Diabetes – en hjärtkärlsjukdom
Risker, komplikationer och prevention



Preventiv kardiologi 2026-11-09, Sigtuna

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Hjärtkärlsjukdom vanligaste globala dödsorsaken

Diabetes, hypertoni BMI viktiga riskfaktorer

CVD är vanligaste dödsorsak

2023

Leading causes of death	Death rate per 100 000
1 Ischaemic heart disease	168·4 (142·7 to 171·5)
2 Stroke	119·4 (105·8 to 131·2)
3 Chronic obstructive pulmonary disease	60·6 (51·9 to 74·0)
4 Alzheimer's disease and other dementias	40·6 (10·2 to 97·4)
5 Tracheal, bronchus, and lung cancer	35·1 (31·6 to 38·2)
6 Diabetes	34·8 (29·4 to 40·6)
7 Lower respiratory infections	31·9 (27·9 to 36·4)
8 Hypertensive heart disease	26·6 (21·4 to 32·3)
9 Chronic kidney disease	26·5 (23·1 to 29·5)
10 Cirrhosis and other chronic liver diseases	22·1 (19·8 to 24·7)
11 Road injuries	20·7 (16·0 to 24·0)
12 Colorectal cancer	19·4 (17·6 to 21·1)
13 Tuberculosis	16·4 (13·3 to 20·0)
14 Stomach cancer	16·3 (13·9 to 18·5)
15 Falls	14·8 (12·5 to 17·1)
16 HIV/AIDS	14·1 (12·3 to 16·2)
17 COVID-19	13·9 (12·3 to 15·1)
18 Breast cancer	13·7 (12·0 to 15·4)
19 Diarrhoeal diseases	13·1 (8·6 to 20·1)
20 Self-harm	12·9 (11·4 to 14·4)

CVD är vanligaste dödsorsak och daglig påverkan

2023

Leading causes of DALYs	Death rate per 100 000
1 Ischaemic heart disease	3381·5 (3069·2 to 3680·1)
2 Stroke	2678·3 (2412·1 to 2947·9)
3 Diabetes	1553·0 (1277·4 to 1842·5)
4 Chronic obstructive pulmonary disease	1302·5 (1147·5 to 1533·6)
5 Falls	1213·1 (959·8 to 1559·3)
6 Low back pain	1184·4 (829·7 to 1605·3)
7 Road injuries	1081·0 (861·2 to 1239·0)
8 Depressive disorders	881·9 (599·0 to 1261·3)
9 Age-related and other hearing loss	880·5 (620·0 to 1194·4)
10 Tracheal, bronchus, and lung cancer	799·7 (721·8 to 871·2)
11 Other musculoskeletal disorders	799·5 (568·6 to 1075·6)
12 Chronic kidney disease	769·2 (691·8 to 857·4)
13 Cirrhosis and other chronic liver diseases	723·0 (645·4 to 811·5)
14 HIV/AIDS	720·2 (638·2 to 807·2)
15 Alzheimer's disease and other dementias	714·2 (323·2 to 1451·3)
16 Headache disorders	711·6 (485·0 to 981·3)
17 Anxiety disorders	696·1 (470·1 to 1020·3)
18 Lower respiratory infections	643·5 (558·9 to 748·7)
19 Tuberculosis	639·6 (532·2 to 775·9)
20 Self-harm	571·3 (497·0 to 643·5)

Vanligaste riskfaktorer för CV-död

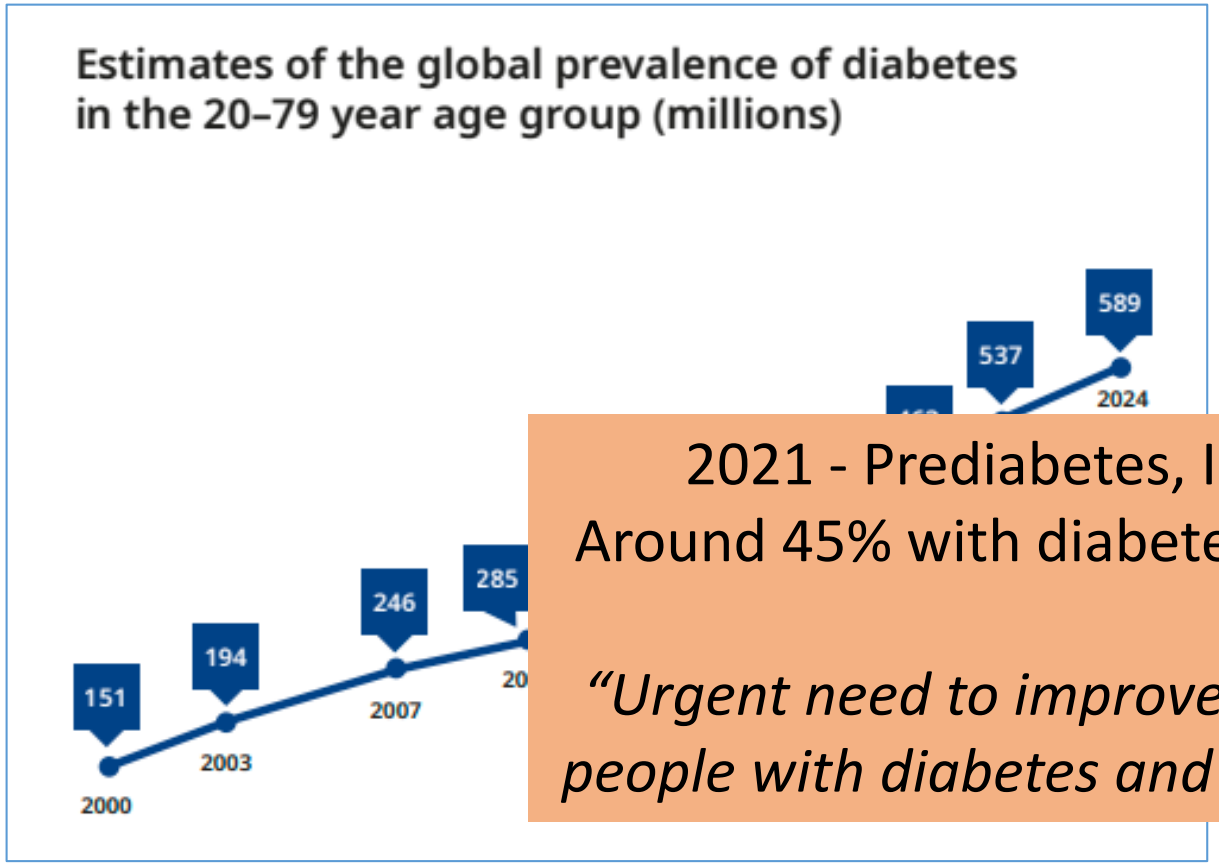
2023

Leading CVD mortality risk factors	Population attributable fraction (%)
1 High systolic blood pressure	55·1 (45·6 to 62·6)
2 Dietary risks	30·8 (12·0 to 44·8)
3 Air pollution	20·7 (16·2 to 25·2)
4 High LDL cholesterol	19·0 (11·8 to 27·6)
5 Other environmental risks	18·0 (14·4 to 21·7)
6 Tobacco	15·3 (13·0 to 17·7)
7 Kidney dysfunction	11·5 (8·4 to 14·5)
8 High fasting plasma glucose	9·9 (8·3 to 12·2)
9 High body-mass index	9·4 (5·5 to 13·3)
10 Non-optimal temperature	6·1 (5·3 to 7·4)
11 Low physical activity	1·9 (0·6 to 3·2)
12 High alcohol use	0·9 (0·2 to 2·2)

The Lancet Nov 2025

Global diabetes prevalence

Yr 2024 - 589 million



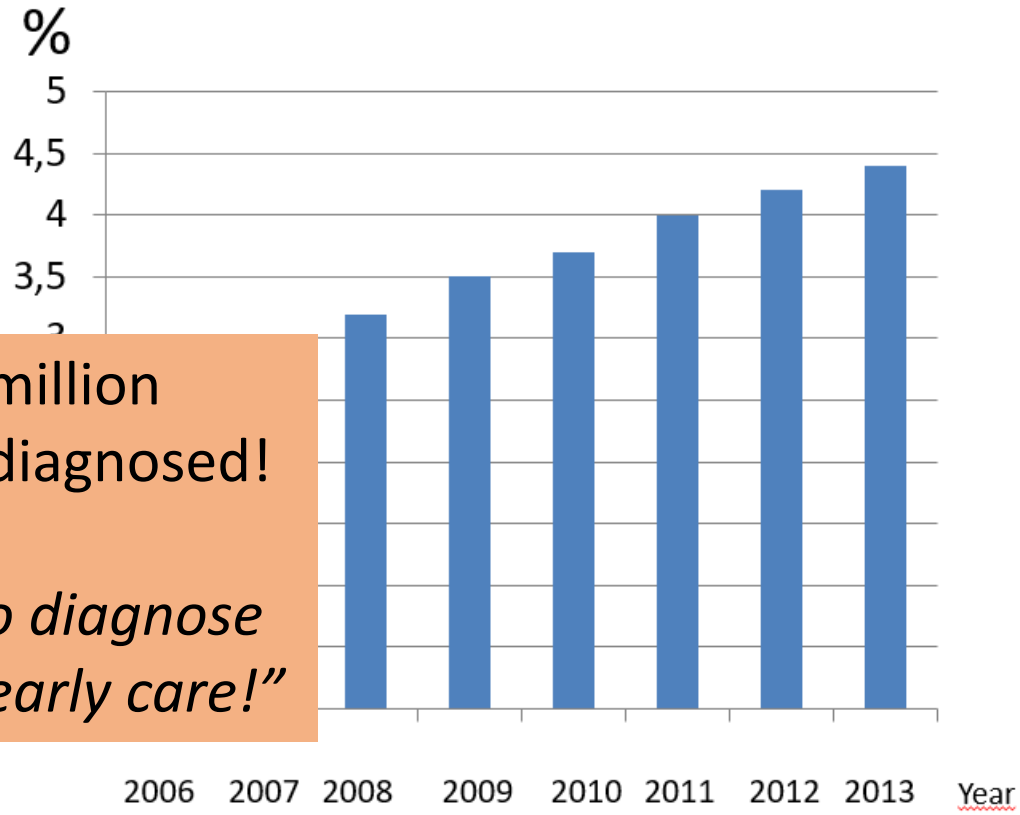
2021 - Prediabetes, IGT, 541 million
Around 45% with diabetes are undiagnosed!

"Urgent need to improve ability to diagnose people with diabetes and provide early care!"

11th Edition | 2025 Diabetes Atlas
IDF Atlas, 10th edition, 14th November 2021
14 November – World diabetes day, birthday of Banting

Prevalence increases in Sweden

60% increase T2DM yr; 2006-2013



Norhammar et al. Diabetologia 2016;59:1692–1701

Hyperglycaemia in pregnancy

This IDF Diabetes Atlas 10th edition

One of new highlights in IDF 10th Atlas

"This IDF Diabetes Atlas 10th edition also shows that hyperglycaemia in pregnancy affects approximately one in six pregnancies"

1/6  **HYPERGLYCAEMIA**

■ **Pregnant women with gestational diabetes can have babies that are large for gestational age, increasing the risk of pregnancy and birth complications for the mother and baby**

Child

1. Large babies, birth defects
2. Birth complications
3. First days hypoglycaemia risk
4. Future diabetes risk

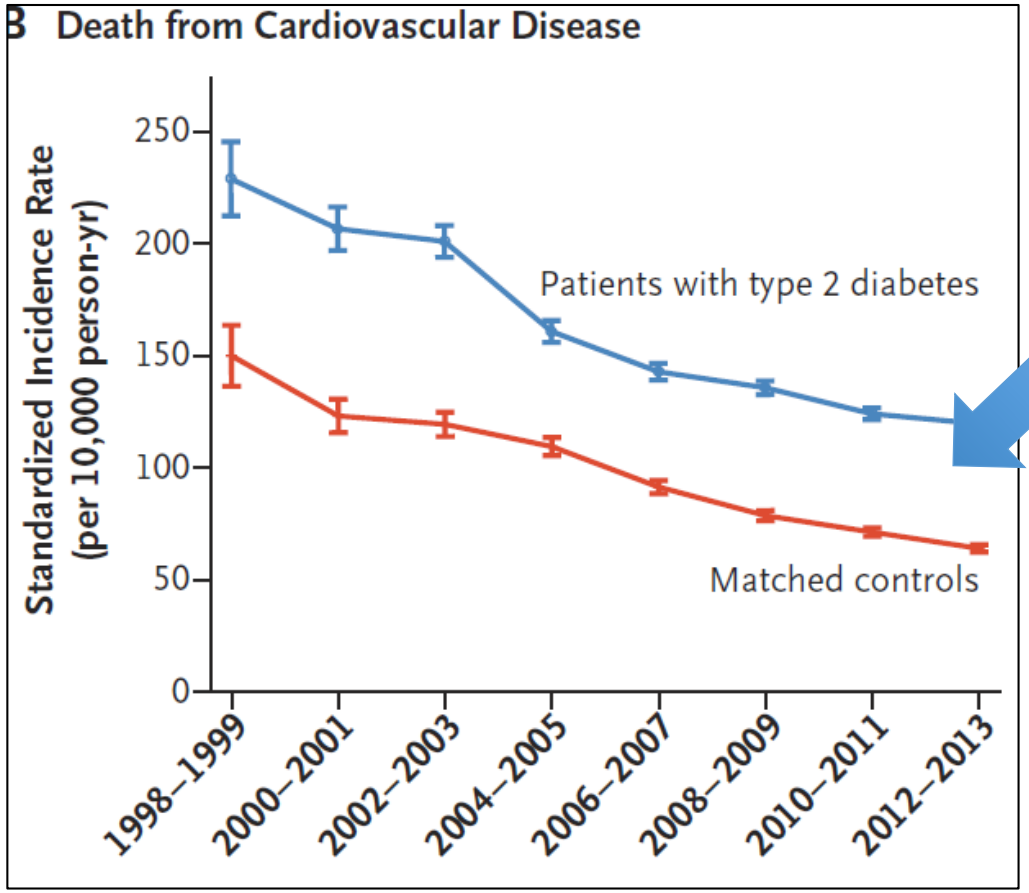
Mother

1. Birth complications
2. Increased preeclampsia
3. *Future risk for mother at risk for diabetes and CVD*

Favorable all-cause mortality trends globally latter decades

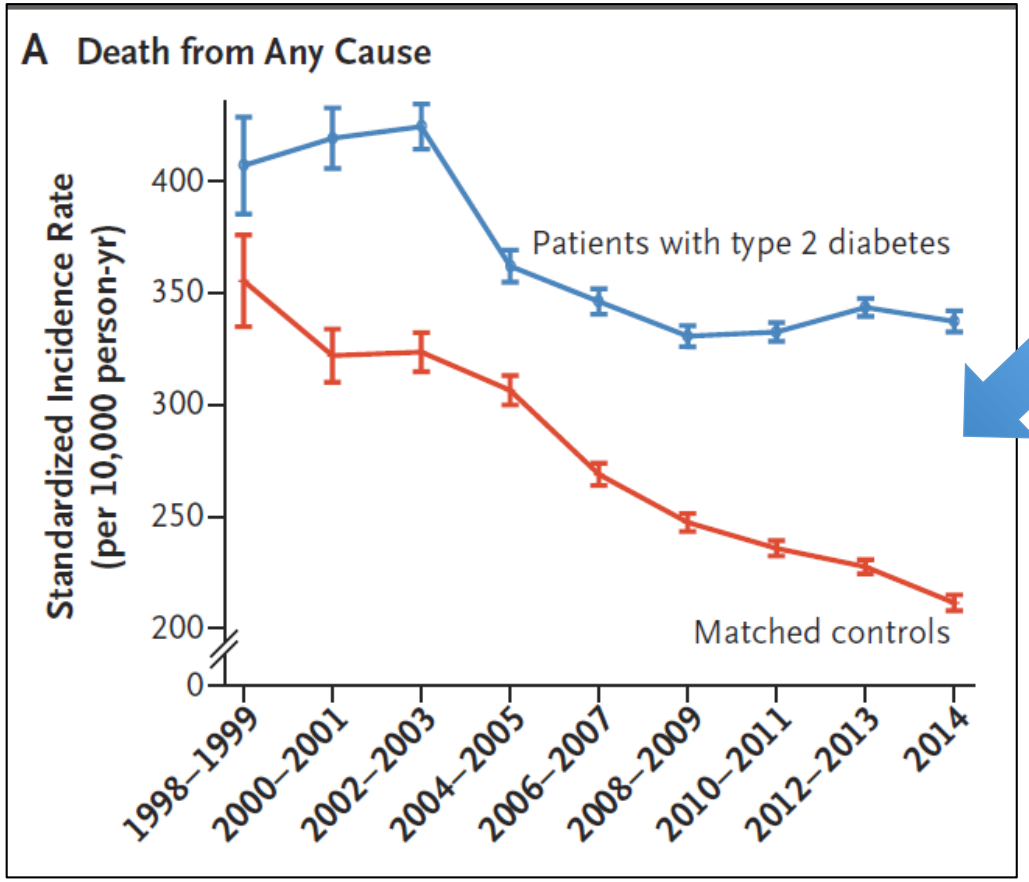
Sweden 1998-2013, CV-mortality decreases, all-cause level off?

CV-mortality



Decline

All-cause mortality

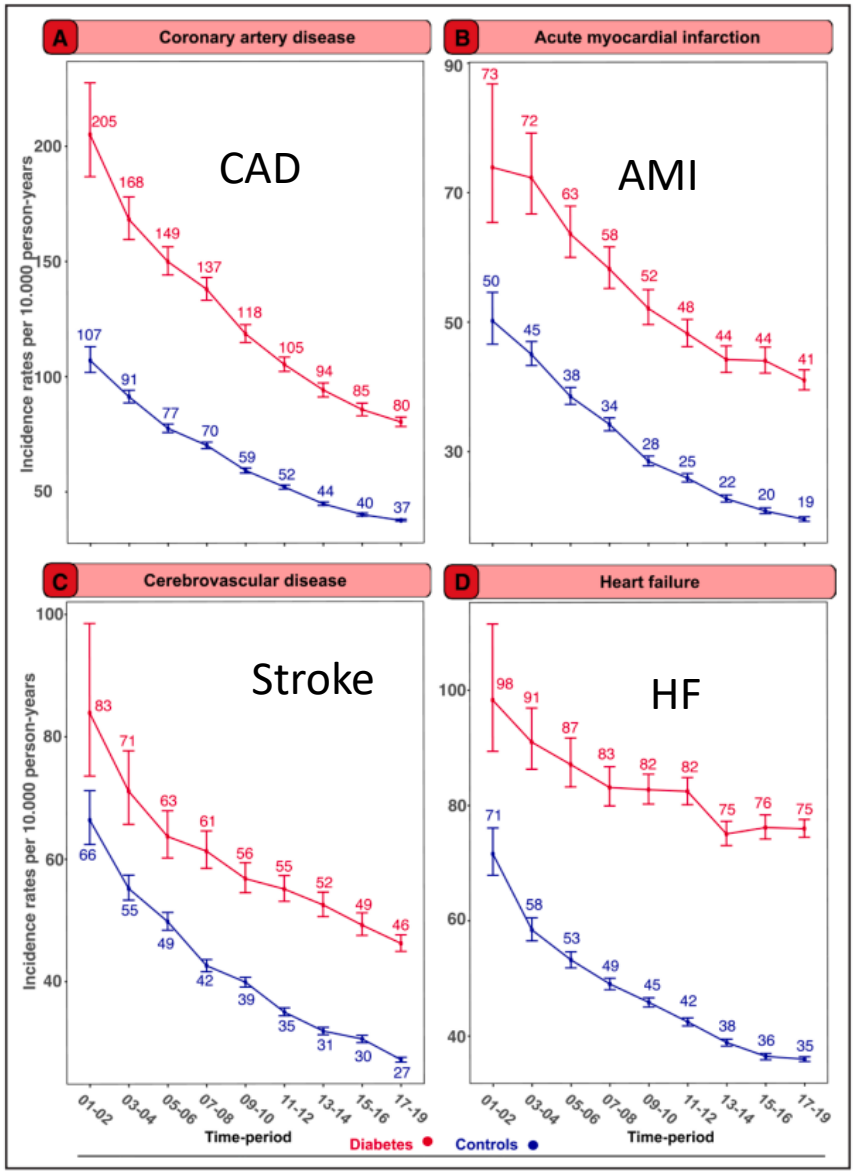


Level off?

NDR; Rawshani A, et al N Engl J Med 2017;376:1407-18.

National Diabetes Registry Sweden 1998-2012, T2DM n=457,473, and matched controls

Incidence of cardiac disease in T2 diabetes NDR

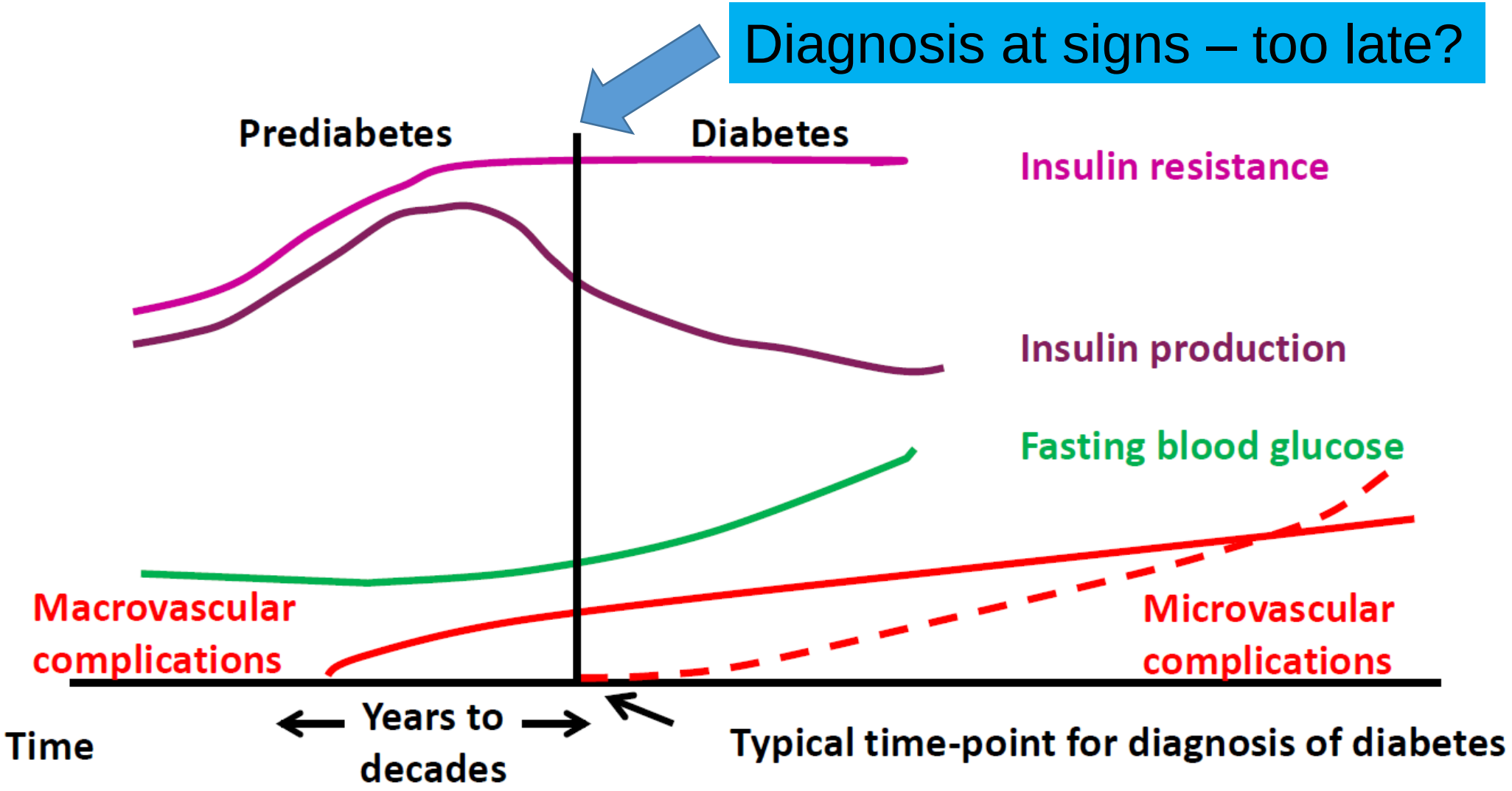


N=679072 individuals with T2D and 2643800 of their control in NDR
Years; 2001 and 2019, Sweden
Compared to controls increased risk for MI, CAD, stroke, HF

HF level off but MI, stroke CAD are decreasing

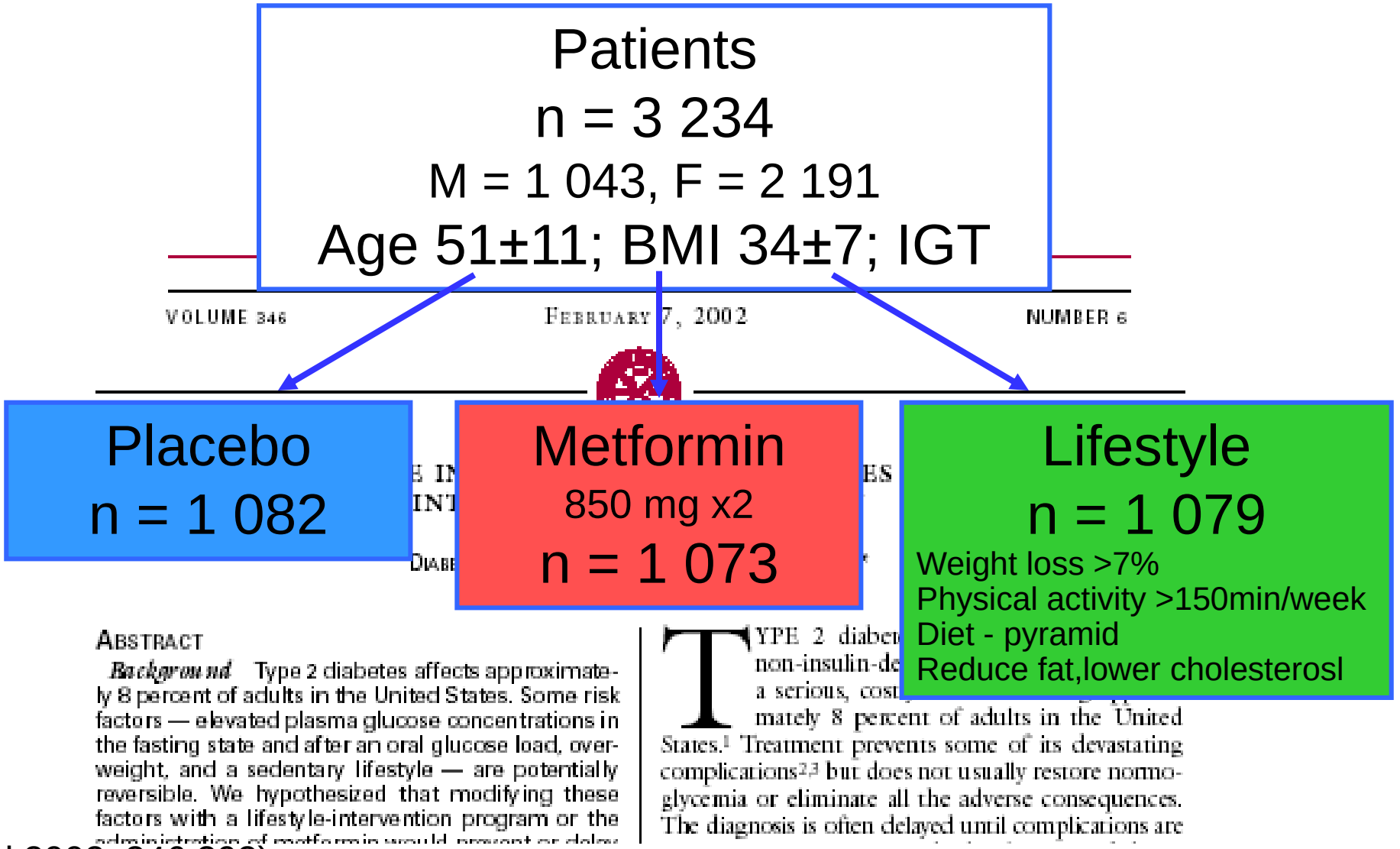
Naveed Sattar et al from NDR in Circulation. 2023;147:1872–1886

Development of type 2 diabetes



Laakso M, Kuusisto J. Eur Heart J Supplements 2003;5:B5-B13

Lifestyle and metformin prevents diabetes



VOLUME 346 FEBRUARY 7, 2002 NUMBER 6

ABSTRACT

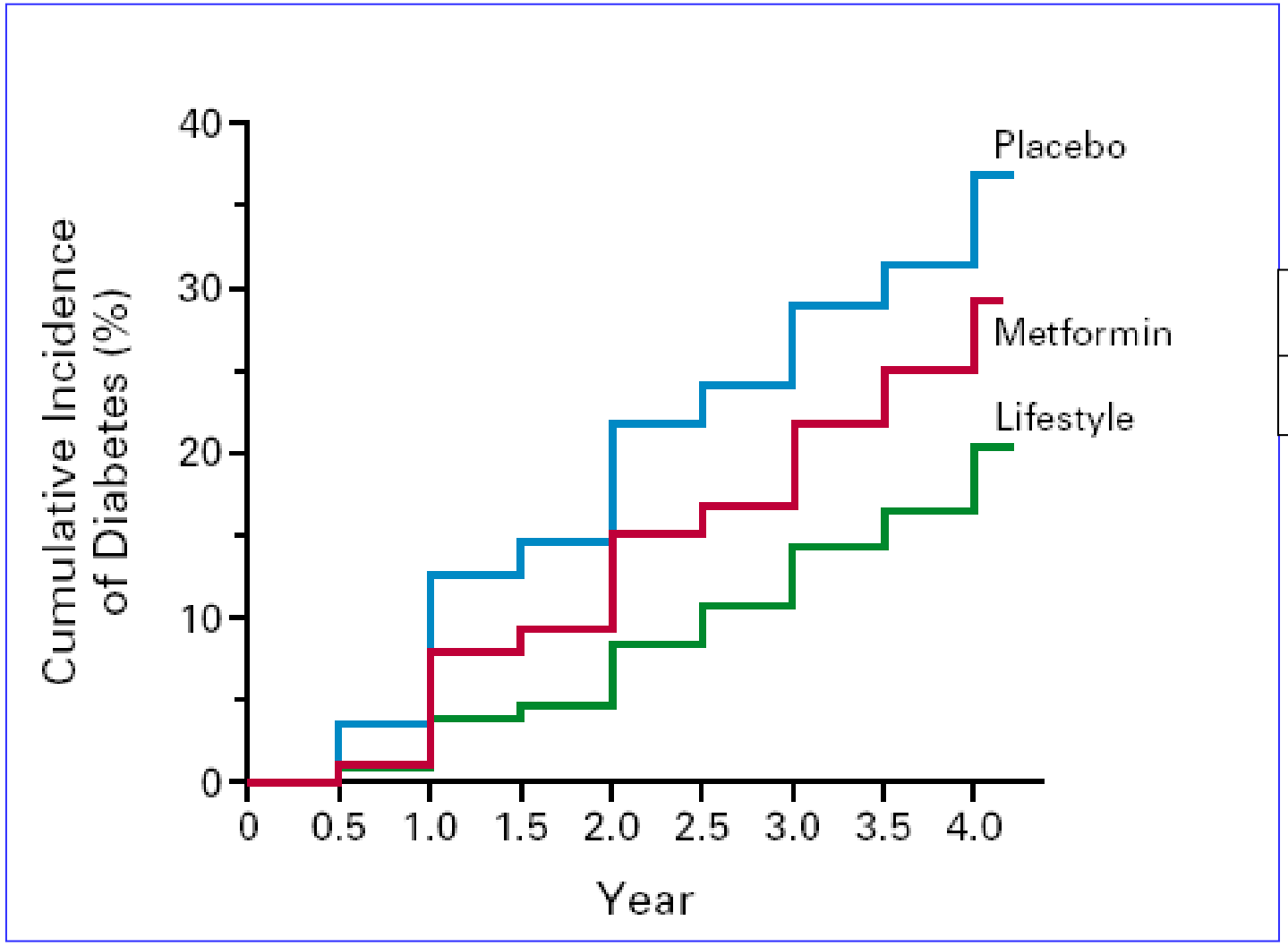
Background Type 2 diabetes affects approximately 8 percent of adults in the United States. Some risk factors — elevated plasma glucose concentrations in the fasting state and after an oral glucose load, overweight, and a sedentary lifestyle — are potentially reversible. We hypothesized that modifying these factors with a lifestyle-intervention program or the

TYPE 2 diabe
non-insulin-de
a serious, cost
mately 8 percent of adults in the United States.[1] Treatment prevents some of its devastating complications[2,3] but does not usually restore normoglycemia or eliminate all the adverse consequences. The diagnosis is often delayed until complications are

(DPP N Engl J Med 2002; 346:393)

Lifestyle and metformin prevents diabetes

Incidence of diabetes by OGTT



-31%

-58%

(DPP N Engl J Med 2002; 346:393)

Impact of diabetes remission

2 trials of lifestyle in prediabetes USA and China
DPP + DaQing Outcome Studies

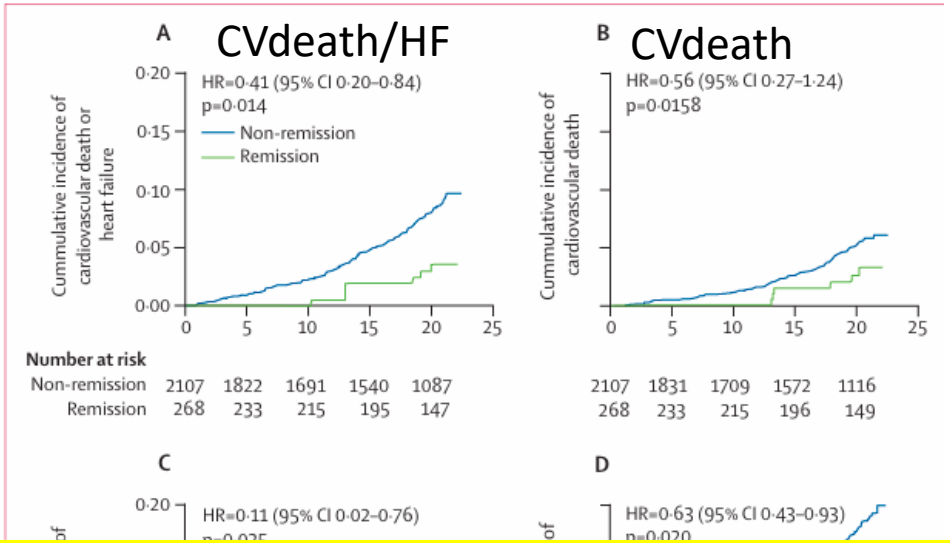
Prediabetes remission and cardiovascular morbidity and mortality: post-hoc analyses from the Diabetes Prevention Program Outcome study and the DaQing Diabetes Prevention Outcome study

Elsa Vazquez Arreola, Qiuhong Gong*, Robert L Hanson, Jinping Wang, Leontine Sandforth, Siyao He, Arvid Sandforth, Xin Qian, Mauro Giacca, Stefan R Bornstein, Andreas Fritsche, Norbert Stefan, Hubert Preissl, Edward W Gregg, Nikolaus Marx, Reiner Jumpertz-von Schwartzenberg*, Guangwei Li*, Andreas L Birkenfeld**

N=2402 in DPP and N= 540 in DaQingDPP
DPP - 11.5% remission at 1 yr, at 6 yr DaQing
Followed for 20 and 30 yr for CVdeath/HF

CV-mortality/Heart failure events

DPP **HR 0·41** (95% CI 0.20–0.84; p=0.014
DaQing **HR 0.49** [95% CI 0.28–0.84]; p=0.010
Remission once; **HR 0.43** (95% CI 0.29–0.63; p<0·0001)



Reaching prediabetes remission - linked to a decades-long benefit
Halving the risk of cardiovascular death or hospitalisation for heart failure

"In Prediabetes, treatment goals should prioritise achieving remission from hyperglycaemia to normoglycaemia alongside promoting weight loss since it offers additional protection against cardiovascular events and mortality.

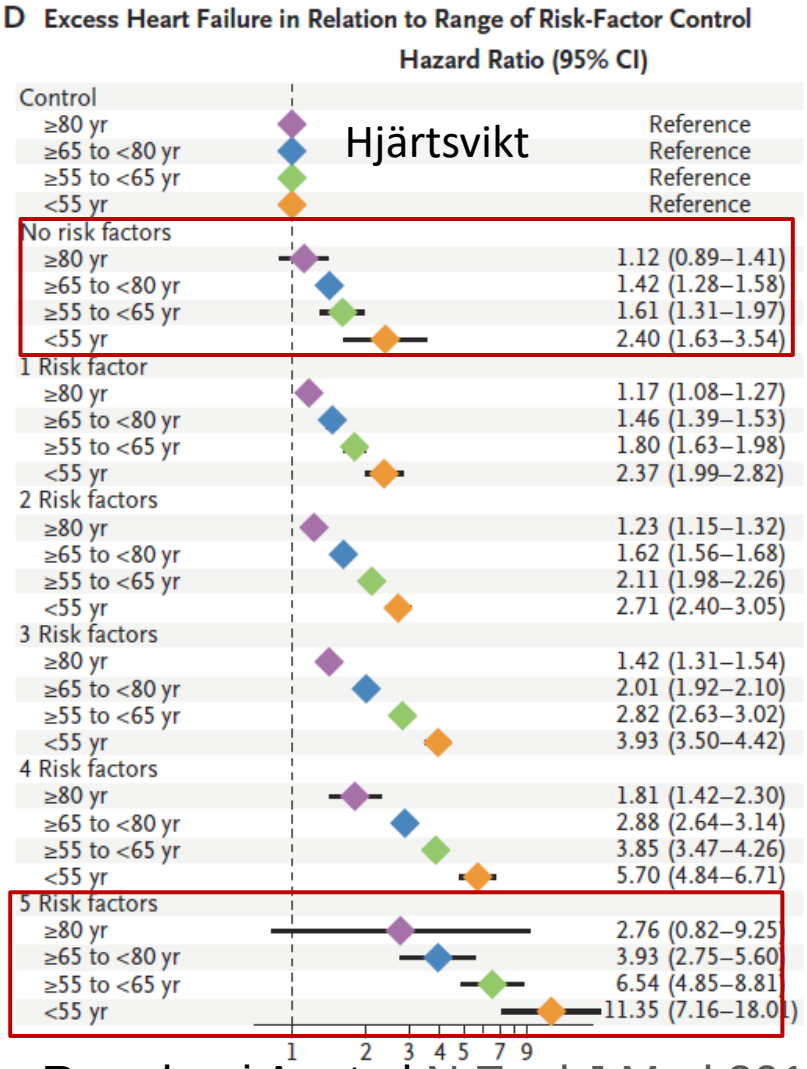
Figure 1: DPPOS: Kaplan–Meier curves for risk of composite endpoint cardiovascular death or hospitalisation for heart failure (A), cardiovascular death (B), hospitalisation for heart failure (C), and extended MACE (D) by remission status after 1 year of lifestyle intervention and over up to 20 years of follow-up
Remission status was determined according to ADA criteria. Extended MACE included cardiovascular death, non-

Elsa Vazquez Arreola et al. Lancet Diabetes End,2025, December

DaQing;prediabetes benefit from lifestyle interventions including diet modification and an increase in exercise
DPP; prediabetes (IGT or IFG) + BMI 25, intensive lifestyle intervention (diet, weigh reduction, exercise or metformin)

Prevention lönar sig – men finns kvarstående ökad risk för hjärtsvikt

T2DM Swedish diabetes registry, 1998-2012, follow-up 5.7 years
n=271,174 controls 1,355,870



Rawshani A, et al N Engl J Med 2018;379.

Fem riskfaktorer

HbA1c, LDL, albuminuria, rökning, BP

Risk för hjärtsvikt

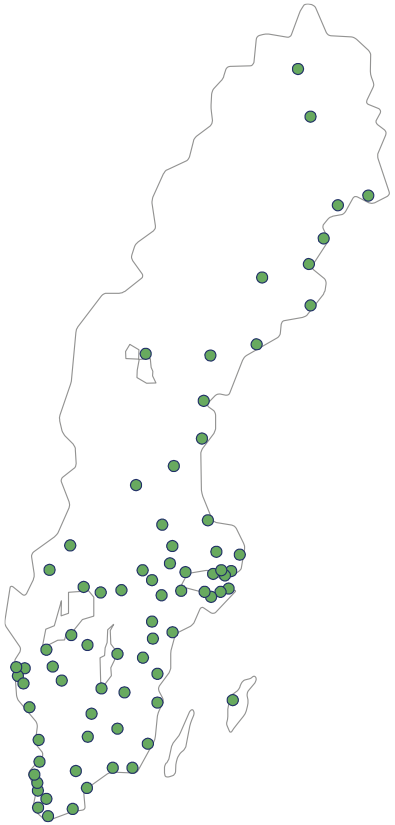
Ingen riskfaktor **HR 1.12 up to 2.40**

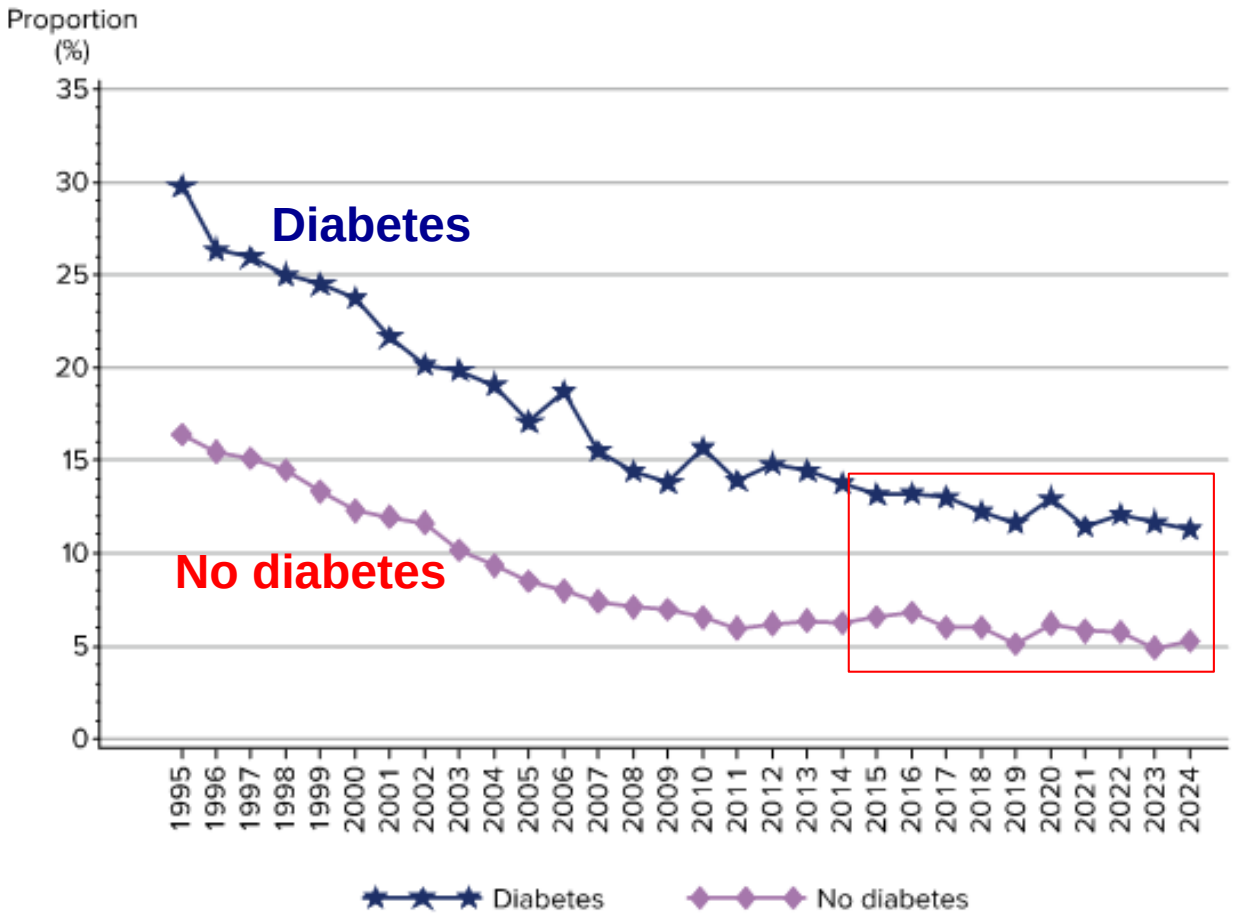
5 riskfaktorer **HR 2.76 up to 11.35**

Prevention viktigt!
Men ännu ej tillräckligt för att hindra hjärtsvikt!

Prognos
1-årsdödlighet efter hjärtinfarkt

The SWEDEHEART registret, 1-årsdödligeht efter AMI 1995-2022





Mer än 50% minskad dödlighet efter hjärtinfarkt

Finns en kvarstående överrisk vid diabetes!

Annual report Swedeheart 2023

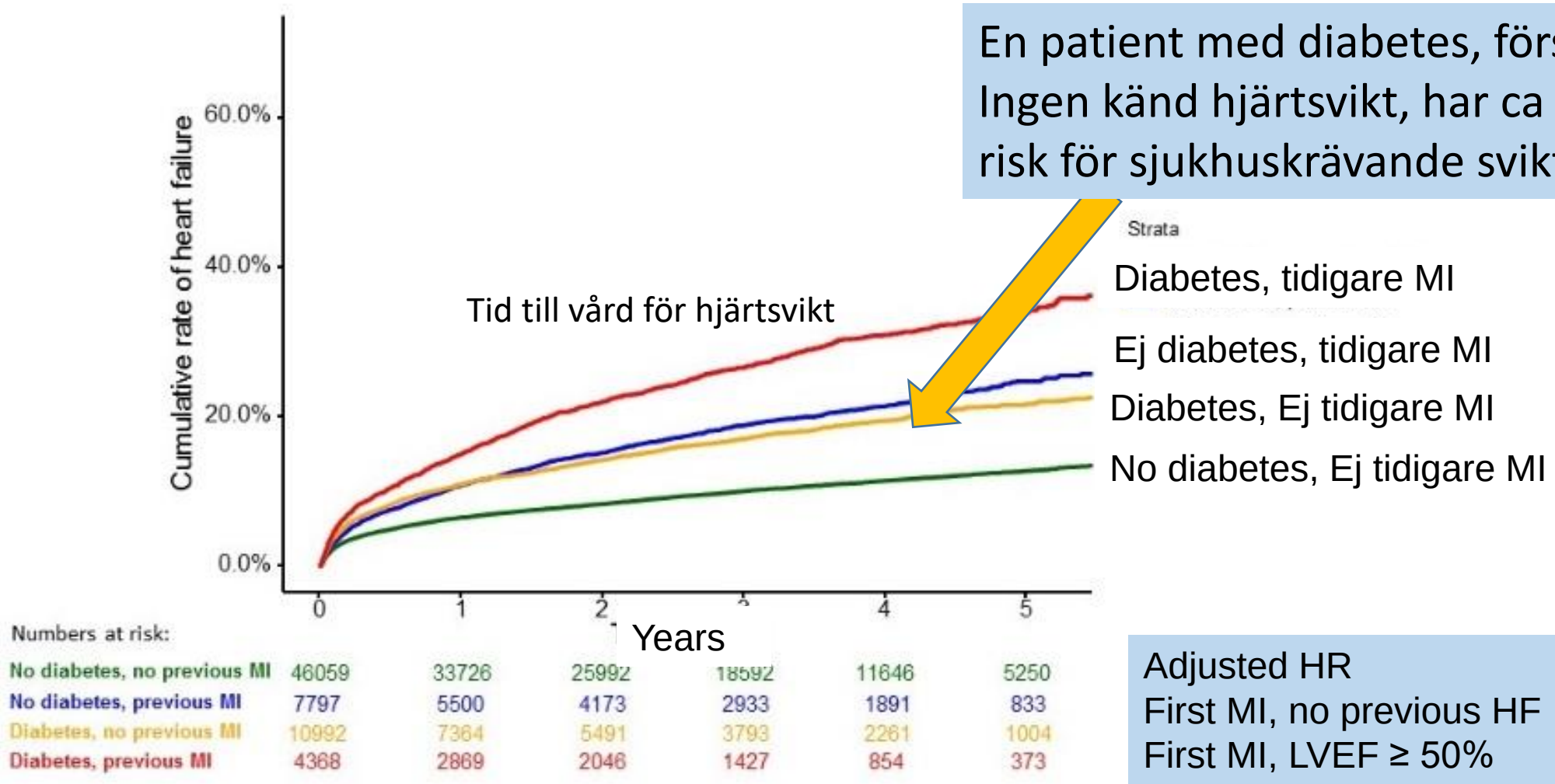
Annual report Swedeheart 2025, issued 2026
Ritsinger V et al EHJ prevention 2020

Hur är långtidsrisken efter hjärtinfarkt?

Hög risk för hjärtsvikt efter AMI om diabetes

73 959 patienter med och utan diabetes åren 2012-2017 med AMI I SWEDEHEART-registret

En patient med diabetes, första hjärtinfarkt
Ingen känd hjärtsvikt, har ca 50% ökad risk för sjukhuskrävande svikt



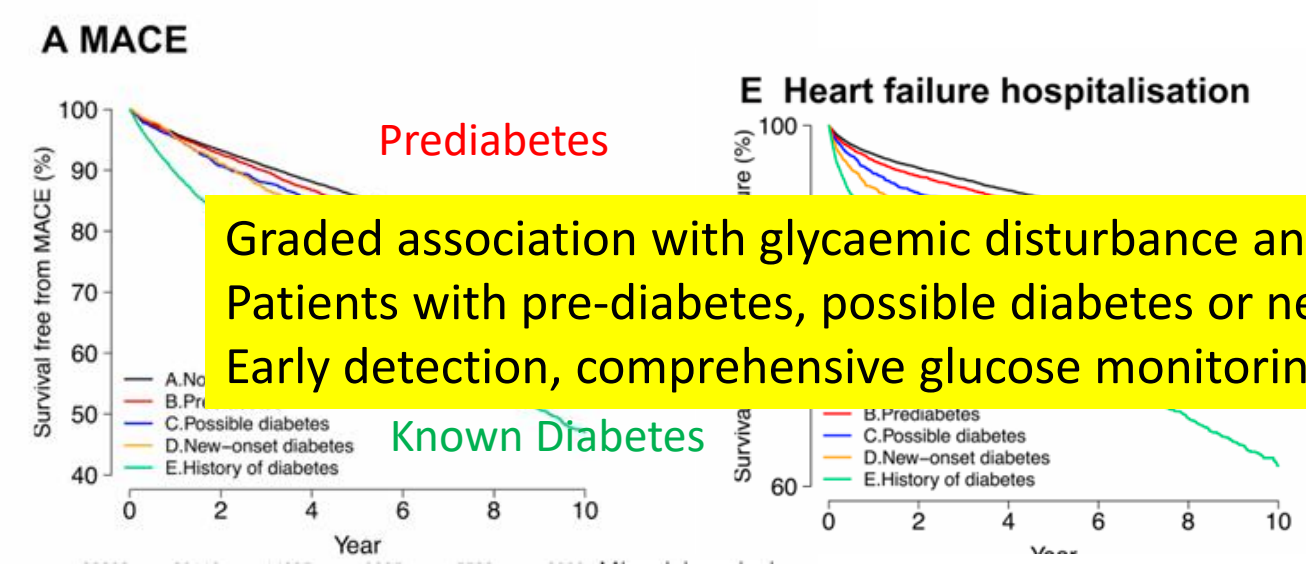
Adjusted HR
First MI, no previous HF 1.48 [1.40-1.57]
First MI, LVEF ≥ 50% 1.56 [1.39-1.76]

Ritsinger et al, EHJ prevention 2020.

Prediabetes &diabetes in SWEDEHEART – common and dangerous

YR;2006 and 2017. N=47 558, attending cardiac rehabilitation post- MI, with available information on glycaemic levels.
WHO diabetes criteria fasting glucose or HbA1c.

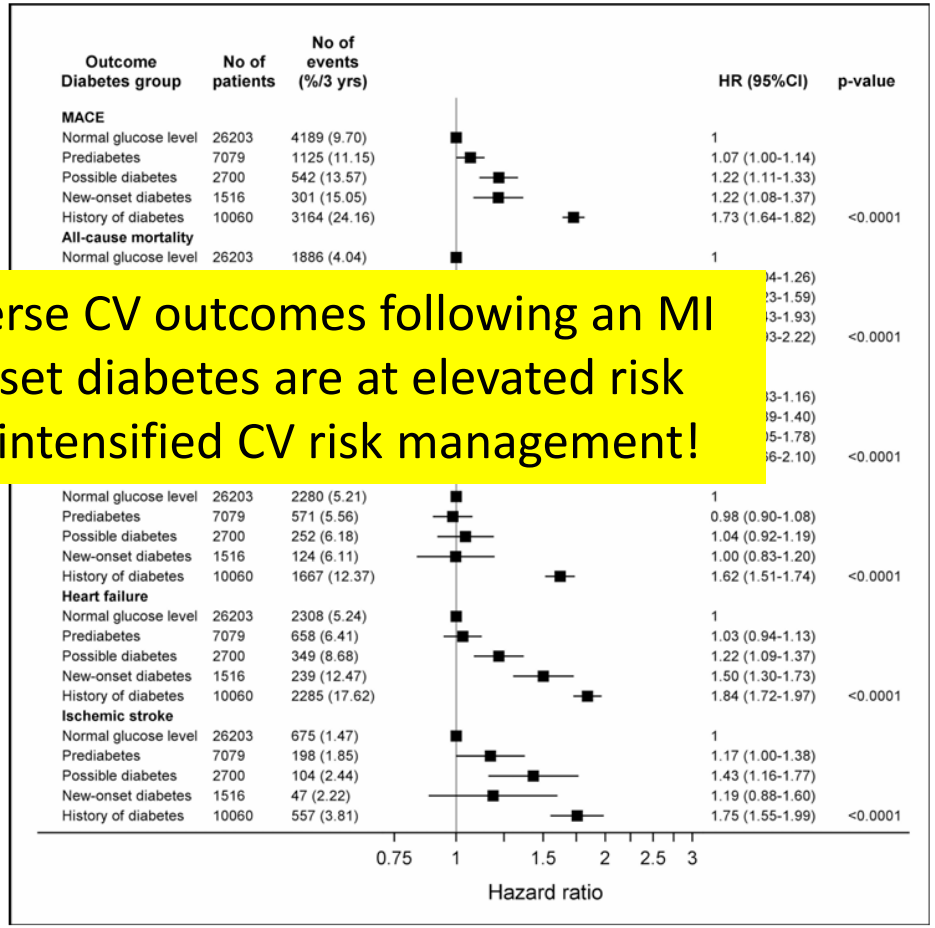
Normal glucose level	Prediabetes	Possible diabetes	New-onset diabetes	History of diabetes
n = 26,203 (55.1%)	n = 7,079 (14.9%)	n = 2,700 (5.7%)	n = 1,516 (3.2%)	n = 10,060 (21.1%)



Prediabetes

Known Diabetes

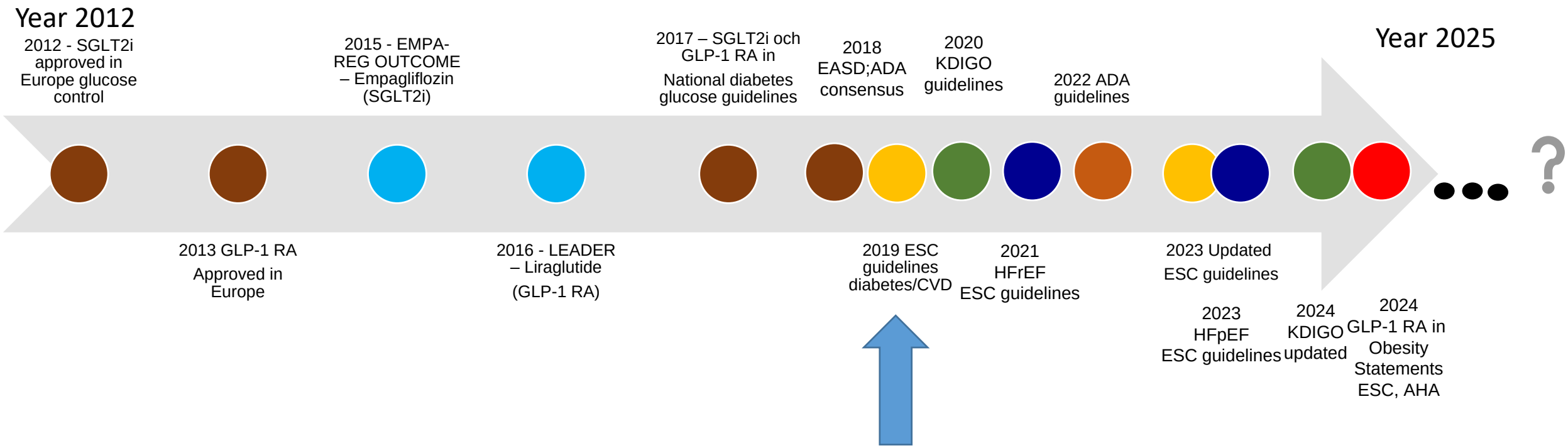
Graded association with glycaemic disturbance and adverse CV outcomes following an MI
Patients with pre-diabetes, possible diabetes or new- onset diabetes are at elevated risk
Early detection, comprehensive glucose monitoring and intensified CV risk management!



Azzum Haider et al. BMJ Open 2026;16:e121970

Rrediabetes (plasma glucose 6.1–6.9 mmol/L and/ or HbA1c 42–47 mmol/mol);
Possible diabetes (plasma glucose ≥7.0 mmol/L and/or HbA1c ≥48 mmol/ mol)
New onset diabetes diagnosed during MI hospitalisation or between hospital discharge and index
Established diabetes diagnosis prior to MI hospitalisation

Introduction of novel glucose lowering agents, now in five different disease guidelines 2012-2025 Diabetes, CVD, HF, CKD, Obesity



Glucose control
Land mark publication
ESC CVD/DM guidelines
HF ESC guidelines
CKD KDIGO guidelines
Obesity without diabetes ESC statement

2019
ESC första riktilnjer med nya lm

Landmark trials first published in 2015 and 2016

SGTL2i

EMPGA-REG OUTCOME, 100% CVD

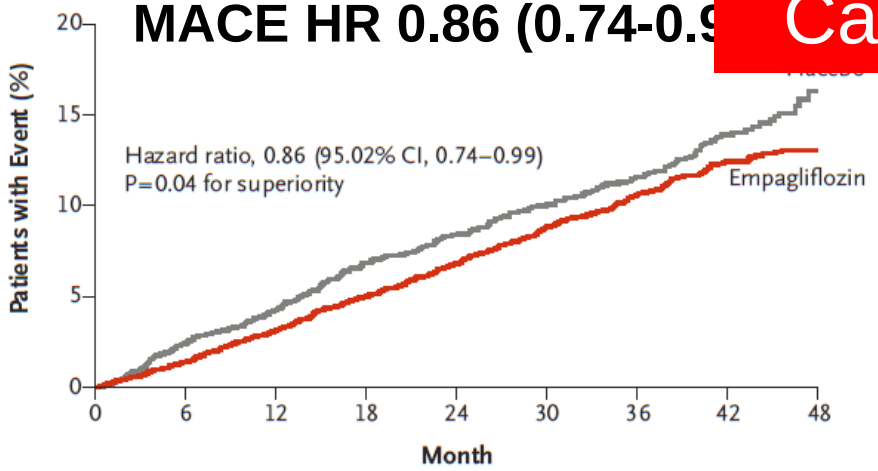
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Empagliflozin, Cardiovascular Outc
and Mortality in Type 2 Diabet

Bernard Zinman, M.D., Christoph Wanner, M.D., John M. Lac

MACE HR 0.86 (0.74-0.9



Zinman et al. N Engl J Med 2015; 373:2117

Mainly driven by HF reduction

SGLT2i and GLP-1RA have different mechanisms!
Can´t replace each other

GLP-1 RA

LEADER 81% CVD

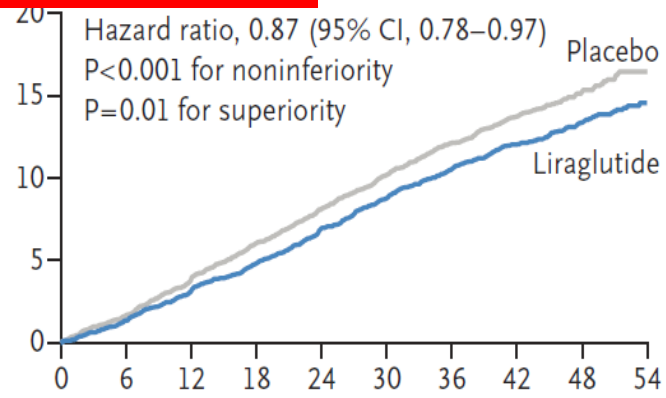
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

rdiovascular Outcomes
2 Diabetes

niels, M.D., Kirstine Brown-Frandsen, M.D.,

.87 (0.78-0.97)

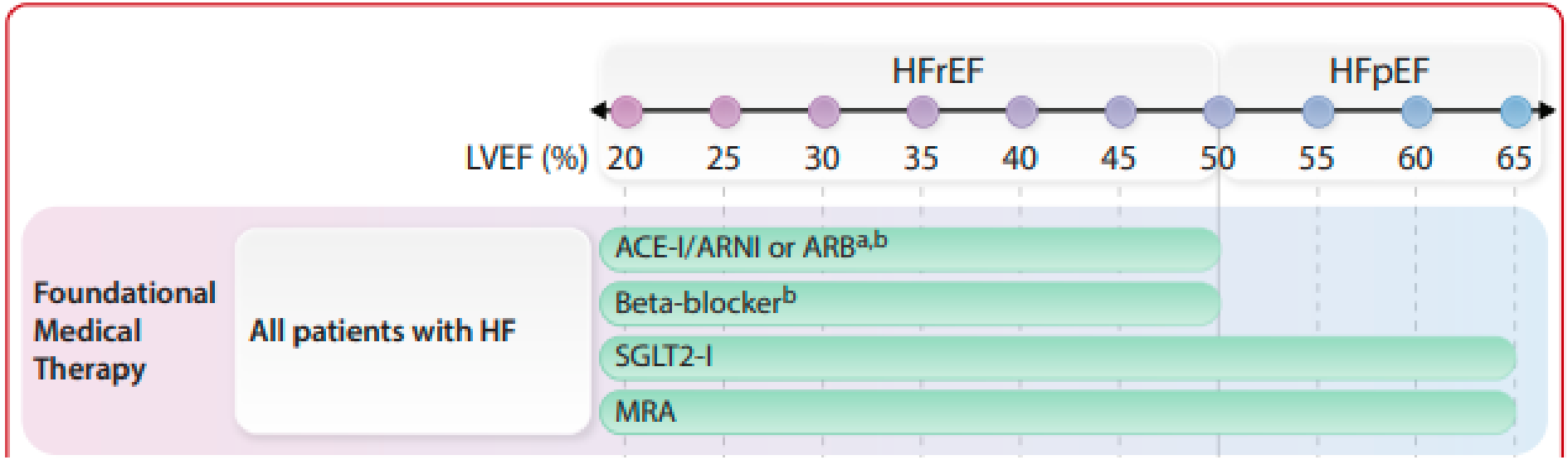


Marso et al. N Engl J Med 2016

Mainly driven by stroke/MI reduction

SGLT2-hämmare - hjärtsviktsmedicin vid HFrEF och HFpEF med eller utan diabetes samt prevention av svikt vid diabetes

Senaste ESC riktlinje för hjärtsvikt 2026



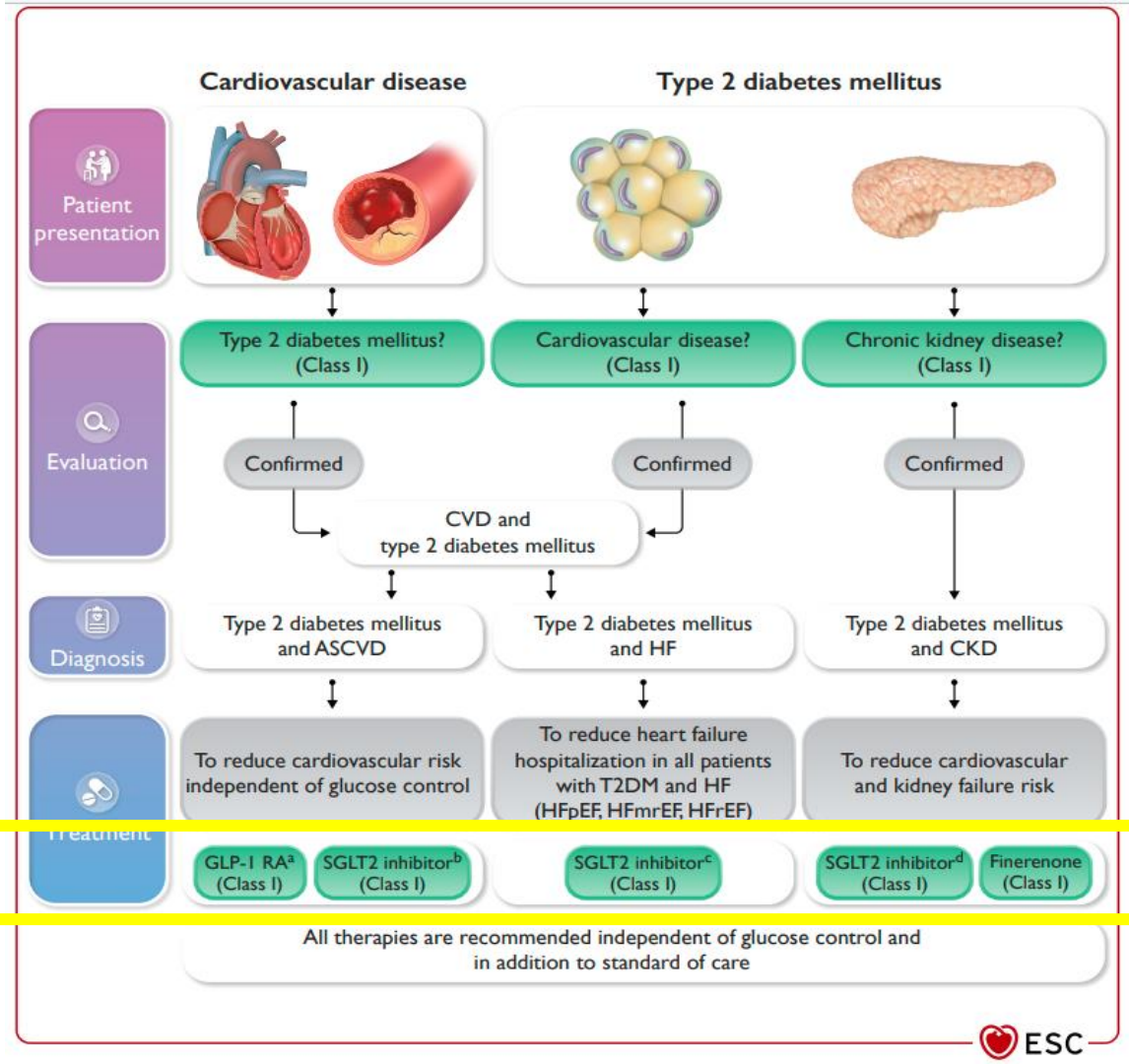
SGLT2i HFrEF+HFpEF

An SGLT2-I is recommended in patients with T2DM at risk of HF (multiple ASCVD risk factors or established ASCVD) to reduce the risk of HF and CV death.[103]	I	A

SGLT2i for prevention of HF

European Heart Journal (2026) 47, 5346–5457

ESC guidelines 2023
Glucose treatment in diabetes after AMI, HF, CKD



Evidence 1A and 1C
SGLT2i and/or GLP1-RA
in T2 diabetes
regardless of HbA1c

- CVD
- HF
- CKD

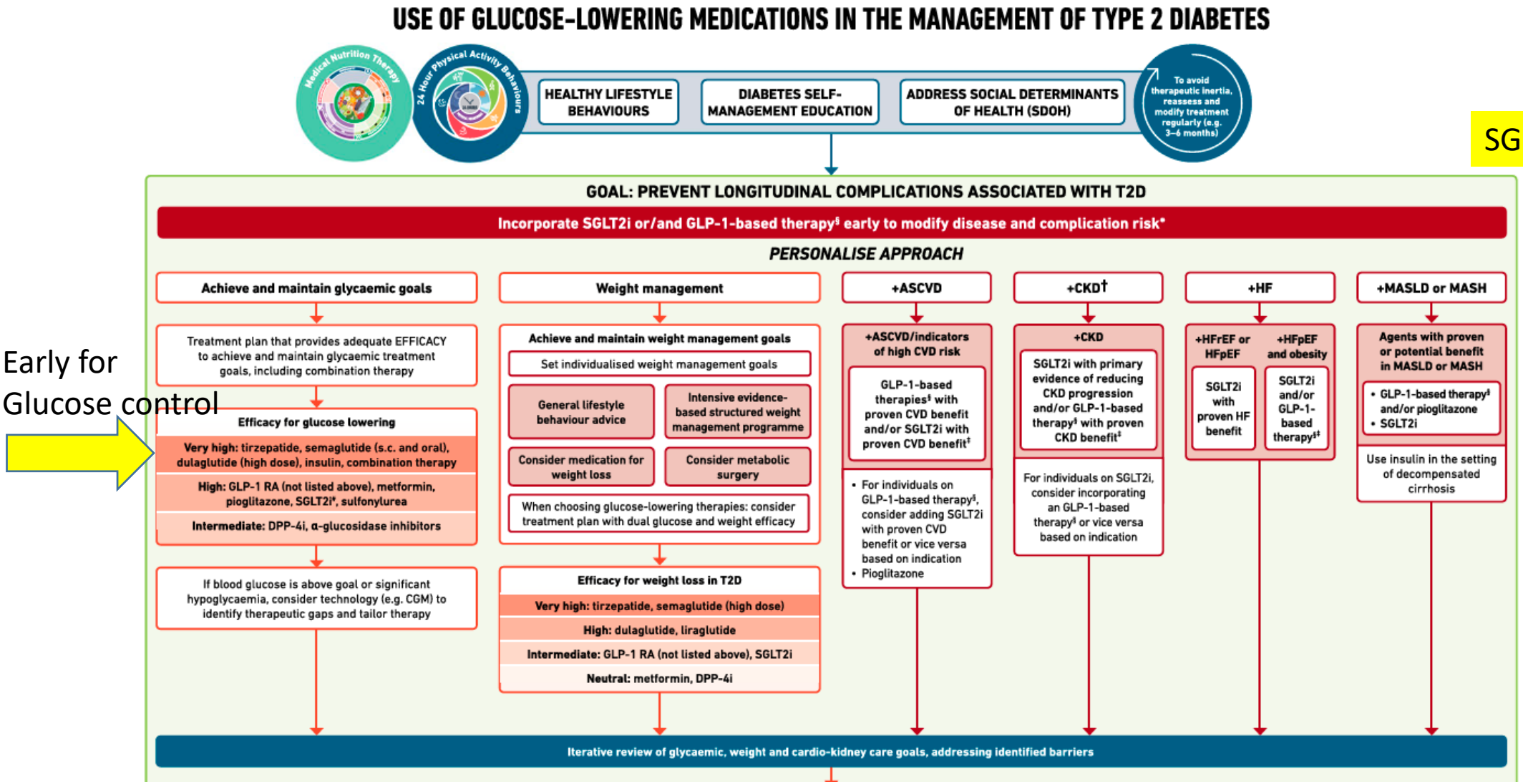
ESC Diabetes guidelines 2023, EHJ

The most recent EASD/ADA consensus diabetes in 2026

Earlier use of novel glucose agents!!

SGLT2i/GLP1 RA early

Early for Glucose control

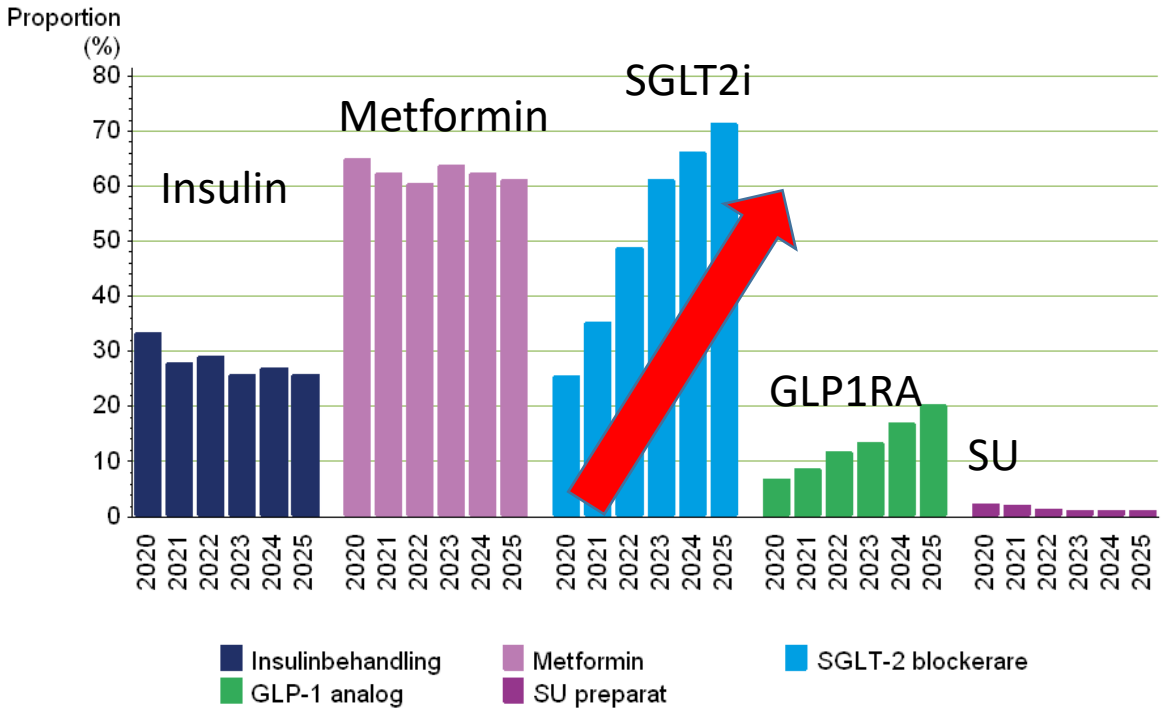


Melanie J. Davies et al Diabetologia 2026

Implementation after myocardial infarction

Use of glucose lowering agents in diabetes post-MI SWEDEHEART 2024

Year 2025



- ESC guidelines on diabetes 2019
- Consensus in Sweden 2020
- New diabetes variable pilot 2018
- Mandatory since 2020
- SGLT2 inhibitor and/ or a GLP-1 receptor agonist at the 1st follow-up was over 65 % in 2023, over 70% 2025
- GLP1 RA around 20 % in 2025 in Diabetes

Swedeheart annual 2025 report issued 2026

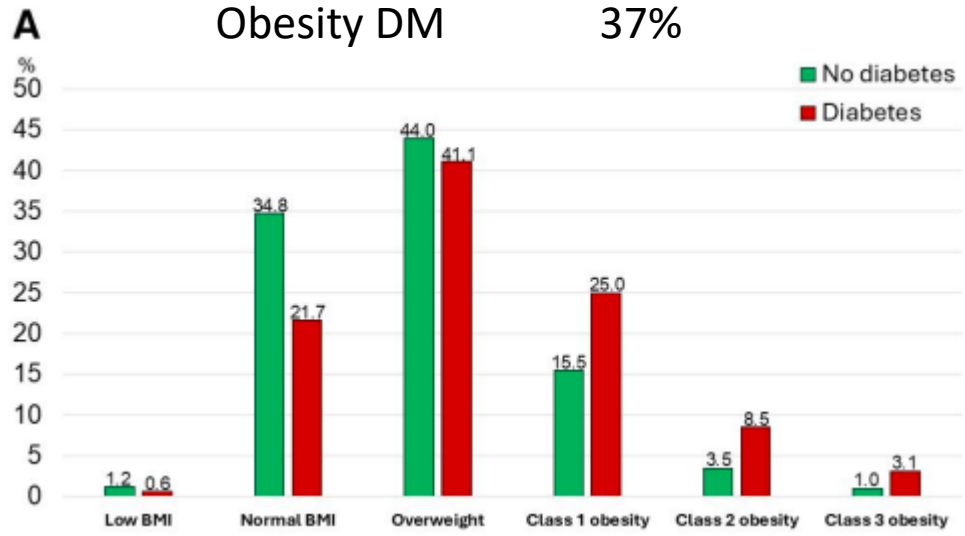
Obesity in SWEDEHEART

ESC European Journal of Preventive Cardiology (2026) 00, 1–14
https://doi.org/10.1093/eurjpc/zwag367

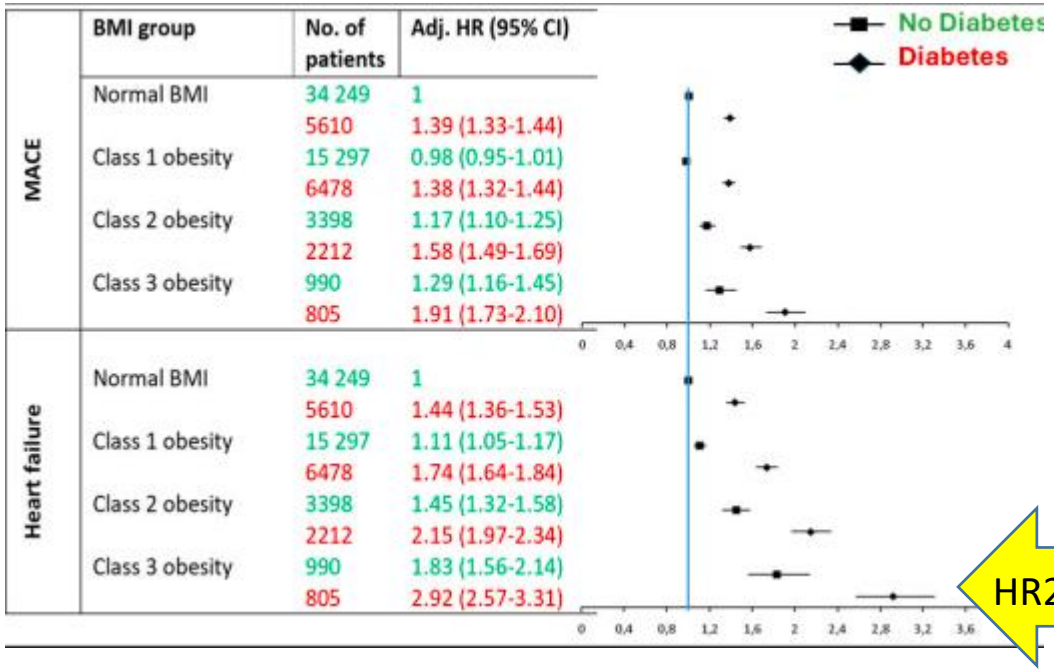
FULL RESEARCH PAPER
Coronary artery disease

Obesity and cardiovascular outcomes after myocardial infarction: a nationwide SWEDEHEART analysis by diabetes status

Obesity No DM 20%
Obesity DM 37%



High risk for MACE and Heart failure
Graded increased risk by obesity class
Even more severe if obesity+ diabetes



HR2.92 vs 1.83

Yr, 2010-2021, n=124 360 with AMI, 21% with diabetes

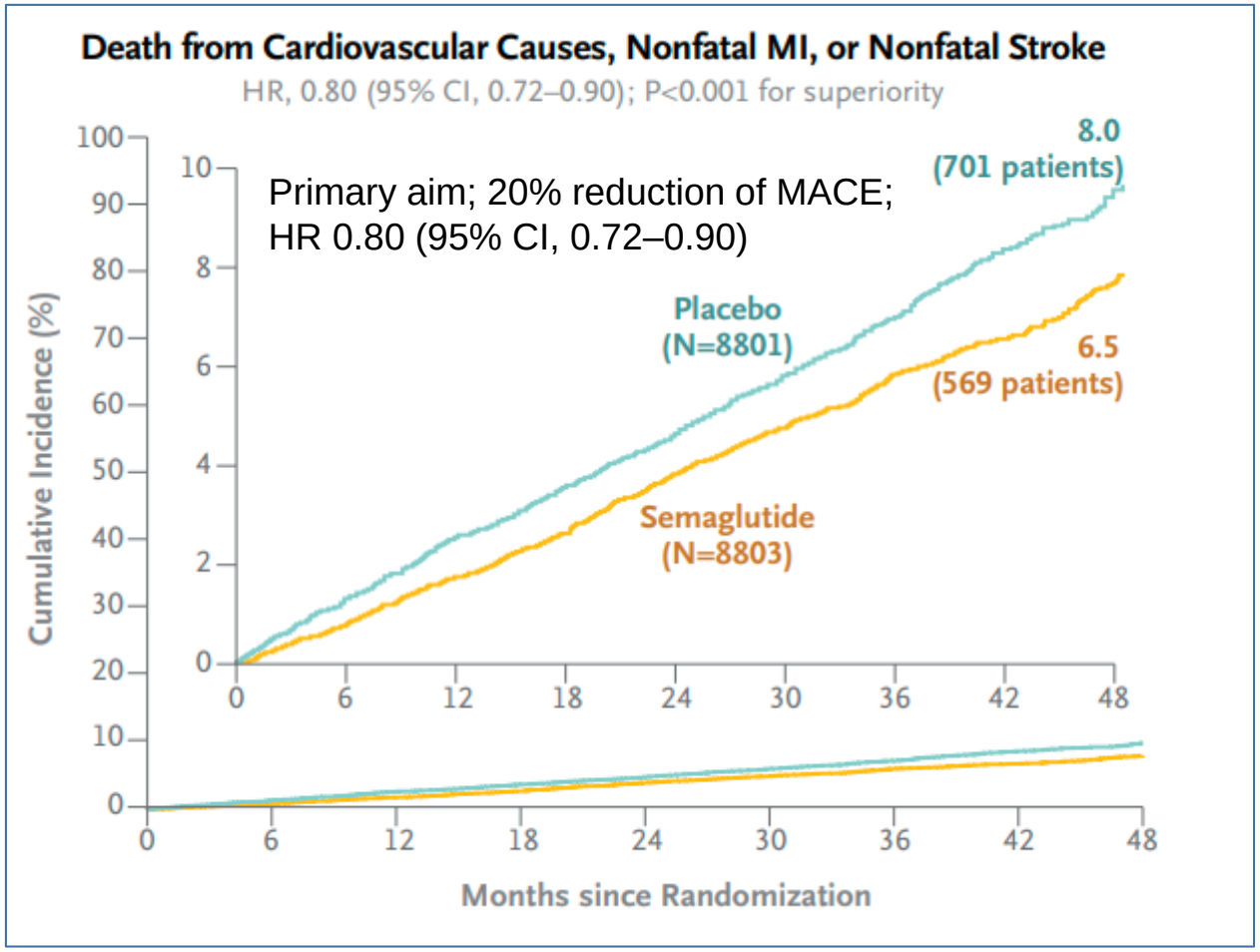
Ritsinger V et al EHJ ofPreventive Cardi 2026;1-14

The GLP-1 RA surprises…..

CV-effects in non diabetes obesity, in HFpEF, in CKD in the FLOW-trial.

The SELECT trial started cardiologists interest for obesity as a disease





N= 17 500, ≥ 45 years, BMI ≥27 kg/m^2, CVD (MI/stroke/PAD), 2018 to 2021

Primary aim; 20% reduction of MACE;	HR 0.80 (95% CI, 0.72–0.90)
Mortality	HR 0.81 (95% CI, 0.71–0.93)
Diabetes was prevented: HbA1c ≥6.5%	HR 0.27 (0.24 to 0.31)

SELECT trial Lincoff A M, NEJM, November 11, 2023.
Science 2023

GLP-11RA in the recent ESC HF guidelines 2026 for prevention of heart failure

"GLP-1 RA should be considered in T2DM with one risk factor to reduce HF or CV-death"

Table 5 New recommendations

Recommendations	Class[a]	Level[b]
Prevention of heart failure—*Section 4*		
Counselling on healthy lifestyle choices including maintaining a healthy weight, consuming a well-balanced diet, avoiding sedentary behaviour, abstaining from smoking and heavy alcohol consumption, as well as counselling against the use of drugs such as cocaine, amphetamines, and anabolic steroids, is recommended for all patients with stage A or B HF to reduce the risk of HF progression.	I	C
A GLP-1 RA should be considered in patients with T2DM and at least one other additional CV risk factor to reduce the risk of HF or CV death.	IIa	A
An ACE-I or ARB (if intolerant to ACE-I) is recommended in patients with stage B HF and LVEF ≤40% to reduce the risk of HFH and death.	I	A
A beta-blocker is recommended in patients with stage B HF and LVEF <50% to reduce the risk of HFH or death.	I	B1
Eplerenone is recommended in patients after myocardial infarction with LVEF ≤40% with signs of HF or diabetes to reduce the risk of HFH or death.	I	B1

2026 HF guidelines ESC

Sammanfattning

- Diabetes typ 2 medför fortfarande ökad risk för hjärtkärlsjukdom och död
- Prediabetes och graviditetsdiabetes medför ökad hjärtkärlrisk
- Prevention av CVD är möjligt! Om god multifaktoriell riskfaktor kontroll, men räcker ej alltid
- Förändrat komplikationsmönster vid diabetes då fler överlever hjärtinfarkt, fler hinner få hjärtsvikt och njursvikt…. (och cancer, demens, förmaksflimmer!)
- SGLT2-hämmare förhindrar hjärtsvikt och skyddar mot försämrad njursjukdom samt förlänger liv och minskar hjärtkärldöd
- GLP-1 RA skyddar mot nya hjärtkärlhändelser vid diabetes med etablerad hjärtkärlsjukdom/hög risk, ffa skyddas mot ateroskleroshändelser, samt förbättrar symtom även vid HFpEF vid obesitas och minskar CV-risk hos de med njursvikt
- GLP-1 RA semaglutide förhindrar progress från prediabetes till diabetes vid obesitas om viktnedgång
- Tidigt insatt behandling av nya diabetesläkemedel i senaste riktlinjerna
- Obesitas även vanligt och farligt vid typ 2 diabetes särskilt hos de med hjärtinfarkt!