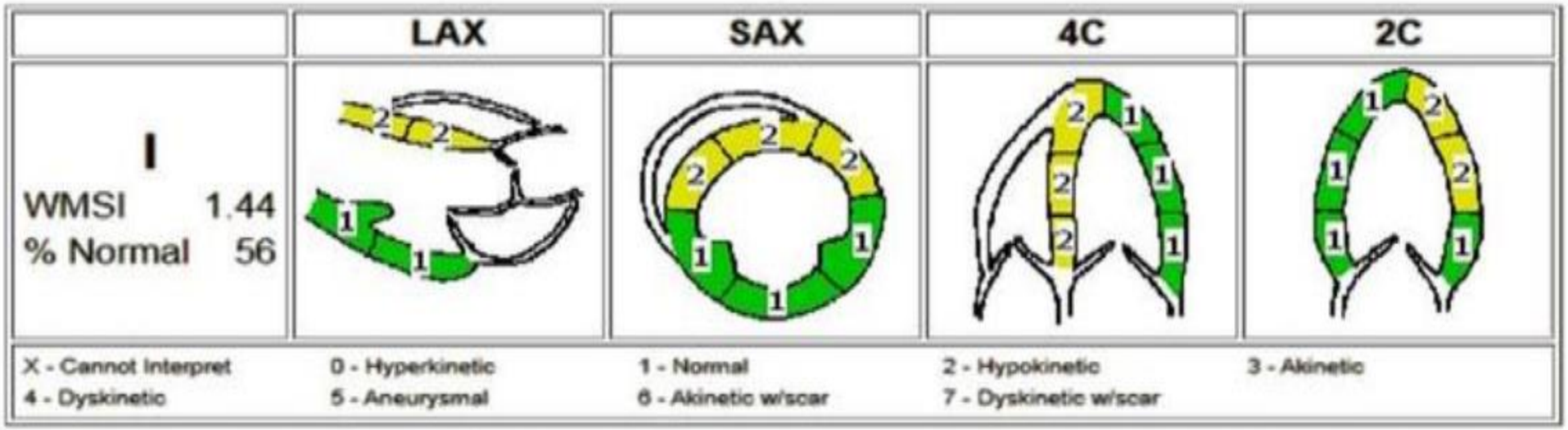
Case 2- progress

- Marked symptomatic improvement over next few months- able to do regular exercise 3 times a week
- Not SOB or tired
- Weight decreased, appetite improved

- Last reviewed in clinic 2 weeks ago- BP 115/60mmHg, HR 56bpm
- Patient felt very well- no cardiac symptomso (NYHA class 0), travelling and back to normal exercise/ activity
- LFTs back to normal
- NT pro BNP 233 pg/mL

Case 2- latest echo (Sept 2019)

- Normal LV size with mildly impaired systolic function (LVEF 46%); normal RV size and function
- Normal LA size
- Trivial MR and TR; PASP 21mmHg



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Case 3

- 78 year old woman presenting with palpitations, breathlessness, increasing weight and ankle swelling
- History of aortic valve replacement, hypertension, minor coronary artery disease and chronic AF
- Last echo 2 years ago showed normal ejection fraction
- Not usually very active at home
- Medication- concor, pradaxa, Lipitor, micardis, digoxin, nexium

- Examination – BMI 27.2, HR 90- 100bpm in AF; BP 140/80mmHg
- Soft systolic murmur lower left sternal edge; mild basal creps in lungs; mild pitting oedema in ankles
- ECG – AF; inferolateral T wave flattening

- How would you diagnose and manage this patient?

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Case 3- initial assessment

- **Differential diagnoses for cause of symptoms:**
  - Worsening AF with poor rate control
  - Ischaemic heart disease
  - Valvular heart disease
  - Heart failure
  - Non-cardiac cause- e.g. anaemia, renal dysfunction, thyroid disease
- **Investigations-**
  - Useful initial tests that can be done in primary care:
    - Bloods- FBC, renal and thyroid function, NT-proBNP
    - Chest X-ray
  - More specialised cardiac tests (done by cardiologist):
    - Echo, Holter monitor, CT coronary angiogram

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Case 3- results and diagnosis

Tests done in primary care:

NT-proBNP : 1365 ng/L

NT-proBNP Reference
Range : 0 – 125 ng/L **Age Dependent** 125 ng/L under 75 years 450 ng/L 75 years + over

•FBC, renal and thyroid function normal

•Mild renal impairment

•Chest Xray- prominent venous congestion, mild cardiomegaly, mild bilateral pleural effusions

Cardiac tests:

•Echo- preserved LV function (EF 50-55%), bioprosthetic AV functioning well, mild MR, biatrial dilatation, evidence of diastolic dysfunction

•24 hour Holter- AF throughout- heart rate range 58- 140bpm (average 94bpm)

•CT coros- mild coronary artery disease; no significant stenoses

Diagnoses:

1. HFPEF
2. AF with poorly controlled ventricular rate

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Case 3- management

- Oral Lasix to reduce oedema (target optimal weight)
- Home weight chart
- Fluid and salt restrict
- Started spironolactone
- Improve AF rate control- AF nodal ablation with pacemaker if required

Take home points in the management of heart failure patients in primary care

- Consider heart failure in patients at risk (hypertensives, diabetics, history of coronary artery disease) presenting with typical or atypical symptoms
- Arrange for diagnostic tests, e.g. blood tests (NT-proBNP), ECG, echocardiogram, chest X ray
- Identify precipitating causes or related co-morbidities (e.g. anaemia, diabetes, renal dysfunction, arrhythmias, CAD)
- Start appropriate pharmacotherapy (admit if unstable)
- Refer to cardiologist for further specialist assessment (especially for more advanced stages of heart failure)
- Monitor for progression of condition and need for escalation of medication or care

Co-management is key: patients may need initial specialist assessment; can be managed in 1ry care when stable

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Q & A

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