The 13th Diabetes in Practice

Updates on Patient-Centered Management of Diabetes

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آکادمی دیابت گابریک

Cardiometabolic care in Diabetes

Panel:

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Heart Failure and Transplant Cardiologist

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Interventional Cardiologist

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Screening and Cardiovascular Evaluation in Diabetes Mellitus

Seyed Hashem Sezavar: M.D.
Interventional Cardiologist

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Clinical Case Scenario

54 y/o male, DM and DLP for 5 years, follow up visit for diabetes.
He has no complain of dyspnea, orthopnea, chest pain. He asks you about the cardiology check up.

PMHx: Dyslipidemia
FHx: No family history of HF or premature CAD
SHx:

- Moderately active lifestyle
- Smoker (25 pack-year)
- Occasional alcohol drinker

Vital Signs:
HR: 78 bpm and regular
Oxygen Sat: 98% on room air
Office BP: 140/90 mm/Hg
BMI: 31 kg/m^2

Physical Examination:
unremarkable

Daily medications:

- **Metformin/empagliflozin/linagliptin** 1000/5/2.5 mg BD
- **Gliclazide MR** 80 mg QD
- **Rosuvastatin** 20 mg QD

Lab Data:
HbA1c: 8%
Cr: 1.2 mg/dL, **eGFR:** 72 mL/min/1.73 m^2
Total Chol: 170 mg/dL
LDL: 70 mg/dL
HDL: 40 mg/dL
TG: 300 mg/dL
UACR: 20 mg/g

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What would be your next step on cardiovascular screening?

- **A** Reassurance- No need for screening
- **B** Follow up with an ECG
- **C** Lab request for Pro-BNP
- **D** Cardiology referral
- **E** Other treatment plan

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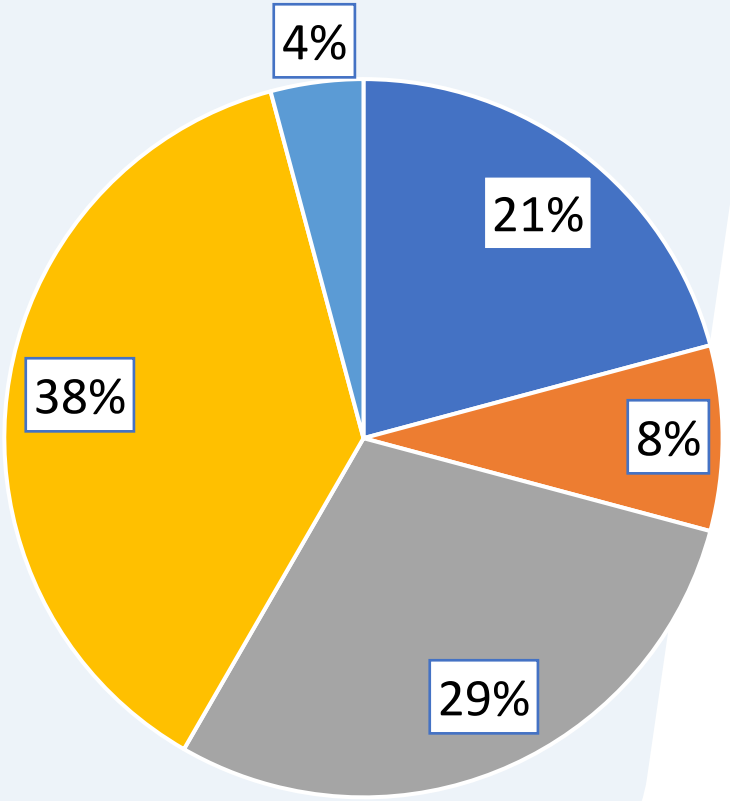
Answering Time!

Results

- **A** Reassurance- No need for screening
- **B** Follow up with an ECG
- **C** Lab request for Pro-BNP
- **D** Cardiology referral
- **E** Other treatment plan



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Why Cardiovascular Screening Matters in Diabetes

- Cardiovascular disease (CVD) is the leading cause of morbidity and mortality in diabetes.
- Patients with type 2 diabetes have 2–4× higher risk of coronary artery disease (CAD).
- Early identification of cardiovascular risk allows targeted preventive strategies.

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Routine Cardiovascular Screening

- Routine screening for CAD in asymptomatic diabetic patients is NOT recommended.
- Screening does not improve outcomes if risk factors are optimally managed.
- Focus on aggressive risk factor control: lipids, blood pressure, and glycemia.

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Routine Cardiovascular Screening

Screening may be considered if:

- Typical or atypical cardiac symptoms are present (chest pain, dyspnea, fatigue).
- Resting ECG shows abnormalities.
- Strong family history of premature CAD.
- Peripheral artery or carotid disease is present.

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Baseline Cardiovascular Evaluation in All DM Patients

At diagnosis and at least annually:

- Detailed history and physical examination for symptoms of ischemia or heart failure.
- Blood pressure measurement at every visit.
- Lipid profile at diagnosis and every 1–2 years.
- Resting ECG: reasonable at baseline in adults with DM and hypertension or symptoms.

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Risk Stratification Tools

- ASCVD Risk Calculator (ACC/AHA): general CV risk assessment.
- UKPDS Risk Engine: specific for type 2 diabetes.
- SCORE2-Diabetes (ESC 2023): integrates glycemic control and duration of diabetes.
- Use these tools to guide therapy intensity and follow-up frequency.

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Very high CV risk	Patients with T2DM with: • Clinically established ASCVD or • Severe TOD or • 10-year CVD risk ≥20% using SCORE2-Diabetes
High CV risk	Patients with T2DM not fulfilling the very high-risk criteria and a: • 10-year CVD risk 10 to <20% using SCORE2-Diabetes
Moderate CV risk	Patients with T2DM not fulfilling the very high-risk criteria and a: • 10-year CVD risk 5 to <10% using SCORE2-Diabetes
Low CV risk	Patients with T2DM not fulfilling the very high-risk criteria and a: • 10-year CVD risk <5% using SCORE2-Diabetes

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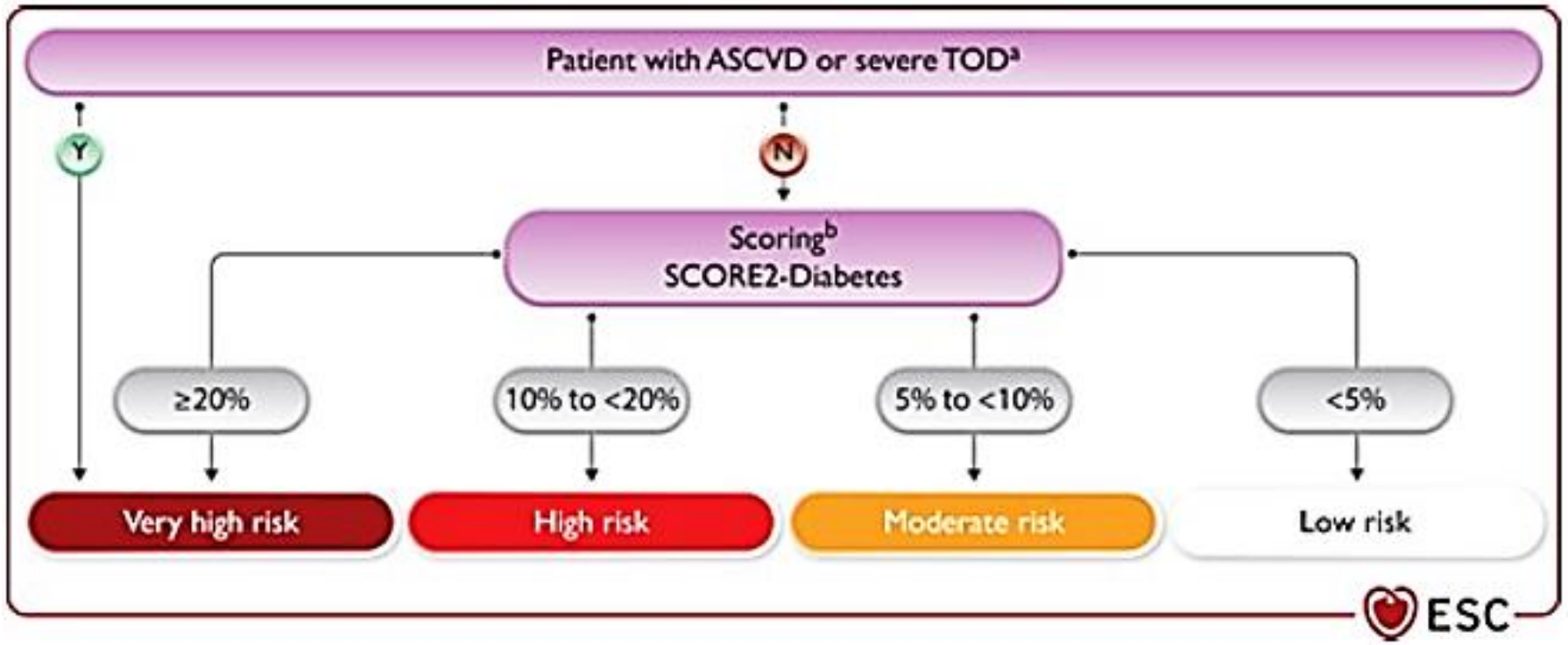
Patient with ASCVD or severe TOD[a]
Y
N
Scoring[b]
SCORE2-Diabetes
≥20%
10% to <20%
5% to <10%
<5%
Very high risk
High risk
Moderate risk
Low risk
ESC

Recommendations to assess cardiovascular risk in patients with diabetes	Class[a]	Level[b]
It is recommended to screen patients with diabetes for the presence of severe TOD.[c,43,44]	I	A
It is recommended to assess medical history and the presence of symptoms suggestive of ASCVD in patients with diabetes.[53–55]	I	B
In patients with T2DM without symptomatic ASCVD or severe TOD,[c] it is recommended to estimate 10-year CVD risk via SCORE2-Diabetes.[d,50]	I	B

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Recommendations	Class[a]	Level[b]
It is recommended that individuals living with overweight or obesity aim to reduce weight and increase physical exercise to improve metabolic control and overall CVD risk profile.[56,79]	I	A

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Recommendations	Class[a]	Level[b]
It is recommended to adopt a Mediterranean or plant-based diet with high unsaturated fat content to lower cardiovascular risk.[82,85]	I	A

[a]Class of recommendation.
[b]Level of evidence.

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Recommendation	Class[a]	Level[b]
It is recommended to increase any physical activity (e.g. 10 min daily walking) in all patients with T2DM with and without CVD. Optimal is a weekly activity of 150 min of moderate intensity or 75 min of vigorous endurance intensity.[97,98]	I	A

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Recommendations	Class[a]	Level[b]
It is recommended to stop smoking to reduce cardiovascular risk.[118–120]	I	A
Nicotine replacement therapy, varenicline, and bupropion, as well as individual or telephone counselling, should be considered to improve smoking cessation success rate.[121]	IIa	B

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Ongoing Cardiovascular Risk Management in DM

- Blood pressure target: <130/80 mmHg (if tolerated).
- Lipid management: High-intensity statin for most adults >40 years or with risk factors.
- Antiplatelet therapy: Low-dose aspirin for secondary prevention.
- Glycemic control: Individualized A1C target (usually <7%).
- Consider SGLT2 inhibitors or GLP-1 RAs for CV and renal protection.

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Heart Failure and Cardiomyopathy Screening

- Consider BNP or NT-proBNP testing in high-risk or symptomatic patients.
- Echocardiography if symptoms suggest heart failure or if structural disease suspected.
- SGLT2 inhibitors are recommended for prevention and treatment of HF in diabetes.

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Summary and Key Takeaways

- 1. Routine CAD screening in asymptomatic DM patients is not recommended.
- 2. Comprehensive baseline CV assessment should be done at diagnosis and annually.
- 3. Use validated risk calculators to personalize care.
- 4. Aggressive risk factor management remains the cornerstone.
- 5. GLP-1 RAs and SGLT2 inhibitors play a major role in CV risk reduction.

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The illusion of LDL Control

Farhad Hossein Panah; M.D.
Endocrinologist

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Clinical Case Scenario

63 y/o male, T2DM 8 years ago, Routine diabetes follow up in outpatient clinic

PMHx: Dyslipidemia, HTN

FHx:

Premature CV death: negative

SHx:

- Sedentary lifestyle
- Smoker (15 pack-year)
- Occasional alcohol drinker

Vital Signs:

HR: 74 bpm and regular

Office BP: 120/70 mm/Hg

BMI: 27 kg/m^2

Physical Examination:

unremarkable

Daily medications:

- **Metformin/Linagliptin/Empagliflozin** 1000/5/10 mg Daily
- **Atorvastatin** 40 mg QD
- **Telmisartan/ amlodipine** 40/5 mg QD

Lab Data:

HbA1c: 6.8%

Cr: 1.4 mg/dL, **eGFR:** 62 mL/min/1.73 m^2

Total Chol: 165 mg/dL

LDL: 65 mg/dL

HDL: 34 mg/dL

TG: 330 mg/dL

AST: 55 U/L

ALT: 68 U/L

Platelet: 420000 10^3/uL

UACR: 15 mg/g on one occasion

FIB-4 score: 1

10-year ASCVD risk: 10-year ASCVD risk not available for patients with LDL-C < 70 mg/dL

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I heard a lot in the media, that statins are harmful!
Now that my LDL is low, can we reduce the dose?

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What would be your suggestion on therapy modification for his LDL?

- **A** Decrease atorvastatin dose
- **B** DC atorvastatin
- **C** Add ezetimibe
- **D** No change is needed
- **E** Other treatment plan

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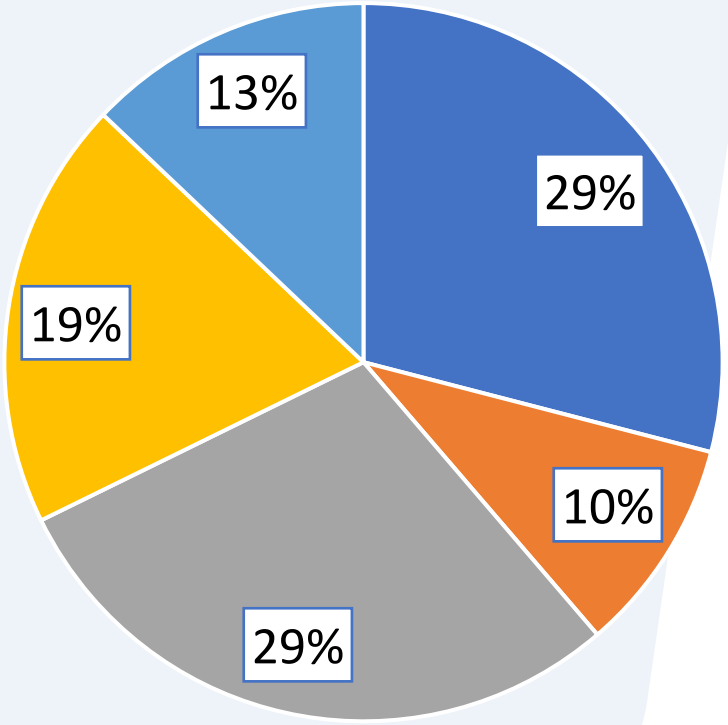
Answering Time!

Results

- A: Decrease atorvastatin dose
- B: DC atorvastatin
- C: Add ezetimibe
- D: No change is needed
- E: Other treatment plan



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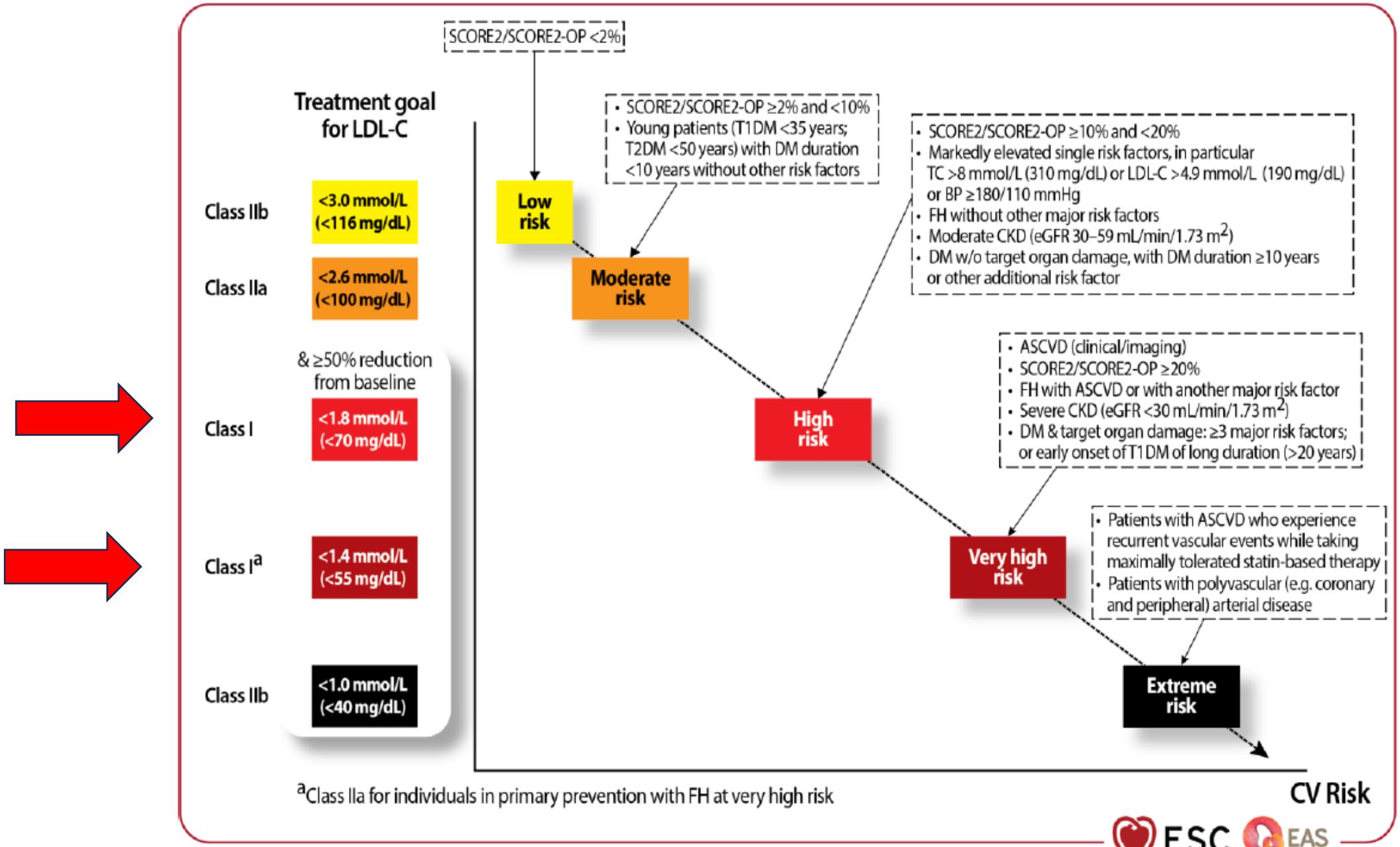
- SCORE2/SCORE2-OP ≥10% and <20%
- Markedly elevated single risk factors, in particular TC >8 mmol/L (310 mg/dL) or LDL-C >4.9 mmol/L (190 mg/dL) or BP ≥180/110 mmHg
- FH without other major risk factors
- Moderate CKD (eGFR 30–59 mL/min/1.73 m^2)
- DM w/o target organ damage, with DM duration ≥10 years or other additional risk factor

- ASCVD (clinical/imaging)
- SCORE2/SCORE2-OP ≥20%
- FH with ASCVD or with another major risk factor
- Severe CKD (eGFR <30 mL/min/1.73 m^2)
- DM & target organ damage: ≥3 major risk factors; or early onset of T1 DM of long duration (>20 years)


SCORE2/SCORE2-OP <2%
Treatment goal for LDL-C
Class IIb
<3.0 mmol/L (<116 mg/dL)
Class IIa
<2.6 mmol/L (<100 mg/dL)
& ≥50% reduction from baseline
Class I
<1.8 mmol/L (<70 mg/dL)
Class I[a]
<1.4 mmol/L (<55 mg/dL)
Class IIb
<1.0 mmol/L (<40 mg/dL)
Low risk
• SCORE2/SCORE2-OP ≥2% and <10%
• Young patients (T1DM <35 years; T2DM <50 years) with DM duration <10 years without other risk factors
Moderate risk
• SCORE2/SCORE2-OP ≥10% and <20%
• Markedly elevated single risk factors, in particular TC >8 mmol/L (310 mg/dL) or LDL-C >4.9 mmol/L (190 mg/dL) or BP ≥180/110 mmHg
• FH without other major risk factors
• Moderate CKD (eGFR 30–59 mL/min/1.73 m2)
• DM w/o target organ damage, with DM duration ≥10 years or other additional risk factor
High risk
• ASCVD (clinical/imaging)
• SCORE2/SCORE2-OP ≥20%
• FH with ASCVD or with another major risk factor
• Severe CKD (eGFR <30 mL/min/1.73 m2)
• DM & target organ damage: ≥3 major risk factors; or early onset of T1 DM of long duration (>20 years)
Very high risk
• Patients with ASCVD who experience recurrent vascular events while taking maximally tolerated statin-based therapy
• Patients with polyvascular (e.g. coronary and peripheral) arterial disease
Extreme risk
[a]Class IIa for individuals in primary prevention with FH at very high risk
CV Risk
ESC
EAS

Lipid management for primary prevention

ADA 2025

- Patients aged 40-75 years:
  - Moderate-intensity statin (A)
  - AT higher cardiovascular risk, including those with one or more additional ASCVD risk factors, high-intensity statin therapy is recommended to reduce LDL cholesterol by ≥50% of baseline and to obtain an LDL cholesterol goal of <70 mg/dL (A)
  - At higher cardiovascular risk, especially those with multiple additional ASCVD risk factors and an LDL cholesterol ≥70 mg/dL , it may be reasonable to add ezetimibe or a PCSK9 inhibitor to maximum tolerated statin therapy (B)

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Lipid management for secondary prevention

ADA 2025

- For people of all ages with diabetes and ASCVD, high-intensity statin therapy should be added to lifestyle therapy. **A**

- For people with diabetes and ASCVD, treatment with high-intensity statin therapy is recommended to obtain an LDL cholesterol reduction of ≥50% from baseline and an LDL cholesterol goal of <55 mg/dL . Addition of ezetimibe or a PCSK9 inhibitor with proven benefit in this population is recommended if this goal is not achieved on maximum tolerated statin therapy. **B**

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Lipid management

ADA 2025

- In people with diabetes intolerant to statin therapy, treatment with **bempedoic acid** is recommended to reduce cardiovascular event rates as an alternative cholesterol-lowering plan. **A**

- For individuals who do not tolerate the intended statin intensity, the maximum tolerated statin dose should be used. **E**

- For people with diabetes and ASCVD intolerant to statin therapy, PCSK9 inhibitor therapy with monoclonal antibody treatment, **A** **bempedoic acid** therapy, **A** or PCSK9 inhibitor therapy with inclisiran siRNA **E** should be considered as an alternative cholesterol-lowering therapy.

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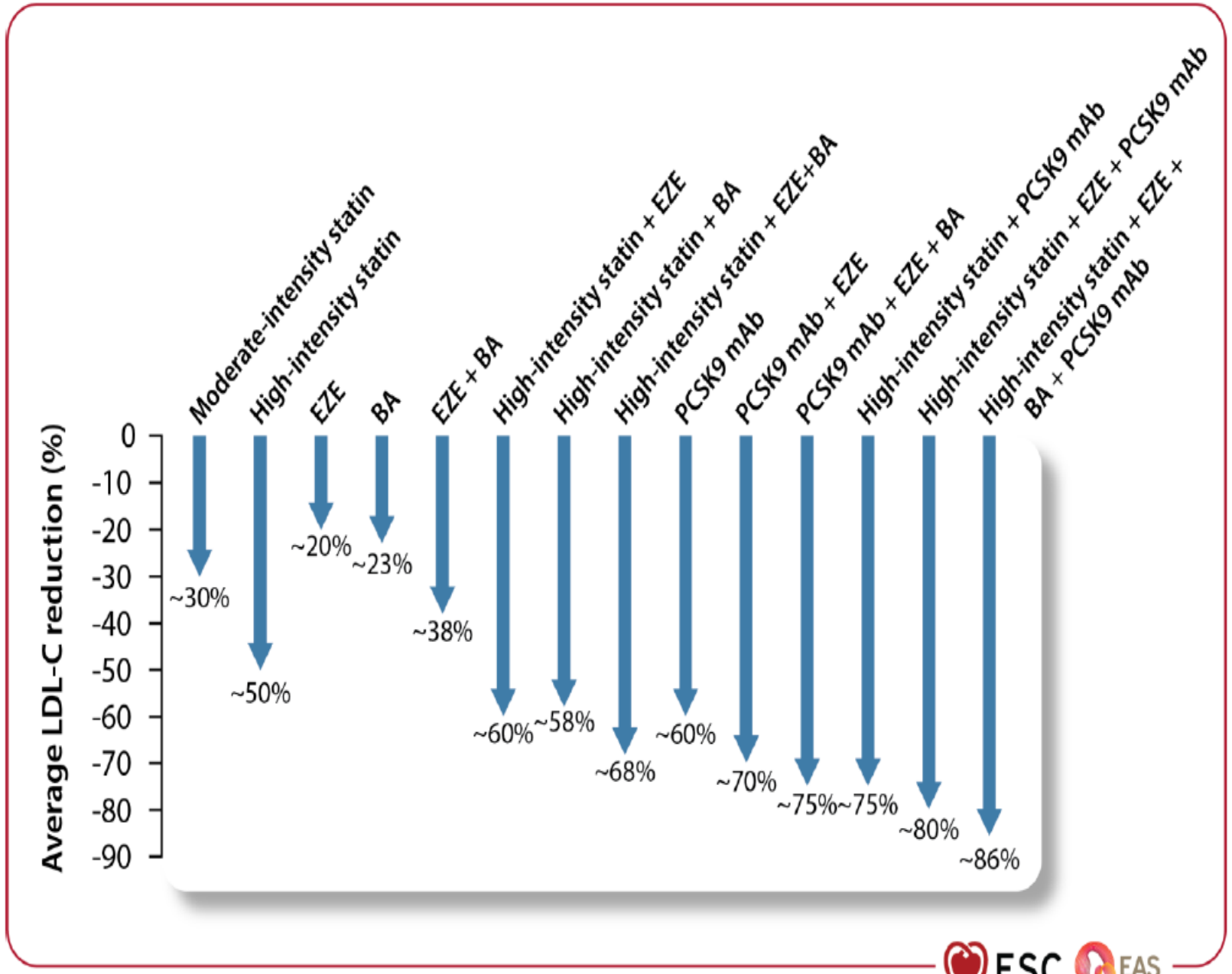
Table I Categories and doses of statins[30]

Statins	Low-intensity dosage (LDL - C reduction <30%)	Moderate-intensity dosage (LDL - C reduction 30% to <50%)	High-intensity dosage (LDL - C reduction ≥50%)
Atorvastatin	—	10–20 mg	40–80 mg
Fluvastatin	20–40 mg	40 mg twice/day; 80 mg	—
Lovastatin	20 mg	40–80 mg	—
Pitavastatin	—	1–4 mg	—
Pravastatin	10–20 mg	40–80 mg	—
Rosuvastatin	—	5–10 mg	20–40 mg
Simvastatin	10 mg	20–40 mg	—

LDL - C, LDL cholesterol.

Average reduction in low-density lipoprotein cholesterol levels with different pharmacological therapies with proven cardiovascular benefit.



ESC EAS

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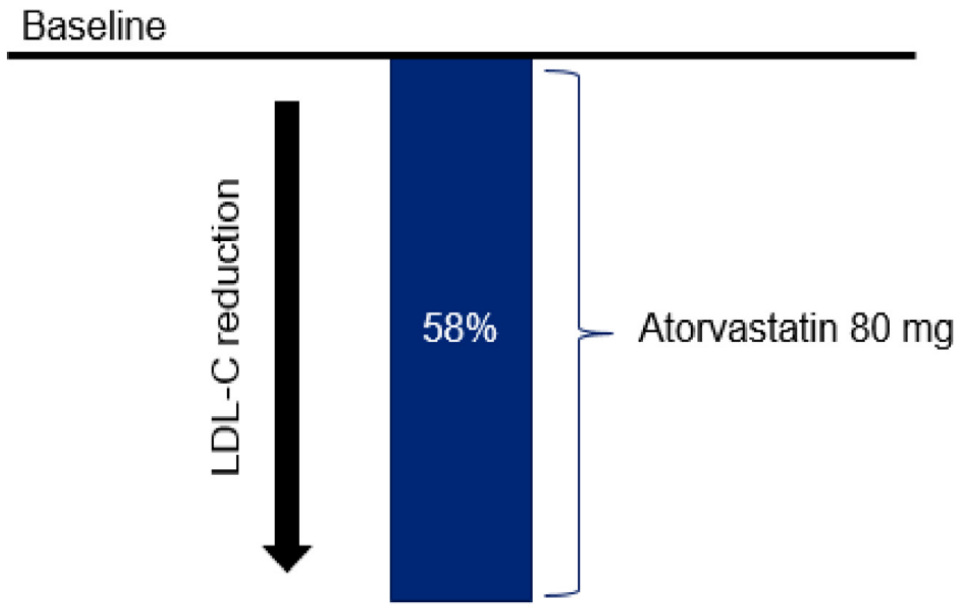
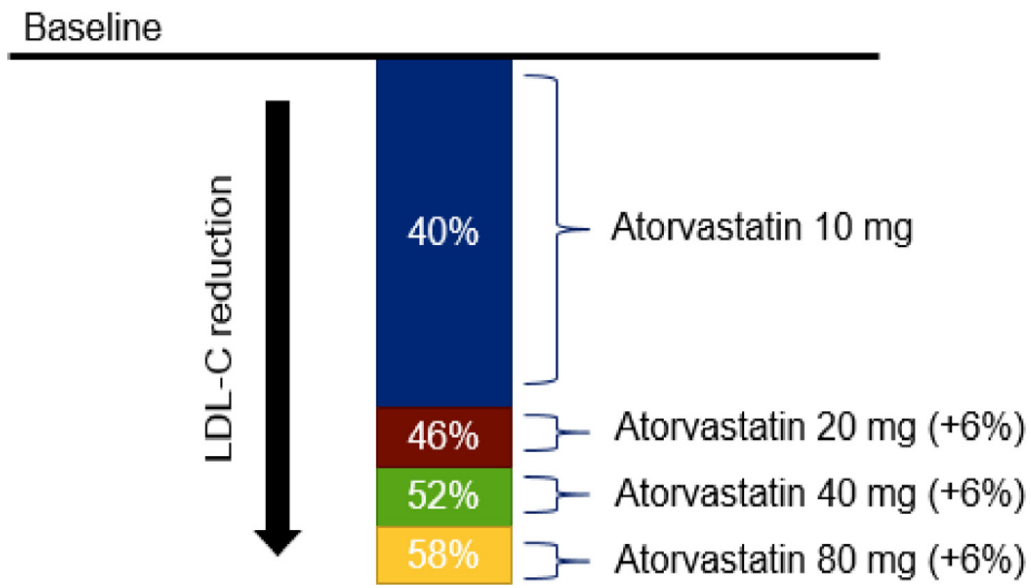
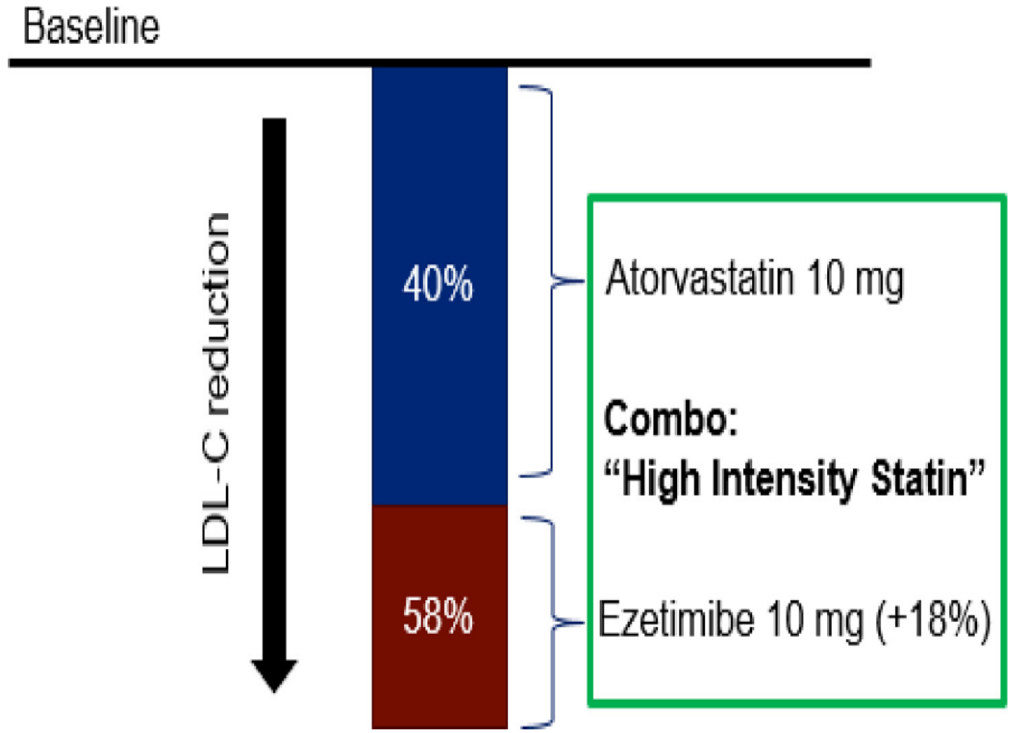
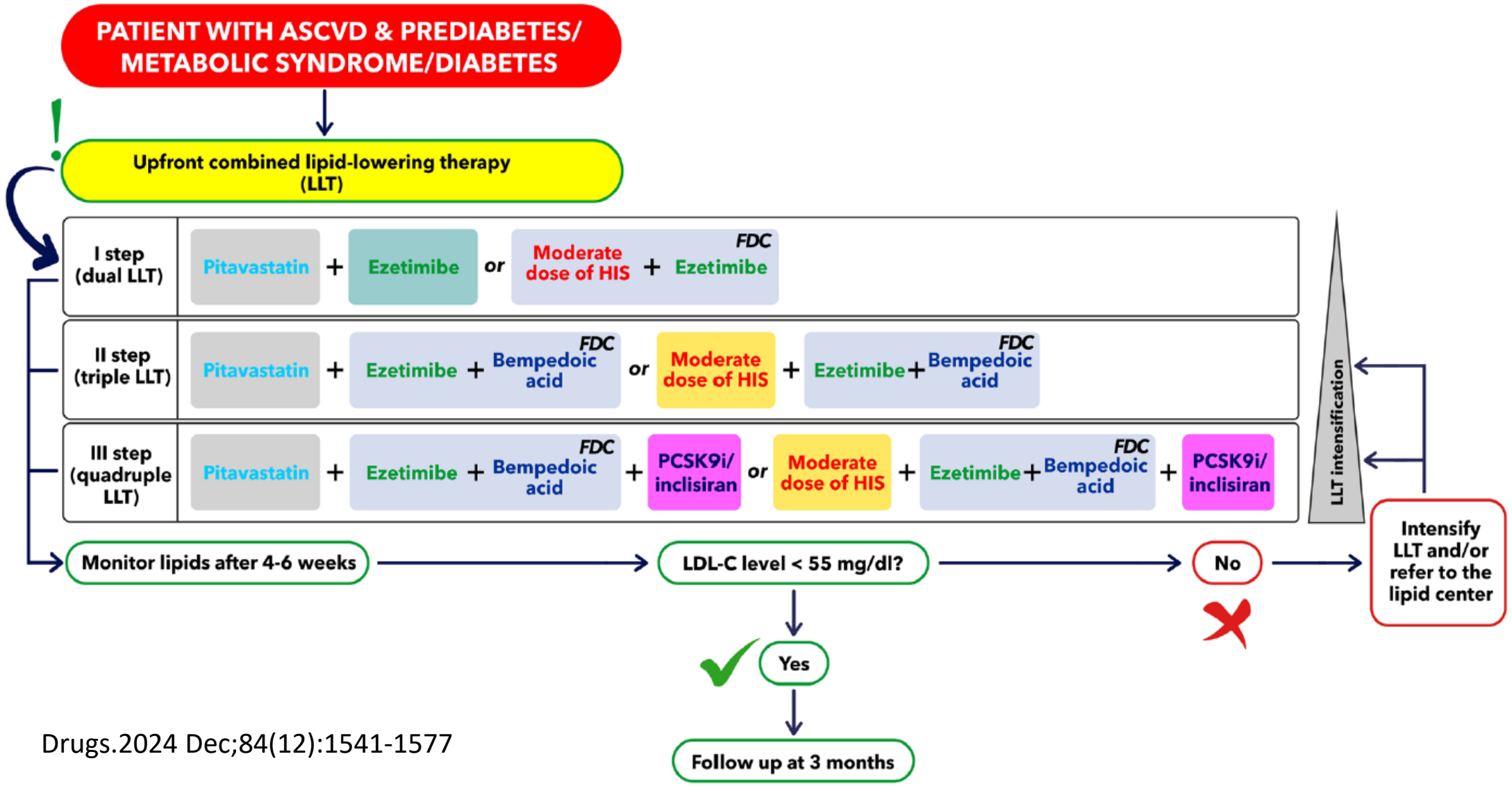

Baseline
LDL-C reduction
58%
Atorvastatin 80 mg

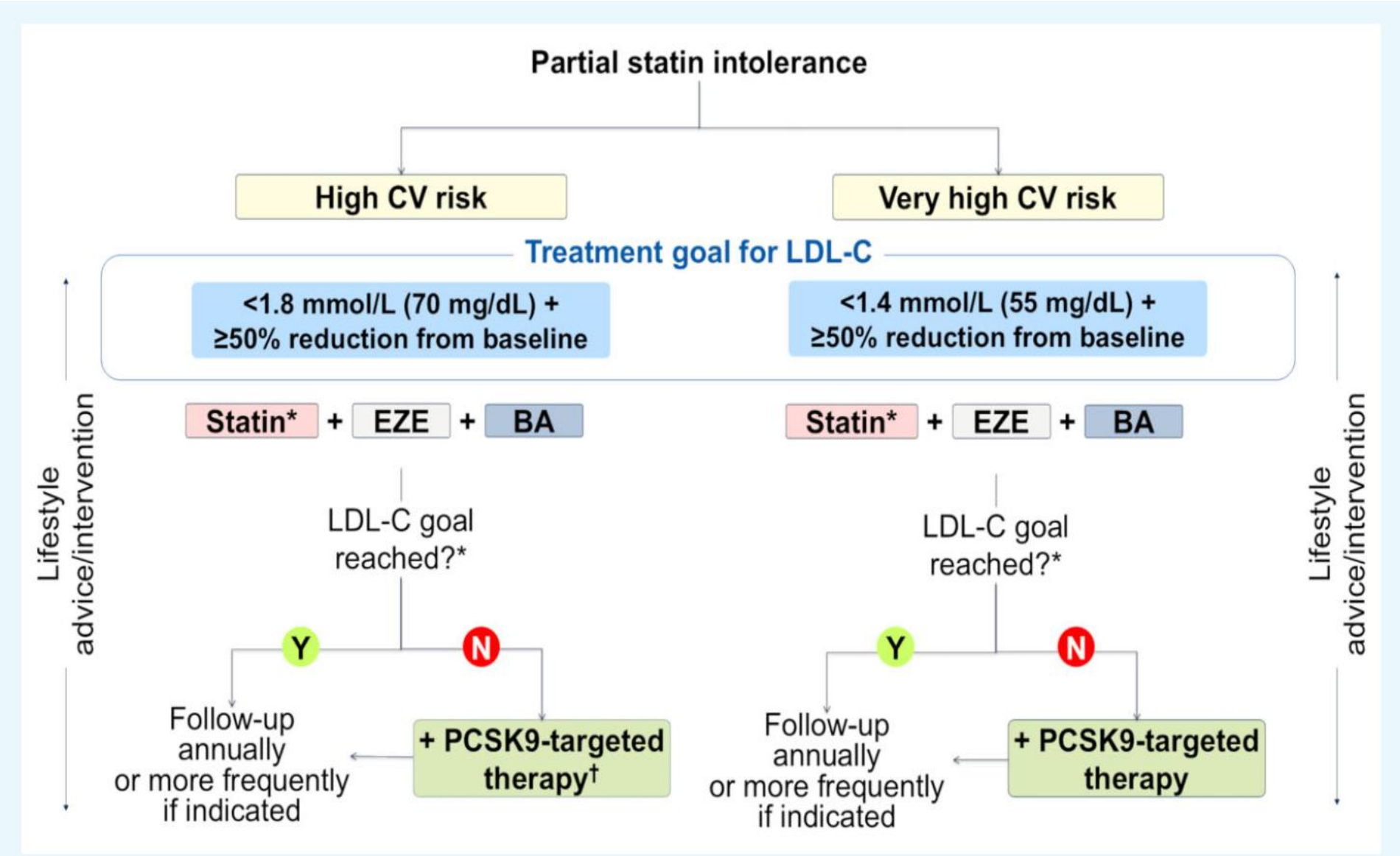

Baseline
LDL-C reduction
40%
Atorvastatin 10 mg
46%
Atorvastatin 20 mg (+6%)
52%
Atorvastatin 40 mg (+6%)
58%
Atorvastatin 80 mg (+6%)


Baseline
LDL-C reduction
40%
Atorvastatin 10 mg
Combo:
"High Intensity Statin"
58%
Ezetimibe 10 mg (+18%)

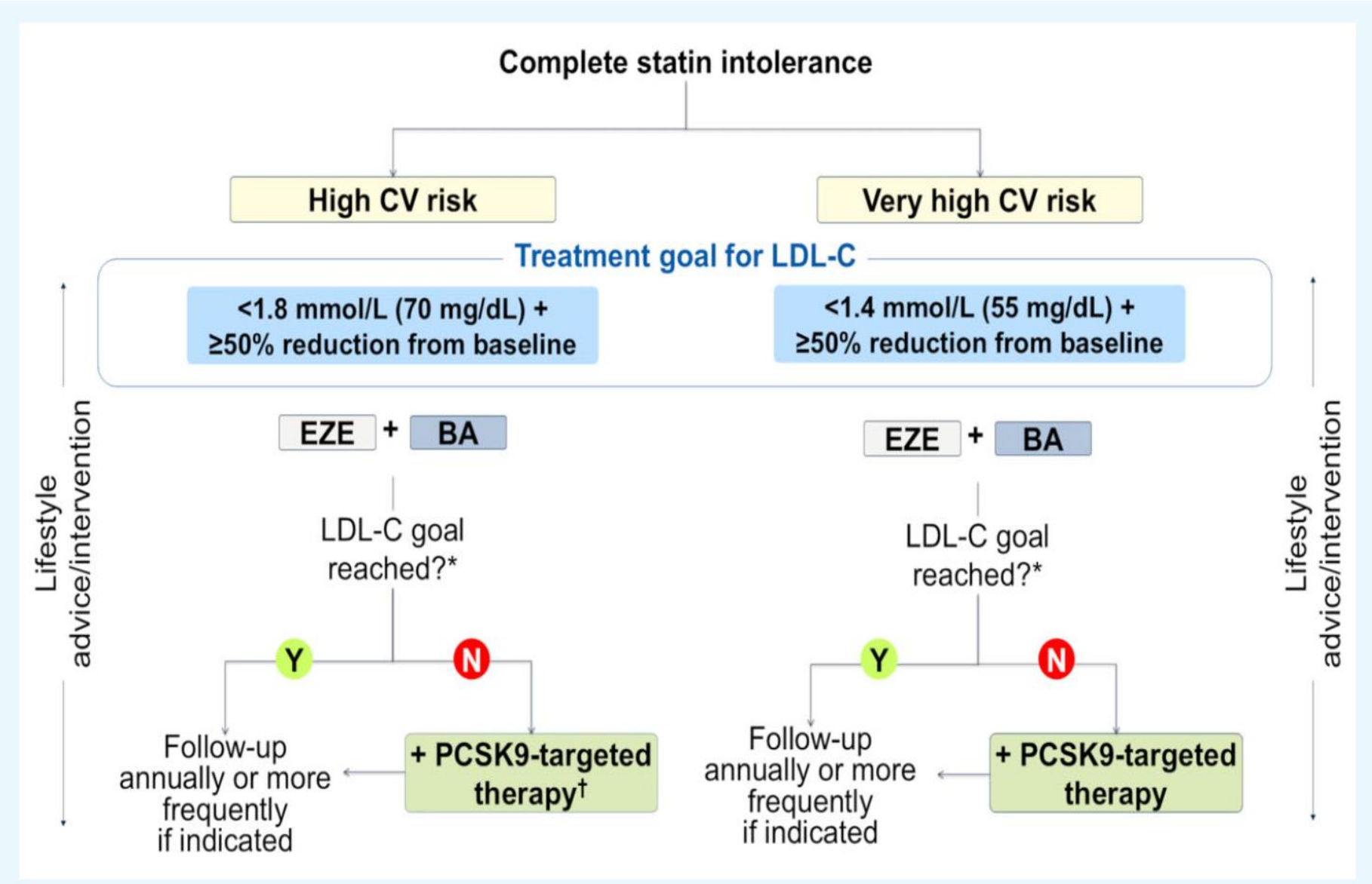
2024 Recommendations on the Optimal Use of Lipid-Lowering Therapy in Established Atherosclerotic Cardiovascular Disease and Following Acute Coronary Syndromes: A Position Paper of the International Lipid Expert Panel (ILEP)



Drugs.2024 Dec;84(12):1541-1577



European Heart Journal - Cardiovascular Pharmacotherapy (2025) 11 , 367–379



European Heart Journal - Cardiovascular Pharmacotherapy (2025) 11 , 367–379

Clinical Outcome Studies Evaluating High-TG-Level Subgroups

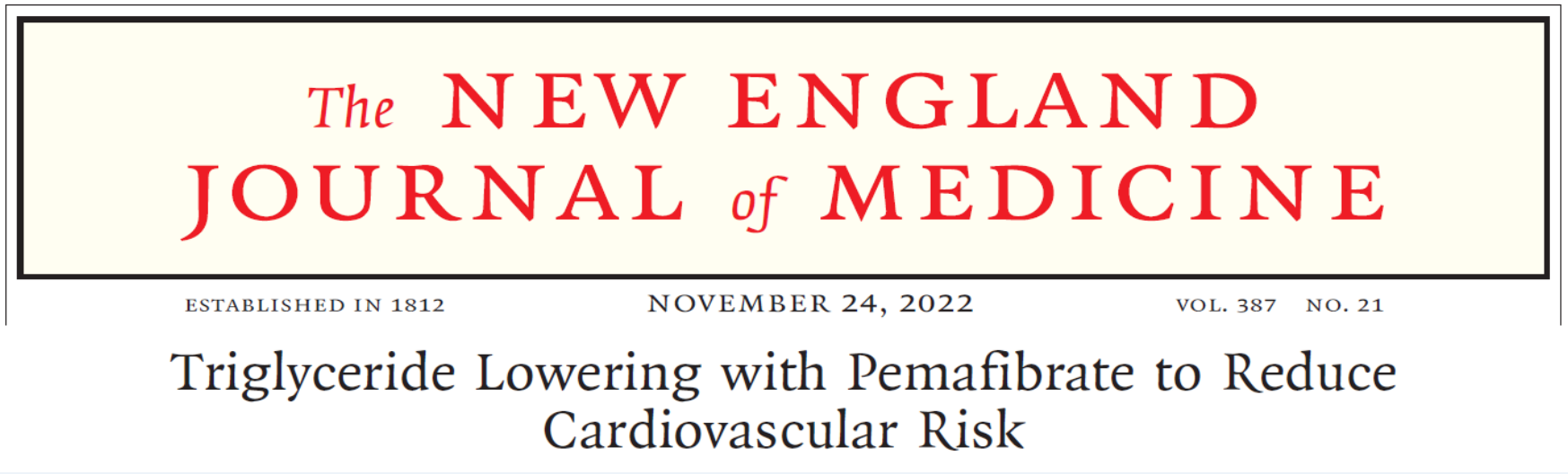
Trial	Drug	Primary Endpoint: Entire Cohort (*P* Value)	Lipid Subgroup Criteria	Primary Endpoint: Subgroup (*P* Value)
HHS	Gemfibrozil	−34% (< .02)	• TG > 204 mg/dL • LDL-C/HDL-C ratio > 5.0	−71% (.005)
BIP	Bezafibrate	−9.4% (.26)	• TG ≥ 200 mg/dL • HDL-C < 35 mg/dL	−40% (.02)
FIELD	Fenofibrate	−11% (.16)	• TG ≥ 150 mg/dL	−12% (.07)
ACCORD	Fenofibrate	−8% (.32)	• TG ≥ 204 mg/dL • HDL-C ≤ 34 mg/dL	−31% (.0567)
JELIS	EPA	−19% (.011)	• TG ≥ 150 mg/dL • HDL-C < 40 mg/dL	−53% (.043)

Maki KC, et al. *J Clin Lipidol*. 2012;6:413-426.

Clinical Outcome Studies in Hypertriglyceridemia

Trial	Study Drug/Groups	Entry Criteria	Primary Endpoint (MACE), %
PROMINENT[a]	Pemafibrate vs placebo	• TG ≥ 200 mg/dL and < 499 mg/dL • HDL-C ≤ 40 mg/dL	Ongoing
STRENGTH[b]	DHA and EPA vs placebo	• TG ≥ 180 mg/dL and < 500 mg/dL • HDL-C < 42 mg/dL (men) and < 47 mg/dL (women) • LDL-C < 100 mg/dL	12 vs 12.2
REDUCE-IT[c]	EPA vs placebo	• TG ≥ 150 mg/dL and < 500 mg/dL • LDL-C > 40 mg/dL and ≤ 100 mg/dL	17.2 vs 22.0

a. Pradhan AD, et al. *Am J Heart*. 2018;206:80-93; b. Nicholls SJ, et al. *JAMA*. 2020;324:2268-2280; c. Bhatt DL, et al. *N Engl J Med*. 2019;380:11-22.



- In a multinational, double-blind, randomized RCT, patients with type 2 diabetes, mild-to-moderate hypertriglyceridemia (triglyceride level, 200 to 499 mg per deciliter), and high-density lipoprotein (HDL) cholesterol levels of 40 mg per deciliter or lower were assigned to receive pemafibrate (0.2-mg tablets twice daily) or matching placebo

- The median follow-up was 3.4 years.

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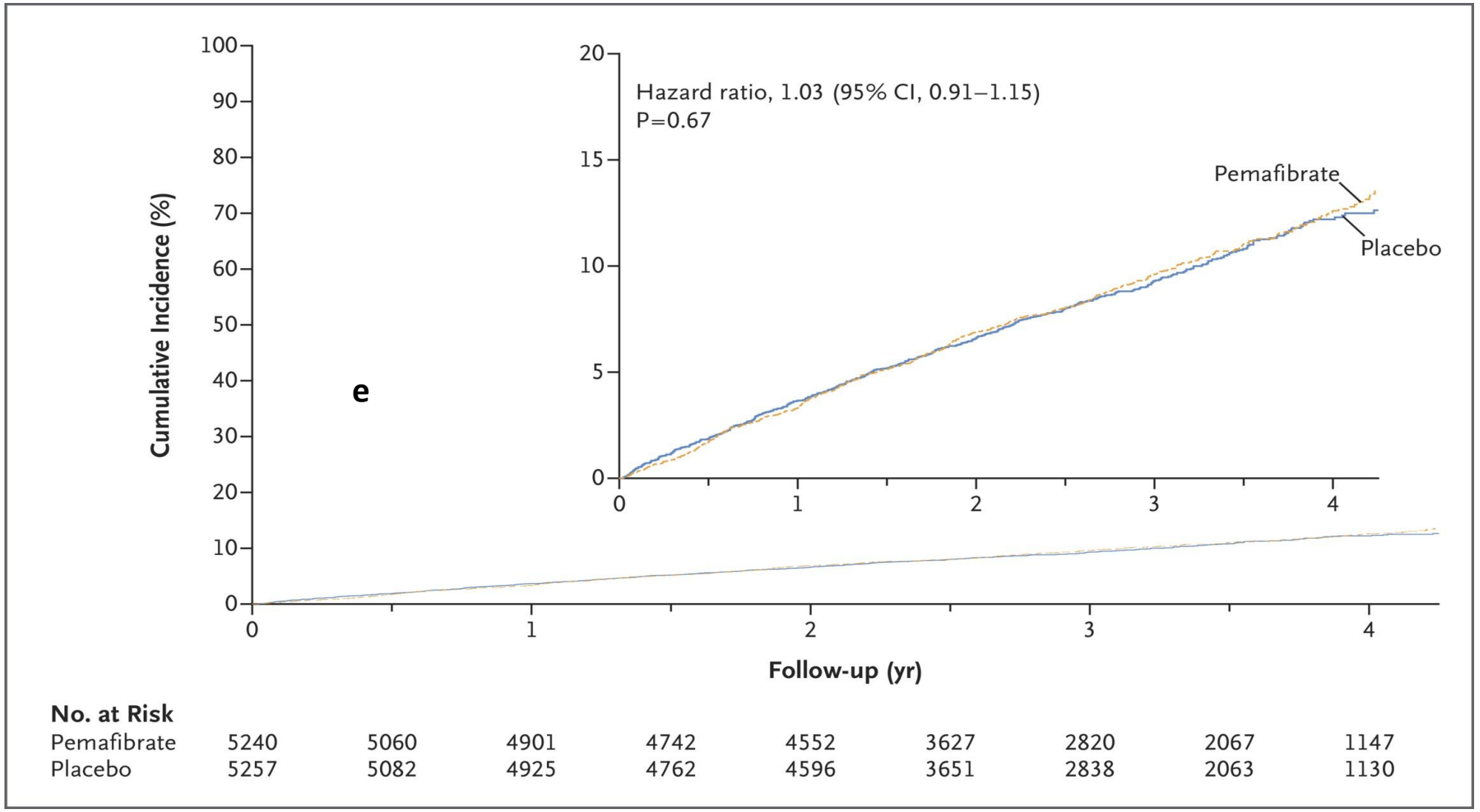
Das Pradhan A et al. N Engl J Md2022;387:1923-1934

Cumulative Incidence of Cardiovascular Events



Das Pradhan A et al. N Engl J Md2022;387:1923-1934

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PROMINENT[a]	Pemafibrate vs placebo	• TG ≥ 200 mg/dL and < 499 mg/dL • HDL-C ≤ 40 mg/dL	Ongoing
STRENGTH[b]	DHA and EPA vs placebo	• TG ≥ 180 mg/dL and < 500 mg/dL • HDL-C < 42 mg/dL (men) and < 47 mg/dL (women) • LDL-C < 100 mg/dL	12 vs 12.2
REDUCE-IT[c]	EPA vs placebo	• TG ≥ 150 mg/dL and < 500 mg/dL • LDL-C > 40 mg/dL and ≤ 100 mg/dL	17.2 vs 22.0

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Cardiovascular Risk Reduction with Icosapent Ethyl for Hypertriglyceridemia

- A multicenter, randomized, double-blind, placebo-controlled trial involving patients with established cardiovascular disease or with diabetes and other risk factors, who had been receiving statin therapy and who had a fasting triglyceride level of 135 to 499 mg/dl and a LDL level of 41 to 100 mg/dl
- The patients were randomly assigned to receive 2 g of icosapent ethyl twice daily (total daily dose, 4 g) or placebo
- Median length of F/U: 4.9 years

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N Engl J Med. 2019 Jan 3;380(1):11-22

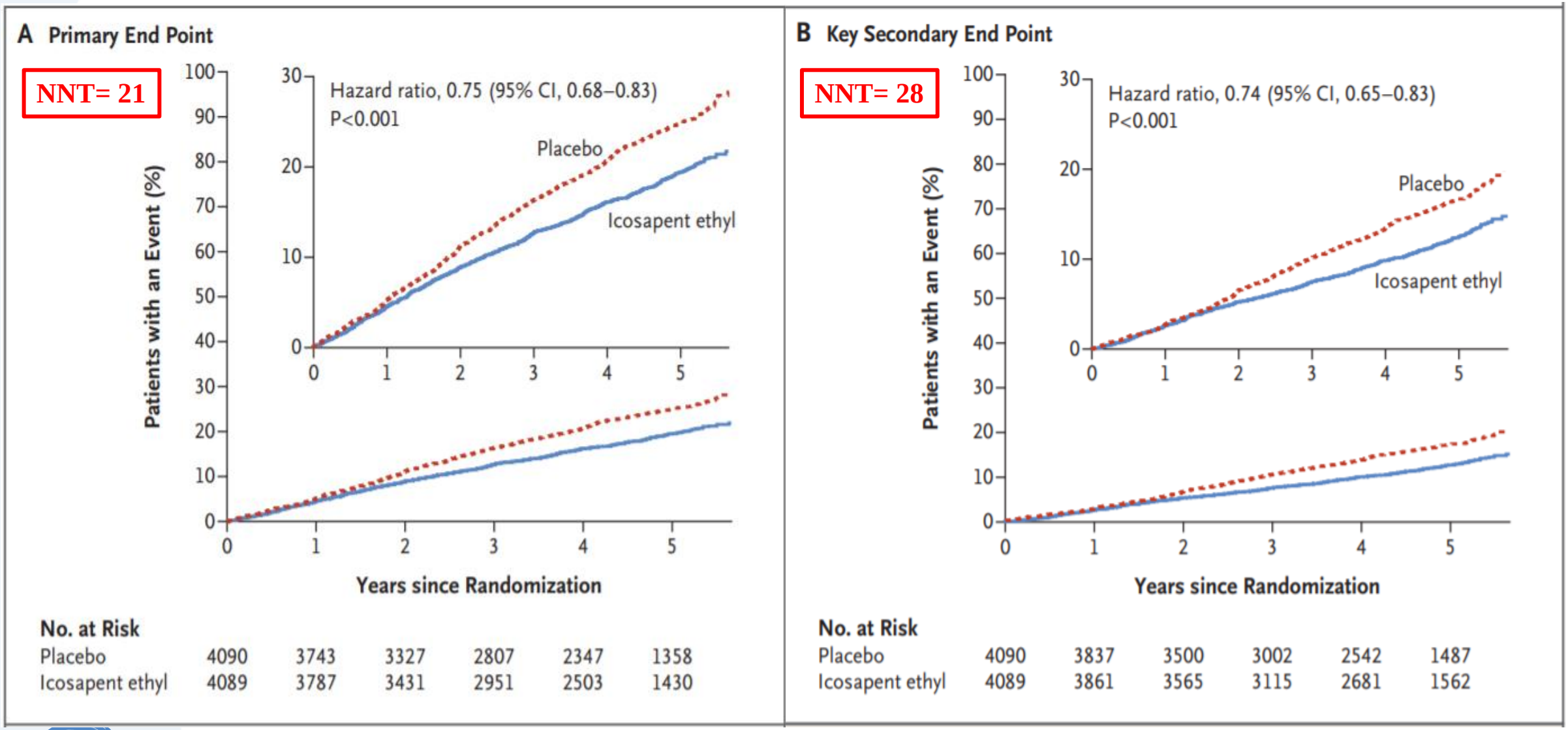

Figure 1: Cumula
nel A shows the
evascularization,
econdary efficacy
the inset shows the
data were included i

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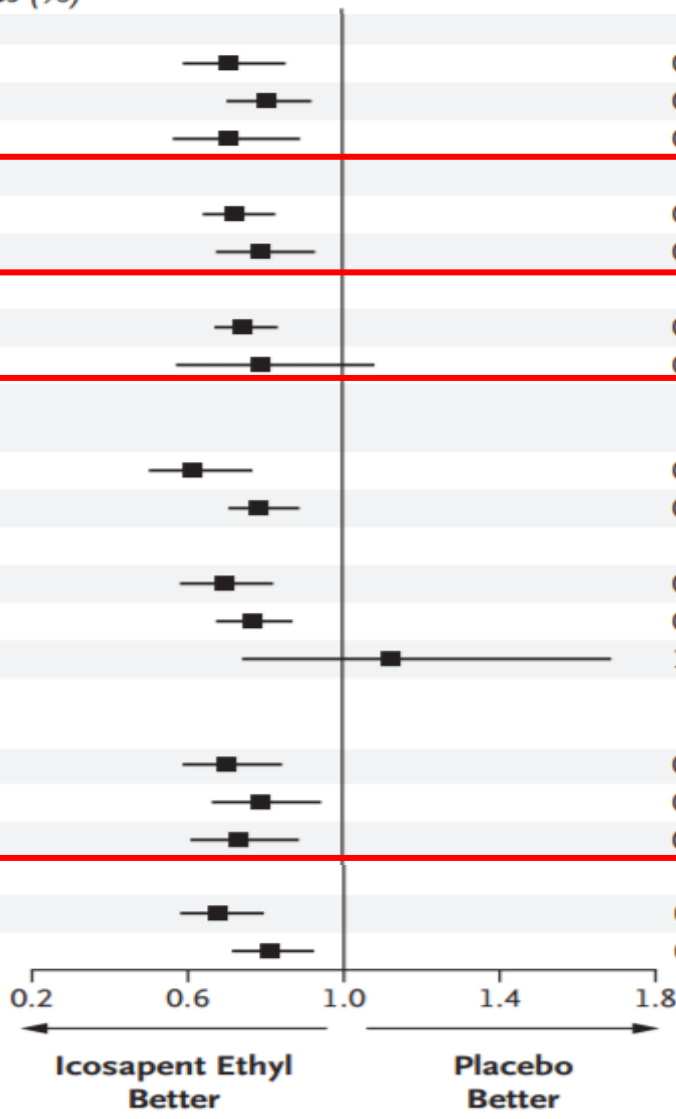
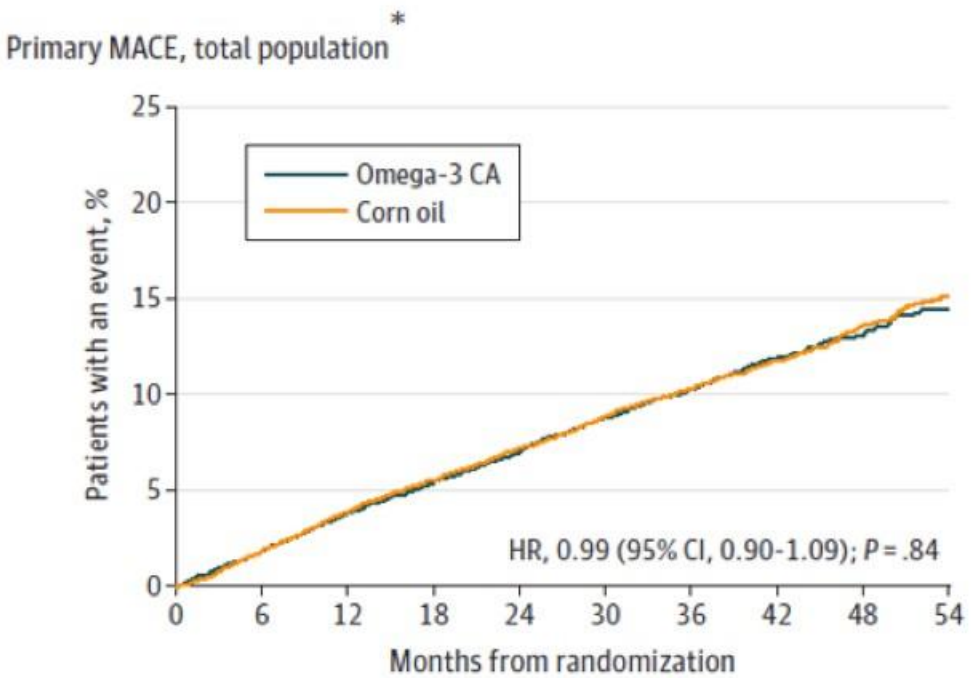
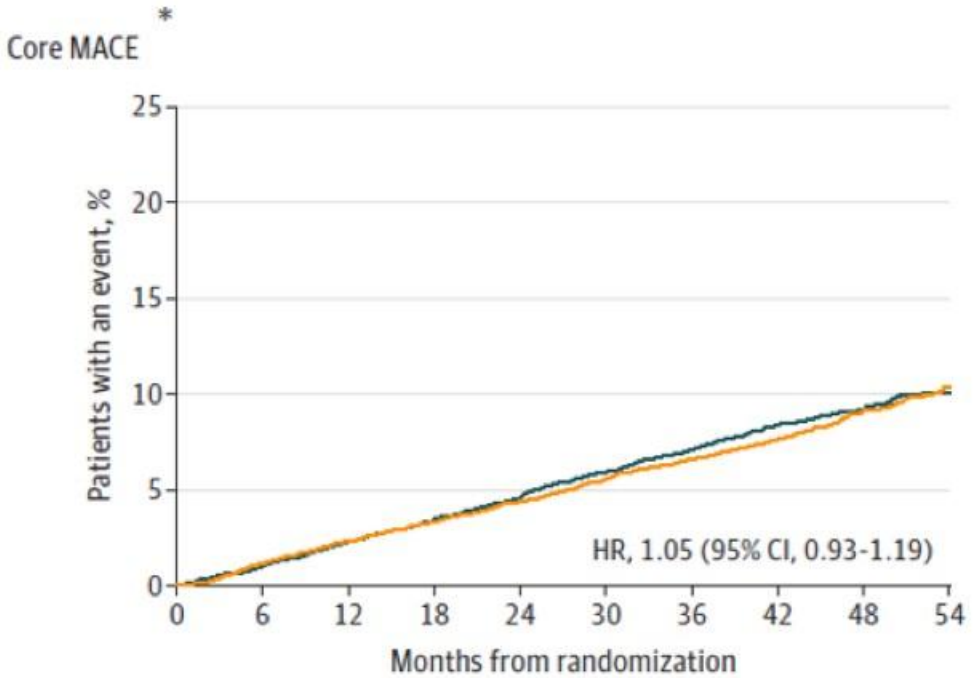
Subgroup	Icosapent Ethyl	Placebo	Hazard Ratio (95% CI)	P Value for Interaction
	no. of patients with event/total no. of patients (%)			
Baseline estimated GFR				0.41
<60 ml/min/1.73 m²	197/905 (21.8)	263/911 (28.9)	0.71 (0.59–0.85)	
≥60 to <90 ml/min/1.73 m²	380/2217 (17.1)	468/2238 (20.9)	0.80 (0.70–0.92)	
≥90 ml/min/1.73 m²	128/963 (13.3)	170/939 (18.1)	0.70 (0.56–0.89)	
Baseline triglycerides				0.45
≥200 mg/dl	430/2481 (17.3)	559/2469 (22.6)	0.73 (0.64–0.83)	
<200 mg/dl	275/1605 (17.1)	342/1620 (21.1)	0.79 (0.67–0.93)	
Baseline triglycerides				0.83
≥150 mg/dl	640/3674 (17.4)	811/3660 (22.2)	0.75 (0.68–0.83)	
<150 mg/dl	65/412 (15.8)	90/429 (21.0)	0.79 (0.57–1.09)	
Baseline triglycerides ≥200 mg/dl and HDL cholesterol ≤35 mg/dl				0.04
Yes	149/823 (18.1)	214/794 (27.0)	0.62 (0.51–0.77)	
No	554/3258 (17.0)	687/3293 (20.9)	0.79 (0.71–0.88)	
Baseline statin intensity				0.12
High	232/1290 (18.0)	310/1226 (25.3)	0.69 (0.58–0.82)	
Moderate	424/2533 (16.7)	543/2575 (21.1)	0.76 (0.67–0.86)	
Low	48/254 (18.9)	45/267 (16.9)	1.12 (0.74–1.69)	
Baseline LDL cholesterol (derived) in thirds				0.62
≤67 mg/dl	244/1481 (16.5)	302/1386 (21.8)	0.72 (0.61–0.85)	
>67 to ≤84 mg/dl	248/1347 (18.4)	307/1364 (22.5)	0.81 (0.68–0.96)	
>84 mg/dl	213/1258 (16.9)	292/1339 (21.8)	0.74 (0.62–0.89)	
Baseline high-sensitivity CRP				0.07
≤2 mg/liter	288/1919 (15.0)	407/1942 (21.0)	0.68 (0.58–0.79)	
>2 mg/liter	417/2167 (19.2)	494/2147 (23.0)	0.81 (0.71–0.93)	



STRENGTH Trial

- 13,078 statin-treated patients with high CV risk, hypertriglyceridemia, and low HDL-C
- Randomized to formulation of EPA and DHA (omega-3 CA) 4 g/d (n = 6539) or corn oil (n = 6539)





The addition of omega-3 CA resulted in no significant difference in a composite outcome of MACEs

*Primary MACE consisted of CV death, nonfatal MI, nonfatal stroke, coronary revascularization, and hospitalization for unstable angina. Core MACE included CV death, nonfatal MI, and nonfatal stroke.

Nicholls SJ, et al. *JAMA*. 2020;324:2268-2280.

2025 Focused Update of the 2019 ESC/EAS Guidelines for the management of dyslipidaemias

Recommendations	Class	Level
Recommendations for drug treatment of patients with hypertriglyceridaemia		
High-dose icosapent ethyl (2 x 2 g/day) should be considered in combination with a statin in high-risk or very high-risk patients with elevated triglyceride levels (fasting triglyceride levels 135–499 mg/dL or 1.52–5.63 mmol/L) to reduce the risk of cardiovascular events.	IIa	B
Volanesorsen (300 mg/week) should be considered in patients with severe hypertriglyceridaemia (>750 mg/dL or >8.5 mmol/L) due to familial chylomicronaemia syndrome, to lower triglyceride levels and reduce the risk of pancreatitis.	IIa	B

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- For individuals with fasting triglyceride levels ≥500mg/dL , evaluate for secondary causes of hypertriglyceridemia and consider medical therapy to reduce the risk of pancreatitis. **C**

- In adults with hypertriglyceridemia fasting triglycerides >150 mg/dL or nonfasting triglycerides >175mg/dL , clinicians should address and treat lifestyle factors (obesity and metabolic syndrome), secondary factors (diabetes, chronic liver or kidney disease and/or nephrotic syndrome, and hypothyroidism), and medications that raise triglycerides. **C**

- In individuals with ASCVD or other cardiovascular risk factors on a statin with managed LDL cholesterol but elevated triglycerides (150–499 mg/dL [1.7–5.6 mmol/L]), the addition of icosapent ethyl can be considered to reduce cardiovascular risk. **B**

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- Statin plus fibrate combination therapy has not been shown to improve ASCVD outcomes and is generally not recommended. **A**

- Statin plus niacin combination therapy has not been shown to provide additional cardiovascular benefit above statin therapy alone, may increase the risk of stroke with additional side effects, and is generally not recommended. **A**

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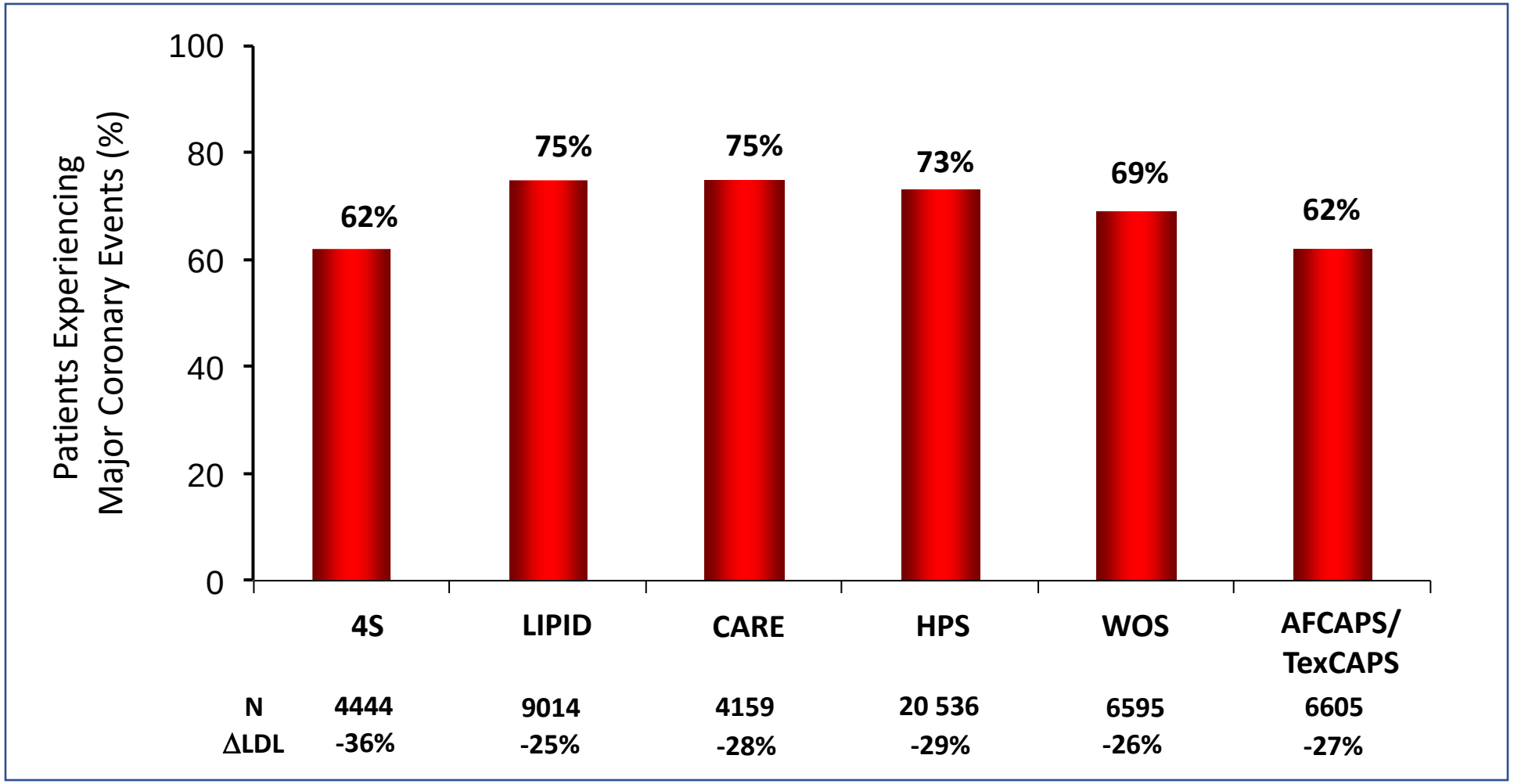
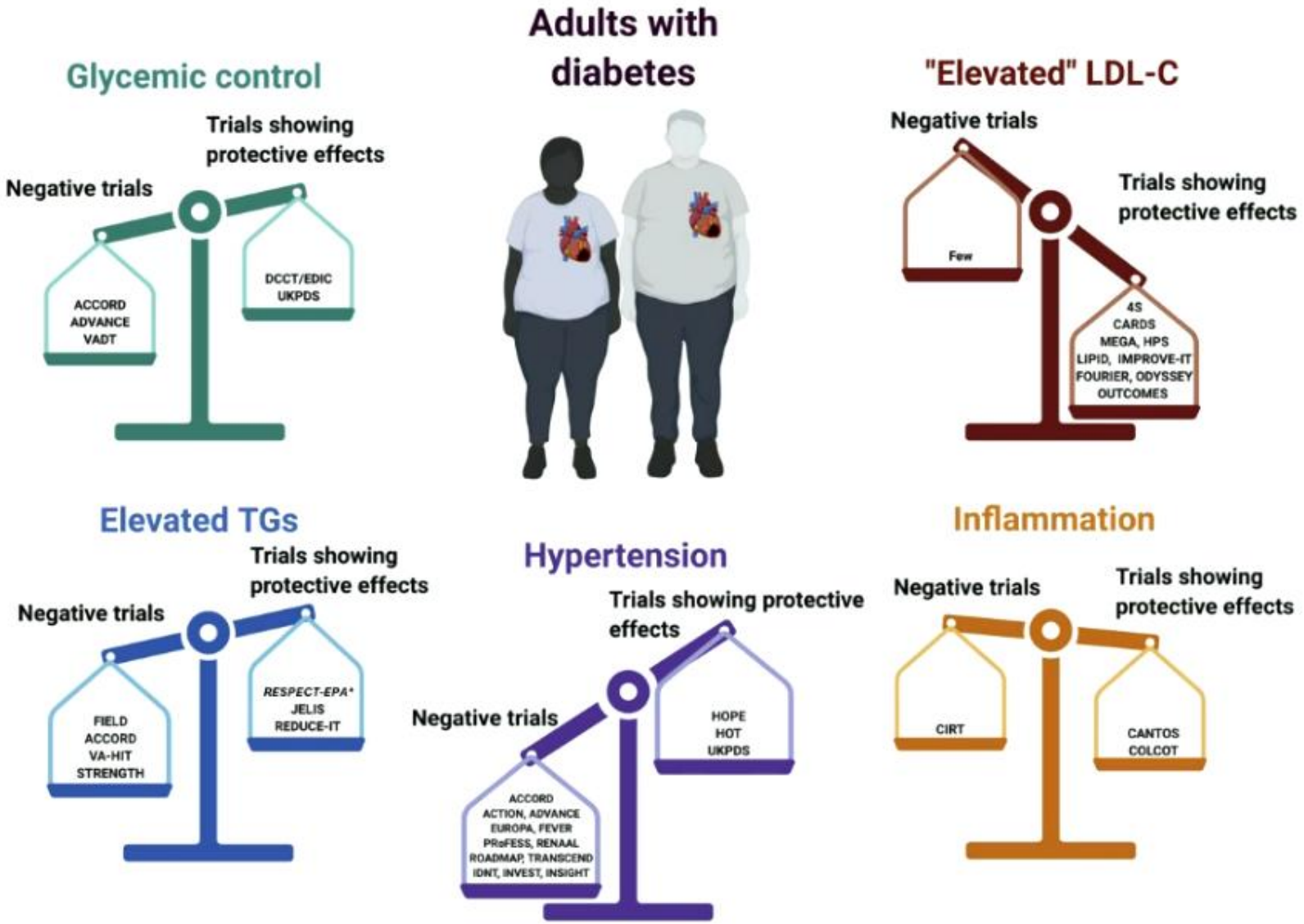
Residual Cardiovascular Risk in Major Statin Trials



4S=Scandinavian Simvastatin Survival Study; LIPID=Long-Term Intervention with Pravastatin in Ischaemic Disease; CARE=Cholesterol and Recurrent Events; HPS=Heart Protection Study; WOS=West of Scotland Coronary Prevention Study; AFCAPS/TexCAPS=Air Force/Texas Coronary Atherosclerosis Prevention Study.

Libby PJ et al. *J Am Coll Cardiol*. 2005;46(7):1225-1228.

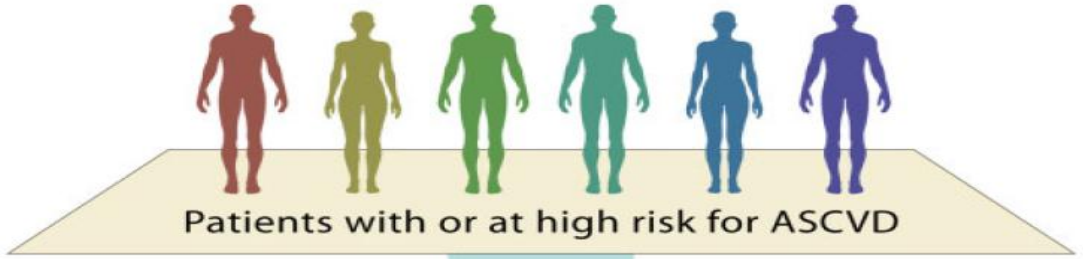
Key determinants of Cardiovascular Risk in Diabetes



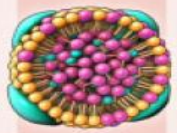
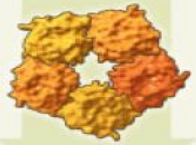
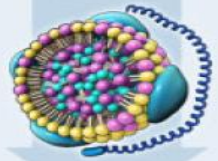
Adapted from Robert et al. Cell Metabolism, Volume 33, Issue 8, 2021, Pages 1519-1545; *RESPECT-EPA showed a reduction in cardiovascular events with high-purity EPA, but results were borderline significant (p= 0.55;

Key contemporary residual risk pathways in secondary prevention

Eur Heart J 2021 Jan 1;42(1):113-131



Despite contemporary evidence-based therapies*, residual risk of ASCVD events persists

Biological Issue	Residual Cholesterol Risk	Residual Inflammatory Risk	Residual Thrombotic Risk	Residual Triglyceride Risk	Residual Lp(a) Risk	Residual Diabetes Risk
						
Critical Biomarker	LDL-C ≥100 mg/dL	hsCRP ≥2mg/L	No simple biomarker	TG ≥150mg/dL	Lp(a) ≥50mg/dL	HbA1c Fasting glucose
Potential Intervention	Targeted LDL/Apo B Reduction	Targeted Inflammation Reduction	Targeted Antithrombotic Reduction	Targeted Triglyceride Reduction	Targeted Lp(a) Reduction	SGLT2 Inhibitors GLP-1 Agonists
Randomized Trial Evidence	IMPROVE-IT FOURIER SPIRE ODYSSEY	CANTOS COLCOT *LoDoCo2* *OASIS-9*	PEGASUS COMPASS THEMIS	REDUCE-IT *PROMINENT*	Planned	EMPA-REG CANVAS DECLARE CREDENCE LEADER SUSTAIN-6 REWIND

Residual risk ?

- Elevated Triglyceride level
- Role of TG rich lipoproteines
- Beyond LDL, non HDL may be a better predictor

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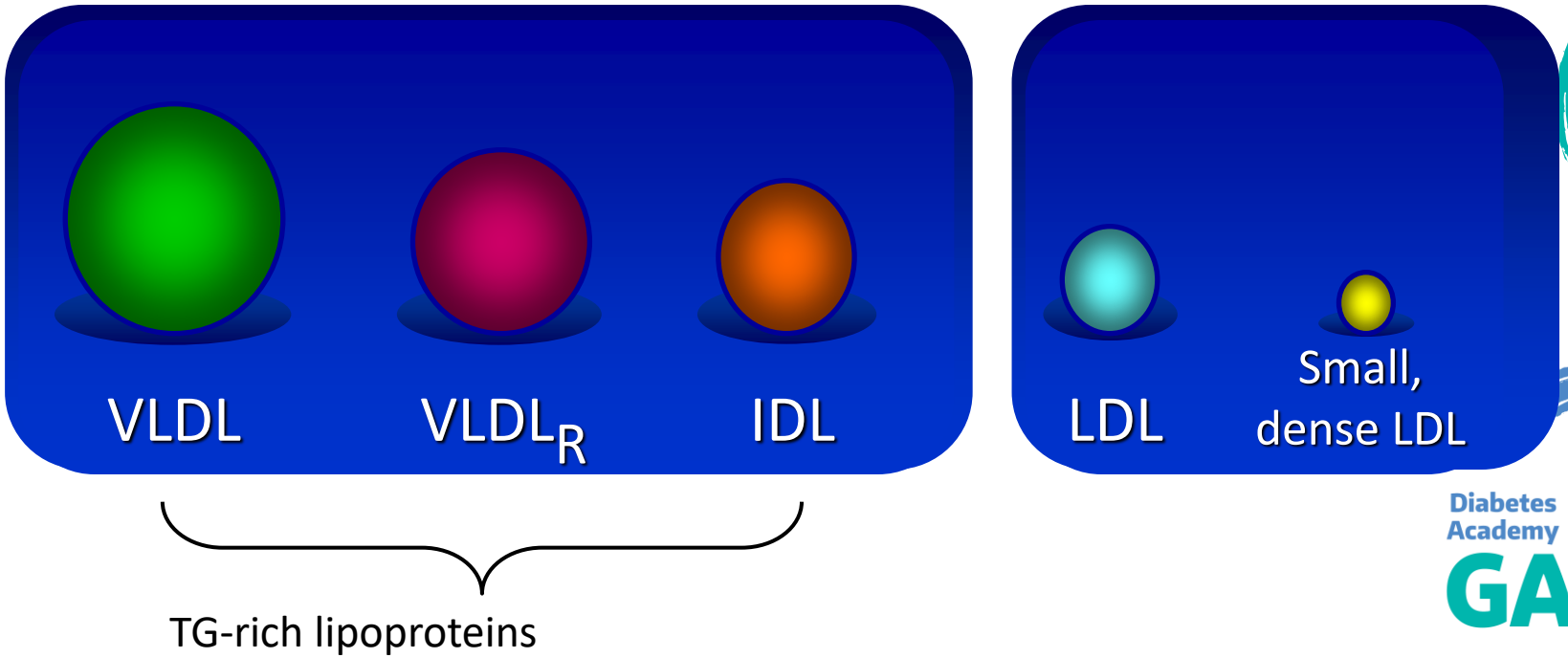
Atherogenic Particles



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Approach to High BP Among Patients with Diabetes

Farzad Hadaegh; M.D.
Endocrinologist

Diabetes Academy
GABRIC

Clinical Case Scenario

58 y/o Female, T2DM 5 years ago, Routine diabetes follow up in outpatient clinic
At the clinic, **BP is measured at 146/92 mmHg** by the nurse. She appears surprised by the number and reports feeling “fine.”

PMHx: DLP for 10 years

FHx:
- T2DM and HTN in first-degree relatives
- Father: Stroke at the age of 68

SHx:
- Moderately active lifestyle
- Non-Smoker
- No Alcohol consumption

Vital Signs:
- **HR:** 74 bpm and regular
- **Office BP:** 146/92 mm/Hg
- **BMI:** 28 kg/m^2

Daily medications:
- **Metformin/Empagliflozin** 1000/5 mg BD
- **Atorvastatin** 20 mg QD

Physical Examination:
- unremarkable

Lab Data:
- **HbA1c:** 7.6%
- **Cr:** 0.9 mg/dL
- **eGFR:** 74 mL/min/1.73 m^2
- **Total Chol:** 162 mg/dL
- **LDL:** 82 mg/dL
- **HDL:** 40 mg/dL
- **TG:** 170 mg/dL
- **UACR:** 40 mg/g on one occasion

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She doesn’t believe your BP measurement device is accurate!

She uses and upper arm digital device at home and randomly checks her BP which are almost below 135/85

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Questions

How reliable is HBPM and how should it be done?

- What is the possibility of masked or White coat hypertension or effect?
- How and when do you recommend HBPM?
- When do you recommend ABPM?
- How many readings are needed? Clinic vs. home?

What's the correct BP threshold for diagnosing hypertension in diabetes?

- Is 146/92 enough to start treatment?
- What's the BP target for this patient?
- <140/90 or <130/80?
- Does albuminuria push you to act sooner?

What is the role of lifestyle change in the management of hypertension?

What is the pharmacological approach in the management of hypertension?

What do you suggest for her glycemic management?

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What would be your suggestion on her BP result?

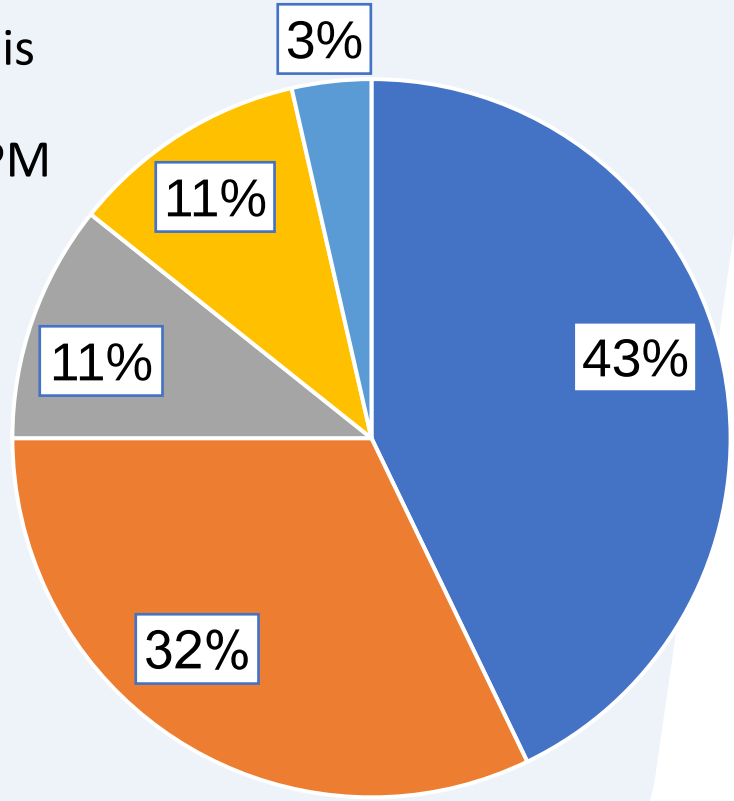
- **A** HTN diagnosis is confirmed-start treatment
- **B** Suspected HTN- suggest HBPM to confirm diagnosis
- **C** Suspected HTN- suggest ABPM to confirm diagnosis
- **D** Suspected HTN- Follow up with next visit office BPM
- **E** Other treatment plan

gdia.ir/dip8

Answering Time!

Results

- **A** HTN diagnosis is confirmed-start treatment
- **B** Suspected HTN- suggest HBPM to confirm diagnosis
- **C** Suspected HTN- suggest ABPM to confirm diagnosis
- **D** Suspected HTN- Follow up with next visit office BPM
- **E** Other treatment plan



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Accurate Measurement of In-Office BP

COR	LOE	Recommendations
1	C-LD	1. When diagnosing and managing high BP in adults, standardized methods are recommended for the accurate measurement and documentation of in-office BP
2a	C-EO	2. When measuring in-office BP in adults, it is reasonable to use the oscillometric method with an automated device over the auscultatory method.

Office BP should be based on the average of available readings, and an average of ≥2 BP measurements obtained on ≥2 separate occasions may minimize error and provide a more accurate estimation of office BP

Office Blood Pressure Measurement

1. The patient should avoid caffeine, exercise, and smoking for at least 30 minutes before measurement. Ensure the patient has emptied their bladder.
2. Use a blood pressure device that has been validated for accuracy (validatebp.org).
3. Use the correct cuff size on a bare arm.
4. The patient's arm should be supported at heart level.
5. Have the patient relax, sitting in a chair (feet on floor, legs uncrossed, and back supported) for more than 5 minutes of rest.
6. Neither the patient nor the clinician should talk during the rest period or during the measurement. The patient should not be using their phone.
7. Blood pressure measurement should be taken in a temperature-controlled room.
8. Take 2 or more blood pressure measurements at least 1 minute apart. Average the readings, and provide the patient their blood pressure readings both verbally and in writing.

Home Blood Pressure Monitoring

Device and blood pressure cuff

Use a blood pressure device that has been validated for accuracy. Check with your clinician or other members of your care team, and the following website for devices: www.validatebp.org.

Use the correct cuff size matched to the size of your arm.

Patient preparation

Avoid smoking, caffeinated beverages, or exercise within 30 minutes before blood pressure measurements.

Positioning of patient and cuff

Place the cuff on a bare arm, and your arm should be supported at heart level.

The bottom of the cuff should be placed directly above the bend of the elbow.

You should relax, and sit in a chair (feet on floor, legs uncrossed, and back supported) for at least 5 minutes.

Blood pressure measurement

While relaxing and measuring your blood pressure, please do not talk, use your phone, or watch TV.
You should take 2 readings 1 min apart twice a day (for a total of 4 readings):
2 readings in the morning after emptying your bladder (urinating) and before taking your medication and eating; and 2 readings at bedtime before sleep.

Check blood pressure for 3 days (minimum) to 7 days (preferred) before your appointment or interaction with your clinician.

Document your daily blood pressure measurements in writing or electronically.

Share your readings with the clinician taking care of you.

Table 7. Values of Systolic/Diastolic Blood Pressure for Ambulatory and Home Blood Pressure Monitoring Corresponding to Office Systolic/Diastolic Blood Pressure Levels

Office, mm Hg	HBPM, mm Hg	Daytime ABPM, mm Hg	Nighttime ABPM, mm Hg	24-Hour ABPM, mm Hg
120/80	120/80	120/80	100/65	115/75
130/80	130/80	130/80	110/65	125/75
140/90	135/85	135/85	120/70	130/80
160/100	145/90	145/90	140/85	145/90

- Out-of-office BP monitoring with either ABPM or HBPM provides valuable and distinct information compared with office BP for confirming the diagnosis of hypertension.
- ABPM more strongly predicts long-term CVD outcomes than office BP.
- HBPM more strongly predicts CVD outcomes than office BP, and may be more reproducible than ABPM.
- ABPM provides distinctive information on nighttime BP, HBPM is often more practical than ABPM in clinical practice.

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COR	LOE	Recommendations
2a	B-NR	1. In adults with untreated office SBP ≥130 mm Hg or DBP ≥80 mm Hg, and without office SBP ≥160 mm Hg or DBP ≥100 mm Hg, it is reasonable to exclude white-coat hypertension using out-of-office BP monitoring before a diagnosis of hypertension is made.[1–5]
2a	B-NR	2. In adults with white-coat hypertension or masked hypertension, out-of-office BP monitoring is reasonable to exclude transition to a diagnosis of sustained hypertension.[6–8]
2a	C-LD	3. In adults with apparent treatment-resistant hypertension on office BP, it is reasonable to exclude white-coat effect, a form of pseudoresistance, using out-of-office BP monitoring.[9–12]
2a	B-NR	4. In adults who are taking antihypertensive medication and have elevated office BP (office SBP ≥130 mm Hg or DBP ≥80 mm Hg) but do not have resistant hypertension or office SBP ≥160 mm Hg or DBP ≥100 mm Hg, it is reasonable to exclude white-coat effect using out-of-office BP monitoring.[1,4,13]
2b	B-NR	5. In adults with untreated office SBP <130 mm Hg and DBP <80 mm Hg, it may be reasonable to exclude masked hypertension using out-of-office BP monitoring.[5,13–15]
2b	B-NR	6. In adults who are taking antihypertensive medication and have office SBP <130 mm Hg and DBP <80 mm Hg, it may be reasonable to exclude masked uncontrolled hypertension using out-of-office BP monitoring.[13–15]

White-Coat Hypertension and Masked Hypertension, and White-Coat Effect and Masked Uncontrolled Hypertension

Table 9. BP Categories Based on Office and Out-of-Office BP Measurements

BP Category	High BP in the Office Setting?	High BP Outside of the Office Setting?*
Among individuals not taking antihypertensive medication		
Sustained normotension	No	No
Sustained hypertension	Yes	Yes
Masked hypertension	No	Yes
White-coat hypertension	Yes	No
Among individuals taking antihypertensive medication		
Controlled hypertension	No	No
Uncontrolled hypertension	Yes	Yes
Masked uncontrolled hypertension	No	Yes
White-coat effect	Yes	No

Questions

How reliable is HBPM and how should it be done?

- What is the possibility of masked or White coat hypertension or effect?
- How and when do you recommend HBPM?
- When do you recommend ABPM?
- How many readings are needed? Clinic vs. home?

What's the correct BP threshold for diagnosing hypertension in diabetes?

- Is 146/92 enough to start treatment?
- What's the BP target for this patient?
- <140/90 or <130/80?
- Does albuminuria push you to act sooner?

What is the role of lifestyle change in the management of hypertension?

What is the pharmacological approach in the management of hypertension?

What do you suggest for her glycemic management?

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Recommendations

10.7 In individuals with confirmed office based blood pressure ≥130/80 mmHg, pharmacologic therapy should be initiated and titrated to achieve the recommended blood pressure goal of <130/80 mmHg. A

10.8 Individuals with confirmed office based blood pressure ≥150/90 mmHg should, in addition to lifestyle therapy, have prompt initiation and timely titration of two drugs or a single-pill combination of drugs demonstrated to reduce cardiovascular events in people with diabetes. A

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Diabetes

COR	LOE	Recommendations
1	A	1. In adults with T2D and hypertension, antihypertensive drug treatment should be initiated at an SBP of ≥130 mm Hg with a treatment goal of <130 mm Hg, with encouragement to achieve an SBP <120 mm Hg to reduce CVD morbidity and mortality.[1–5]
1	C-LD	2. In adults with T2D and hypertension, antihypertensive drug treatment should be initiated at a DBP of ≥80 mm Hg with a treatment goal of <80 mm Hg to reduce CVD morbidity and mortality.[6]
1	A	3. In adults with T2D and hypertension, all first-line classes of antihypertensive agents (ie, thiazide-type diuretics, long-acting CCB, ACEi, and ARB) are useful and effective for BP lowering.[1,7–9]
1	A	4. In adults with diabetes and hypertension, ACEi or ARB are recommended in the presence of CKD as identified by eGFR <60 mL/min/1.73 m^2 or albuminuria ≥30 mg/g and should be considered when mild albuminuria (<30 mg/g) is present to delay progression of diabetes-related kidney disease.[10–12]

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Intensive Blood-Pressure Control in Patients with Type 2 Diabetes

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ABSTRACT

BACKGROUND

Effective targets for systolic blood-pressure control in patients with type 2 diabetes are unclear.

METHODS

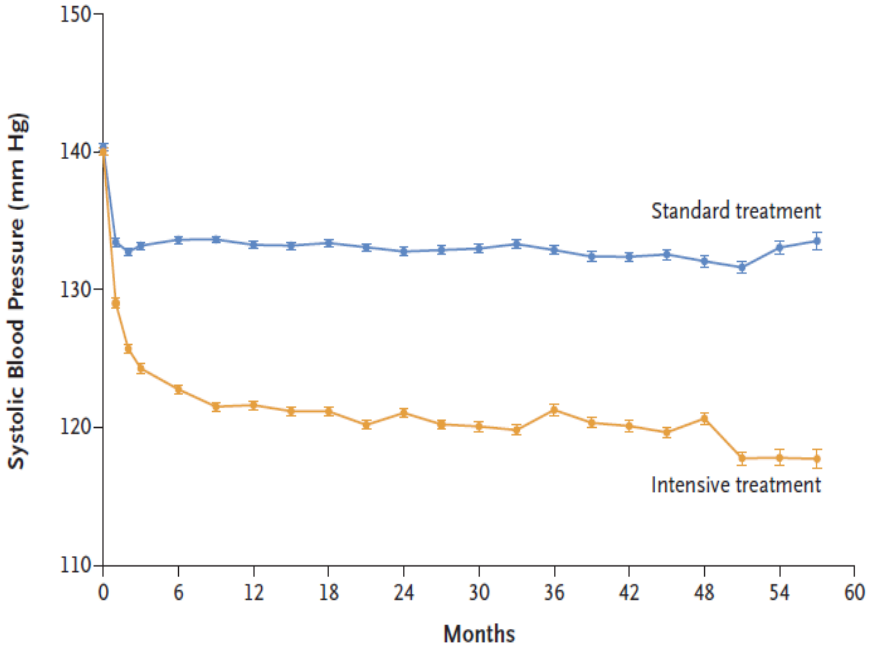
We enrolled patients 50 years of age or older with type 2 diabetes, elevated systolic blood pressure, and an increased risk of cardiovascular disease at 145 clinical sites across China. Patients were randomly assigned to receive intensive treatment that targeted a systolic blood pressure of less than 120 mm Hg or standard treatment that targeted a systolic blood pressure of less than 140 mm Hg for up to 5 years. The primary outcome was a composite of nonfatal stroke, nonfatal myocardial infarction, treatment or hospitalization for heart failure, or death from cardiovascular causes. Multiple imputation was used for missing outcome data, with an assumption that the data were missing at random.

RESULTS

Of 12,821 patients (6414 patients in the intensive-treatment group and 6407 in the standard-treatment group) enrolled from February 2019 through December 2021, 5803 (45.3%) were women; the mean (±SD) age of the patients was 63.8±7.5 years. At 1 year of follow-up, the mean systolic blood pressure was 121.6 mm Hg (median, 118.3 mm Hg) in the intensive-treatment group and 133.2 mm Hg (median, 135.0 mm Hg) in the standard-treatment group.

Blood Pressure Control Target in Diabetes (BPROAD) trial

Systolic Blood Pressure throughout the Trial



No. with Data										
Standard treatment	6407	5885	5663	5555	5257	4535	4091	3550	3187	1597
Intensive treatment	6414	5858	5612	5474	5244	4541	4119	3573	3198	1622
Mean No. of Medications Prescribed										
Standard treatment	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.3
Intensive treatment	1.7	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.1

BPROAD

Table 2. Primary Outcome and Main Secondary Outcomes.*

Outcome	Intensive Treatment (N=6414)		Standard Treatment (N=6407)		Hazard Ratio (95% CI)†	P Value†
	No. of Events	Incidence Rate	No. of Events	Incidence Rate		
		no. of events/100 person-yr		*no. of events/100 person-yr*		
Primary outcome: nonfatal stroke, nonfatal MI, treatment or hospitalization for heart failure, or death from cardiovascular causes	393	1.65 (1.50–1.82)	492	2.09 (1.91–2.28)	0.79 (0.69–0.90)	<0.001
Secondary outcomes						
Fatal or nonfatal MI	68	0.28 (0.22–0.35)	81	0.33 (0.27–0.41)	0.84 (0.60–1.16)	—
Fatal or nonfatal stroke	284	1.19 (1.06–1.33)	356	1.50 (1.35–1.66)	0.79 (0.67–0.92)	—
Treatment or hospitalization for heart failure	31	0.13 (0.09–0.18)	46	0.19 (0.14–0.25)	0.66 (0.41–1.04)	—
Death from cardiovascular causes	60	0.24 (0.19–0.31)	79	0.32 (0.26–0.40)	0.76 (0.55–1.06)	—
Death from any cause	169	0.69 (0.59–0.80)	179	0.73 (0.63–0.84)	0.95 (0.77–1.17)	—
Primary-outcome event or death from any cause	493	2.07 (1.90–2.26)	584	2.48 (2.28–2.69)	0.83 (0.74–0.94)	—
CKD outcomes						
CKD progression	24	1.61 (1.08–2.41)	16	1.11 (0.68–1.80)	1.36 (0.71–2.59)	—
CKD development	232	1.14 (1.00–1.29)	214	1.05 (0.92–1.20)	1.11 (0.92–1.34)	—
Incident albuminuria	554	11.29 (10.39–12.27)	648	13.84 (12.81–14.95)	0.87 (0.77–0.97)	—

Table 3. Adverse Events.*

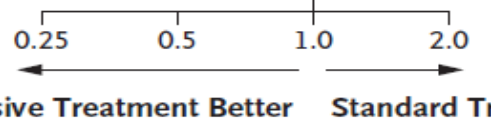
Outcome	Intensive Treatment (N=6414)		Standard Treatment (N=6407)		Hazard Ratio (95% CI)	P Value
	No. of Events	Percentage of Participants	No. of Events	Percentage of Participants		
Serious adverse event†	2340	36.5	2328	36.3	1.00 (0.94–1.06)	0.96
Conditions of interest‡						
Arrhythmia	69	1.1	68	1.1	1.01 (0.72–1.41)	0.95
Electrolyte abnormality	36	0.6	35	0.6	1.03 (0.65–1.64)	0.91
Injurious fall	65	1.0	61	1.0	1.06 (0.75–1.51)	0.74
Symptomatic hypotension	8	0.1	1	<0.1	7.92 (0.99–63.34)	0.05
Syncope	10	0.2	10	0.2	1.00 (0.41–2.39)	0.99
Acute renal failure	4	0.1	5	0.1	0.79 (0.21–2.95)	0.73
Clinical safety alerts§						
Serum sodium <130 mmol/liter	46	0.7	47	0.8	0.97 (0.65–1.46)	0.89
Serum sodium >150 mmol/liter	22	0.4	25	0.4	0.88 (0.49–1.56)	0.65
Serum potassium <3.0 mmol/liter	32	0.5	33	0.5	0.97 (0.60–1.58)	0.90
Serum potassium >5.5 mmol/liter	177	2.8	125	2.0	1.41 (1.12–1.77)	0.003

† Serious adverse events were events that were fatal or life-threatening, resulted in substantial or persistent disability, resulted in or prolonged hospitalization, or were important medical events that investigators judged to represent substantial hazards or harm to research participants.

BPROAD

Prespecified Subgroup Analysis.

Subgroup	Intensive Treatment	Standard Treatment	Hazard Ratio (95% CI)
	no. of patients with event/total no. (%)		
Overall	393/6414 (6.1)	492/6407 (7.7)	0.79 (0.69–0.90)
Age			
<65 yr	188/3607 (5.2)	229/3500 (6.5)	0.81 (0.67–0.99)
≥65 yr	205/2807 (7.3)	263/2907 (9.0)	0.77 (0.64–0.93)
Previous cardiovascular disease			
No	235/4934 (4.8)	319/4999 (6.4)	0.75 (0.63–0.88)
Yes	158/1480 (10.7)	173/1408 (12.3)	0.84 (0.68–1.04)
Previous chronic kidney disease			
No	349/5913 (5.9)	437/5938 (7.4)	0.79 (0.69–0.91)
Yes	44/501 (8.8)	55/469 (11.7)	0.81 (0.54–1.21)
Systolic blood pressure			
<135 mm Hg	119/2110 (5.6)	130/2010 (6.5)	0.83 (0.64–1.06)
135 to <144 mm Hg	141/2248 (6.3)	182/2286 (8.0)	0.79 (0.64–0.99)
≥144 mm Hg	133/2056 (6.5)	180/2111 (8.5)	0.77 (0.61–0.96)
Glycated hemoglobin			
<6.8%	81/2051 (3.9)	101/1989 (5.1)	0.77 (0.57–1.03)
6.8 to <7.9%	119/2008 (5.9)	172/2143 (8.0)	0.74 (0.58–0.93)
≥7.9%	190/2261 (8.4)	219/2195 (10.0)	0.82 (0.68–1.00)
Duration of diabetes			
<9.8 yr	168/3166 (5.3)	225/3196 (7.0)	0.72 (0.59–0.89)
≥9.8 yr	223/3218 (6.9)	267/3174 (8.4)	0.84 (0.70–1.00)
Duration of high blood pressure			
<10 yr	177/3168 (5.6)	238/3241 (7.3)	0.73 (0.60–0.89)
≥10 yr	214/3210 (6.7)	254/3122 (8.1)	0.84 (0.70–1.00)



Among patients with T2D, the incidence of CVD was significantly lower with intensive treatment targeting a SBP<120 mm Hg than with standard treatment targeting a SBP<140 mm Hg.

CURRENT CHRONIC KIDNEY DISEASE (CKD) NOMENCLATURE USED BY KDIGO

Lab Data:

eGFR: *74 mL/min/1.73 m²*

UACR: *40 mg/g on one occasion*

CKD is defined as abnormalities of kidney structure or function, present for a minimum of 3 months, with implications for health. CKD is classified based on Cause, Glomerular filtration rate (GFR) category (G1–G5), and Albuminuria category (A1–A3), abbreviated as CGA.

KDIGO: Prognosis of CKD by GFR and albuminuria categories

GFR categories (ml/min/1.73 m²) Description and range				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30–300 mg/g 3–30 mg/mmol	>300 mg/g >30 mg/mmol
	G1	Normal or high	≥90			
	G2	Mildly decreased	60–89			✓
	G3a	Mildly to moderately decreased	45–59			
	G3b	Moderately to severely decreased	30–44			
	G4	Severely decreased	15–29			
	G5	Kidney failure	<15			

Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk; Red: very high risk. GFR, glomerular filtration rate.

KIDIGO 2024

Choice of Initial Monotherapy Versus Initial Combination Drug Therapy

COR	LOE	Recommendations
1	B-R	1. In adults with stage 2 hypertension (SBP ≥ 140 mm Hg and DBP ≥90 mm Hg), initiation of antihypertensive drug therapy with 2 first-line agents of different classes, ideally in a single-pill combination (SPC), is recommended to improve BP control and adherence.[1–6]
2a	C-EO	2. In adults with stage 1 hypertension (SBP 130-139 mm Hg and DBP 80-89 mm Hg), initiation of antihypertensive drug therapy with a single first-line antihypertensive drug is reasonable, with dosage titration and sequential addition of other agents as needed to achieve BP control.
3: Harm	A	3. In adults with hypertension, simultaneous use of an ACEi, ARB, and/or renin inhibitor in combination is not recommended due to the potential for harm.[7–9]

ACC/AHA 2025

Recommendations

10.9 Treatment for hypertension should include drug classes demonstrated to reduce CVD in people with diabetes. A ACE inhibitors or ARBs are recommended first-line therapy for hypertension in people with diabetes and CAD. A

10.11 An ACE inhibitor or ARB, at the maximum tolerated dose indicated for blood pressure treatment, is the recommended first-line treatment for hypertension in people with diabetes and urinary albumin-to-creatinine ratio ≥300 mg/g creatinine A or 30–299 mg/g creatinine. B

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Questions

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- How and when do you recommend HBPM?
- When do you recommend ABPM?
- How many readings are needed? Clinic vs. home?

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What is the pharmacological approach in the management of hypertension?

What do you suggest for her glycemic management?

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ACC/AHA 2025

Table 12. Lifestyle and Stress Reduction Interventions to Lower Blood Pressure

Intervention	Target/Biomarker	Evidence-Based Goals	Approximate Mean Change in SBP (mm Hg)*	
			With Hypertension	Without Hypertension
Weight loss	Body weight or BMI	Aim for sustained ≥5% reduction in body weight or ≥3 kg/m² reduction in BMI; expect about 1 mm Hg reduction for every 1-kg reduction in body weight	−6 to −8	−3 to −5
Heart-healthy diet	DASH eating pattern	Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat	−5 to −8	−3 to −7
Reduced intake of sodium	Dietary sodium intake; 24-h urinary sodium	Optimal goal is <2300 mg/d, but aim for an ideal limit of <1500 mg/d	−6 to −8	−1 to −4
Use of salt substitute	Replace cooking/table salt (100% sodium chloride) with salt substitute (25%-30% potassium chloride, 65%-75% sodium chloride, and 0%-10% flavoring agents); 24-h urinary sodium and potassium	Reduce dietary sodium intake as above	−5 to −7	−5
Enhanced intake of potassium	Dietary potassium intake; 24-h urinary potassium	Aim for 3500-5000 mg/d, ideally by consumption of a diet rich in potassium; or alternative use of moderate-dose pharmacological potassium supplementation (<80 mmol)	−6	−3 to −6
Reduced alcohol intake	Alcohol consumption	Optimal goal is abstinence for all adults for best health outcomes; in patients who consume alcohol, aim for >50% reduction in daily intake to no more than 2 drinks/d in men or 1 drink/d in women	−4 to −6	−3
Exercise	Aerobic exercise	90-150 min/wk 65%-75% heart rate reserve	−4 to −8	−2 to −7
	Dynamic resistance	90-150 min/wk 50%-80% 1 rep maximum 6 exercises, 3 sets/exercise, 10 repetitions/set	−2 to −7	−2 to −5
	Isometric resistance	4 × 2 min (hand grip), 1 min rest between exercises, 30%-40% maximum voluntary contraction, 3 sessions/wk	−5 to −10	−4 to −6

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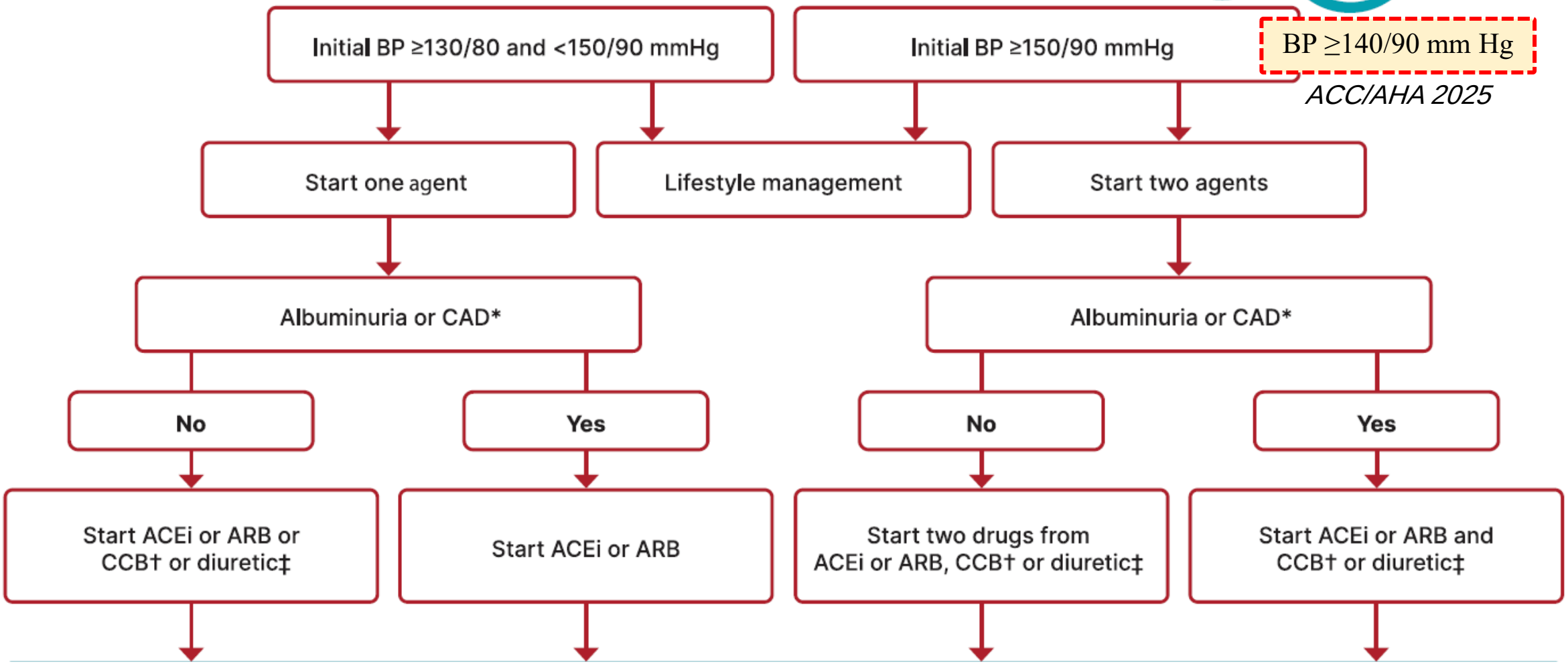
Recommendations for the Treatment of Confirmed Hypertension in Nonpregnant People With Diabetes



BP ≥140/90 mm Hg

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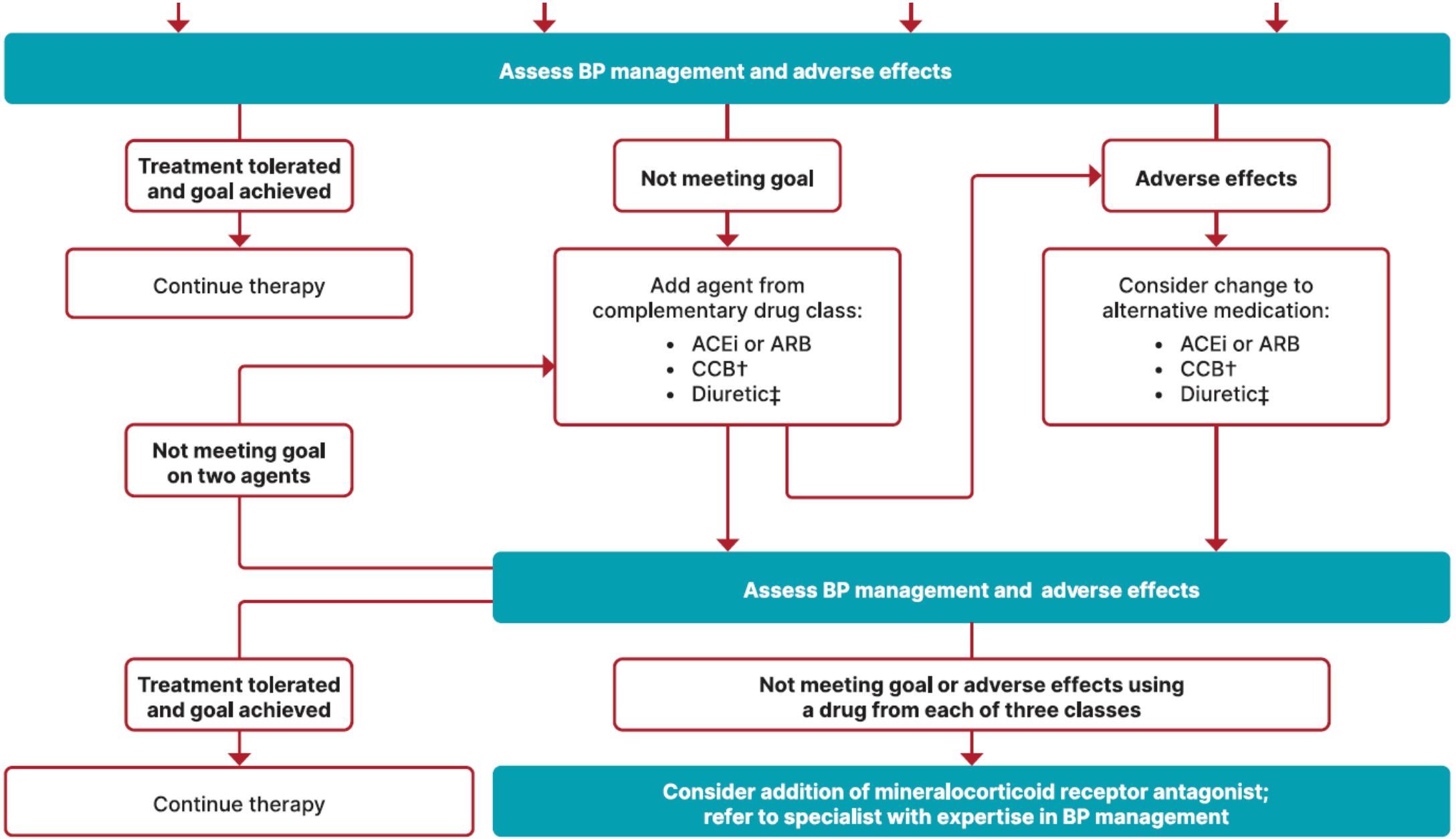
Assess BP management and adverse effects
Treatment tolerated and goal achieved
Continue therapy
Not meeting goal
Add agent from complementary drug class:
• ACEi or ARB
• CCB†
• Diuretic‡
Adverse effects
Consider change to alternative medication:
• ACEi or ARB
• CCB†
• Diuretic‡
Not meeting goal on two agents
Assess BP management and adverse effects
Treatment tolerated and goal achieved
Continue therapy
Not meeting goal or adverse effects using a drug from each of three classes
Consider addition of mineralocorticoid receptor antagonist; refer to specialist with expertise in BP management

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FDA-Approved Drugs for Treatment of Hypertension

AHA/ACC 2025

Class	Drug	Usual Dose, Range (mg/d)*	Daily Frequency	Comments
Agents recommended for initial therapy				
Thiazide-type diuretics	Chlorthalidone	12.5-25	1	Chlorthalidone has a longer half-life and is more potent than hydrochlorothiazide on a mg-to-mg basis.
	Hydrochlorothiazide	25-50	1	**Monitor for hyponatremia and hypokalemia, increased glucose, uric acid, and calcium levels.**
	Indapamide	1.25-2.5	1	**Monitor patients with history of acute gout unless patient is on uric acid-lowering therapy.**
ACEi	Benazepril	10-40	1 or 2	Do not use in combination with ARB or direct renin inhibitor.
	Captopril	12.5-150	2 or 3	There is an increased risk of hyperkalemia, especially in patients with CKD or in those on K+ supplements or K+-sparing drugs.
	Enalapril	5-40	1 or 2	**There is a risk of acute renal failure in patients with severe bilateral renal artery stenosis.**
	Fosinopril	10-40	1	Do not use if patient has history of angioedema with ACEi.
	Lisinopril	10-40	1	Avoid use in pregnancy.
	Moexipril	7.5-30	1 or 2	
	Perindopril	4-16	1	
	Quinapril	10-80	1 or 2	
	Ramipril	2.5-20	1 or 2	
	Trandolapril	1-4	1	
ARBs	Azilsartan	40-80	1	Do not use in combination with ACEi or direct renin inhibitor.
	Candesartan	8-32	1	There is an increased risk of hyperkalemia in CKD or in those on K+ supplements or K+-sparing drugs.
	Eprosartan	600-800	1 or 2	**There is a risk of acute renal failure in patients with severe bilateral renal artery stenosis**.
	Irbesartan	150-300	1	Do not use if patient has history of angioedema with ARBs. Patients with a history of angioedema with an ACE inhibitor can receive an ARB beginning 6 weeks after ACE inhibitor is discontinued.
	Losartan	50-100	1 or 2	Avoid use in pregnancy.
	Olmesartan	20-40	1	
	Telmisartan	20-80	1	
	Valsartan	80-320	1	
CCB—dihydropyridines	Amlodipine	2.5-10	1	**Associated with dose-related lower extremity edema, which is more common in women than men.**
	Felodipine	2.5-10	1	
	Isradipine	5-10	2	
	Nicardipine SR	60-120	2	
	Nifedipine LA	30-90	1	
	Nisoldipine	17-34	1	

FDA-Approved Drugs for Treatment of Hypertension

AHA/ACC 2025

Class	Drug	Usual Dose, Range (mg/d)*	Daily Frequency	Comments
Alternative agents				
CCB—nondihydropyridines	Diltiazem ER Verapamil IR Verapamil SR Verapamil-delayed onset ER	120-360 120-360 120-360 100-300	1 3 1 or 2 1 (in the evening)	Avoid routine use with beta blockers because of increased risk of bradycardia and heart block. Do not use in patients with HFrEF. There are drug interactions with diltiazem and verapamil (CYP3A4 major substrate and moderate inhibitor).
Diuretics—loop	Bumetanide Furosemide Torsemide	0.5-2 20-80 5-10	2 2 1	**These are preferred diuretics in patients with symptomatic HF.** **They are preferred over thiazide-type diuretics in patients with moderate-to-severe CKD (eg, GFR <30 mL/min).** **The longer-acting choice of torsemide is preferred for treatment of hypertension.** **A loop diuretic is an option for patients who develop thiazide-type diuretic associated hyponatremia**.
Diuretics—potassium-sparing	Amiloride Triamterene	5-10 50-100	1 or 2 1 or 2	As monotherapy, these agents are minimally effective antihypertensive agents. Combination therapy of a potassium-sparing diuretic with a thiazide-type diuretic can be considered in patients with hypokalemia on thiazide-type diuretic monotherapy. Avoid use in patients with significant CKD (eg, GFR <45 mL/min).
Diuretics—aldosterone antagonists	Eplerenone Spironolactone	50-100 25-100	1 or 2 1	These are preferred agents in primary aldosteronism and resistant hypertension. Spironolactone is associated with greater risk of gynecomastia and impotence compared with eplerenone. Demonstrated efficacy as fourth-agent add-on therapy for resistant hypertension. Avoid use with K+ supplements, other K+-sparing diuretics, or significant renal dysfunction (eg, GFR <45 mL/min). Eplerenone often requires twice-daily dosing for adequate BP lowering. Avoid use in pregnancy.
Beta blockers—cardioselective	Atenolol Betaxolol Bisoprolol Metoprolol tartrate Metoprolol succinate	25-100 5-20 2.5-10 100-200 50-200	2 1 1 2 1	Beta blockers are not recommended as first-line agents unless the patient has CHD or HF. These are preferred in patients with bronchospastic airway disease requiring a beta blocker. Bisoprolol and metoprolol succinate are preferred in patients with HFrEF. Avoid abrupt cessation.

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Clinical Case Scenario

58 y/o Female, T2DM 5 years ago, Routine diabetes follow up in outpatient clinic

At the clinic, **BP is measured at 146/92 mmHg** by the nurse. She appears surprised by the number and reports feeling “fine.”

PMHx: DLP for 10 years

FHx:
- T2DM and HTN in first-degree relatives
- Father: Stroke at the age of 68

SHx:
- Moderately active lifestyle
- Non-Smoker
- No Alcohol consumption

Vital Signs:
- **HR:** 74 bpm and regular
- **Office BP:** 146/92 mm/Hg
- **BMI:** 28 kg/m^2

Daily medications:
- **Metformin/Empagliflozin** 1000/5 mg BD
- **Atorvastatin** 20 mg QD

Physical Examination:
- unremarkable

Lab Data:
- **HbA1c:** 7.6%
- **Cr:** 0.9 mg/dL
- **eGFR:** 74 mL/min/1.73 m^2
- **Total Chol:** 162 mg/dL
- **LDL:** 82 mg/dL
- **HDL:** 40 mg/dL
- **TG:** 170 mg/dL
- **UACR:** 40 mg/g on one occasion

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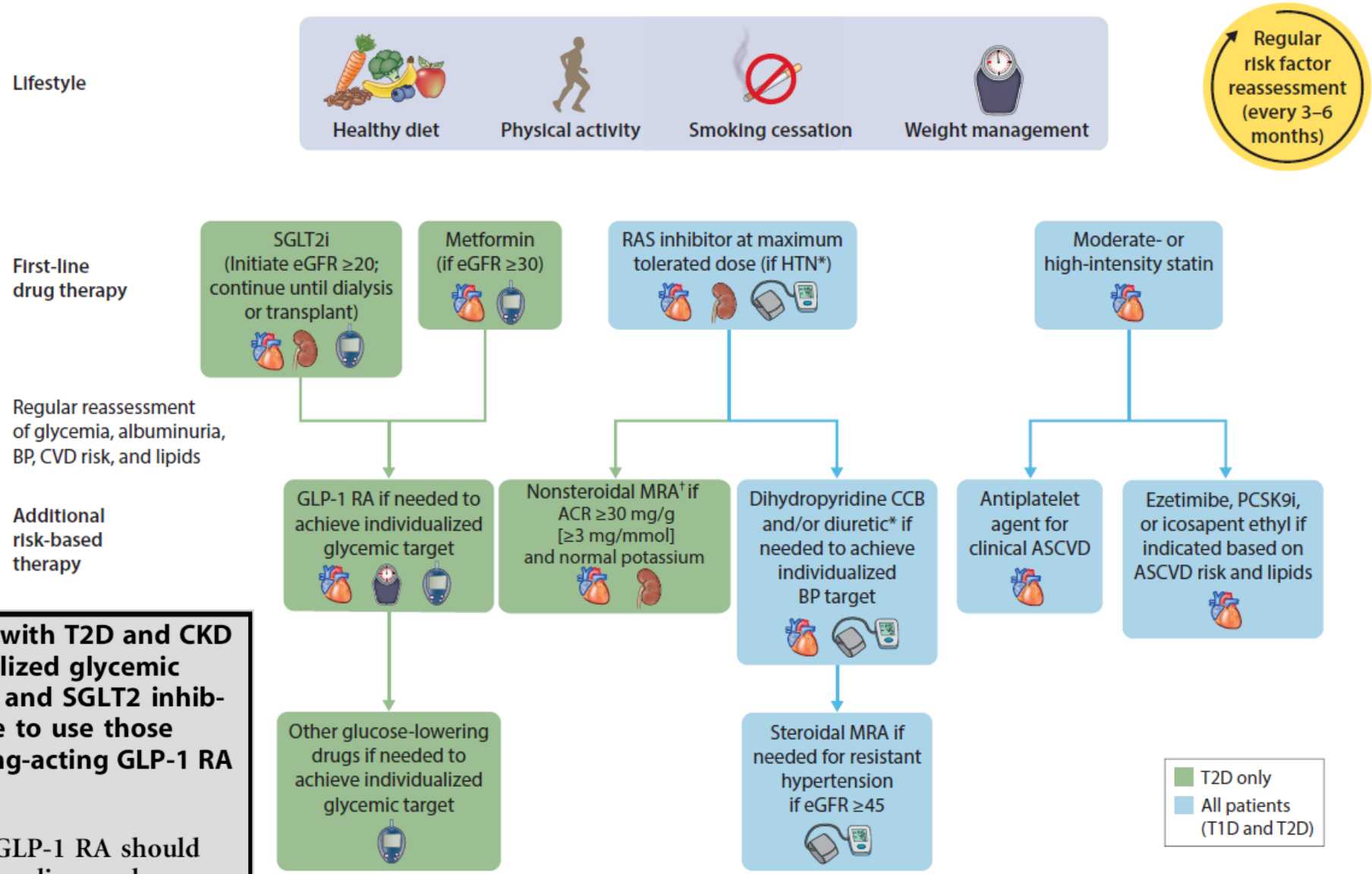
Holistic approach to chronic kidney disease (CKD) treatment and risk modification



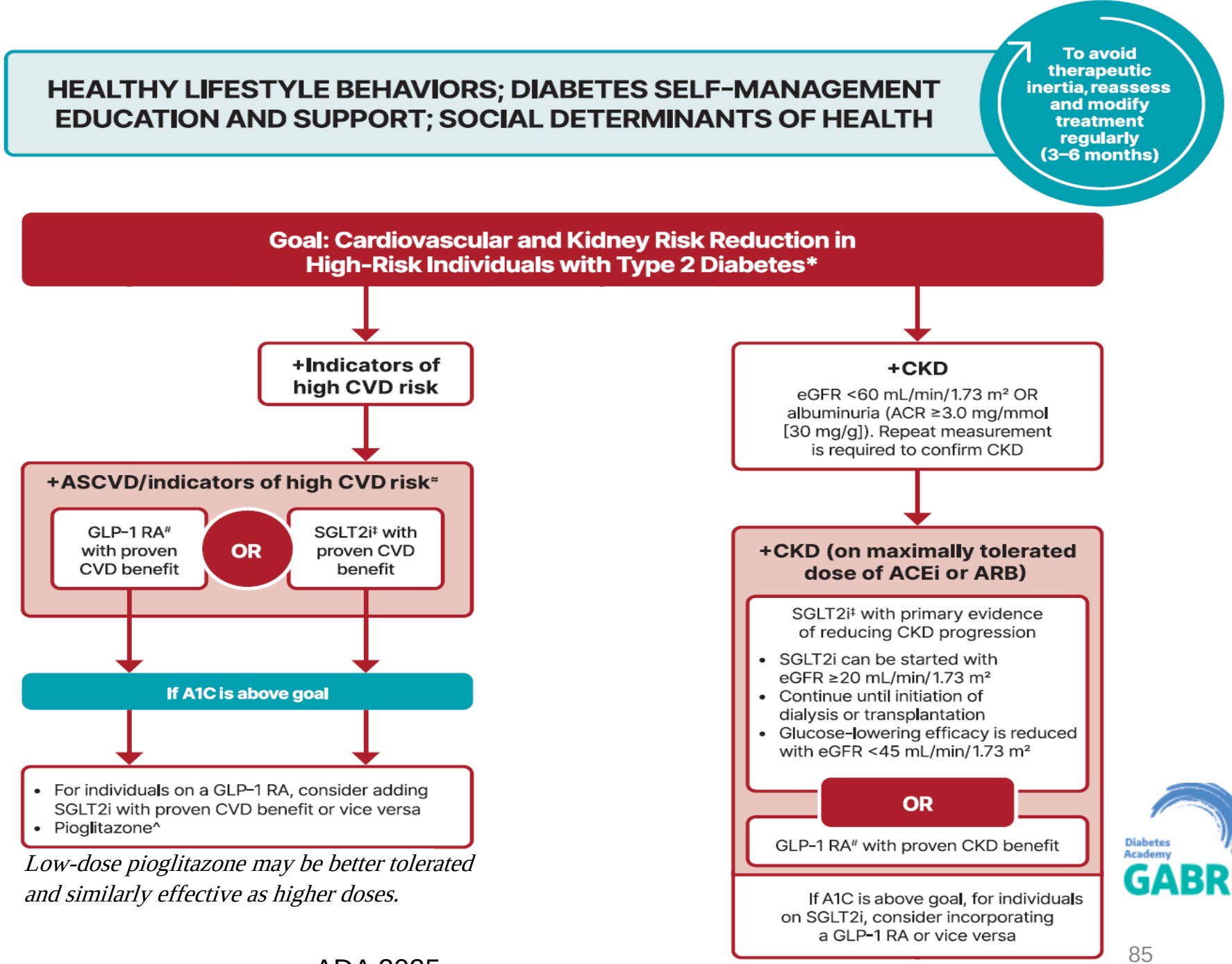
Recommendation 3.9.1: In adults with T2D and CKD who have not achieved individualized glycemic targets despite use of metformin and SGLT2 inhibitor treatment, or who are unable to use those medications, we recommend a long-acting GLP-1 RA *(1B)*.

Practice Point 3.9.1: The choice of GLP-1 RA should prioritize agents with documented cardiovascular benefits.

KIDIGO 2022-2024

Aged ≥ 55 years with 2 ≥ additional CV-risk factor (BMI ≥ 30 Kg/m^2, BP≥ 130/80 mmHg, Smoking, Dyslipidemia or Albuminuria)

GLP-1 RAs with proven CV-benefit that do not require dose adjustment in CKD include Liraglutide, Semaglutide (injectable), and Dulaglutide.



Low-dose pioglitazone may be better tolerated and similarly effective as higher doses.

ADA 2025

Return to the case

℞

1. *Proved micro albuminuria in the second spot urine sample,*
2. *Request Echocardiography to assess LVH and possible HF,*
3. *Initiate Telmisartan 20mg/day and up-titrate, might consider Telmisartan 20mg/day + Amlodipine 2.5 mg/day as SPC; Reinforce correct HBPM,*
4. *Discuss long acting GLP1analogue, Semaglutide 0.25mg/week and up-titrate as tolerate to 2.4 mg/week,*
5. *If cost is a barrier, consider Pioglitazone 15 mg/day as a possible second choice.*

Diabetes Academy GABRIC

Heart Failure: An Underrecognized Diabetes Complication

Babak Sharif Kashani;M.D.
Heart Failure and Transplant Cardiologist

Diabetes Academy GABRIC

Clinical Case Scenario

62 y/o male, T2DM 10 years ago, Routine diabetes follow up in outpatient clinic

PMHx: Dyslipidemia for 10 years

FHx:

- T2DM in first-degree relatives
- No family history of HF or premature CAD

SHx:

- Sedentary lifestyle
- Non-Smoker
- Non-drinker

Vital Signs:

HR: 78 bpm and regular

Oxygen Sat: 98% on room air

Office BP: 124/78 mm/Hg

BMI: 30 kg/m^2

Physical Examination:

Mild bilateral non-pitting ankle edema (1+)

No JVD or rales

Paraclinical Data:

ECG: Normal Sinus Rythm

Echocardiography report:

EF:55%

Grade 1 diastolic dysfunction

Daily medications:

- **Metformin/Sitagliptin** 1000/50 mg BD
- **Gliclazide MR** 30 mg QD
- **Atorvastatin** 20 mg QD

Lab Data:

HbA1c: 7.3%

Cr: 1.2 mg/dL, **eGFR:** 68 mL/min/1.73 m^2

Total Chol: 162 mg/dL

LDL: 88 mg/dL

HDL: 40 mg/dL

TG: 170 mg/dL

UACR: 20 mg/g

Diabetes Academy GABRIC

I feel more tired than usual lately!

The patient reports **progressive fatigue** over the past few months. He notices that he **gets tired more quickly** when climbing stairs or walking longer distances.
He **denies any chest pain, palpitations, or shortness of breath** at rest or during light activity.
No recent weight gain or swelling reported spontaneously.

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Would you suspect heart failure based on this presentation?

A Yes

B No

Answering Time!

gdia.ir/dip9

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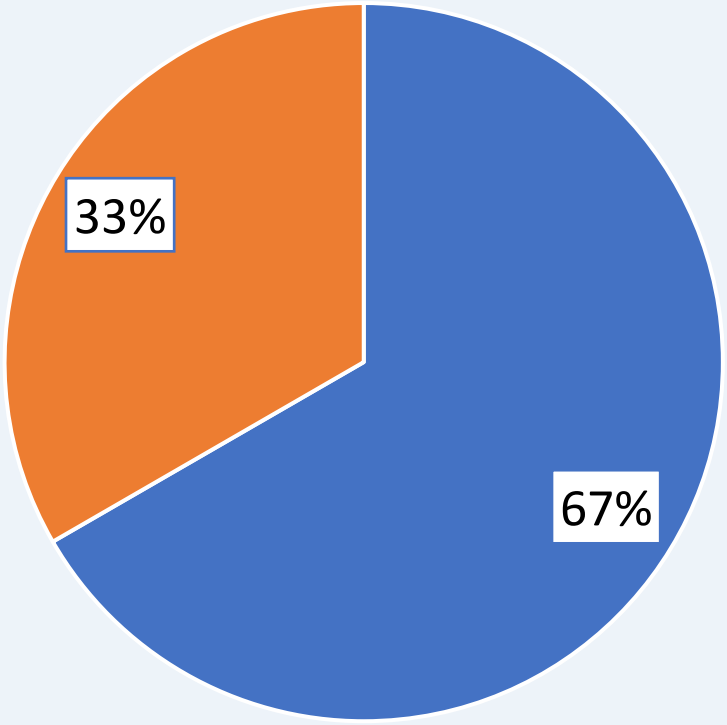
Results

A Yes

B No



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Heart Failure: An Underrecognized Complication of Diabetes Care

“Just Tired”: A Subtle Presentation of HFpEF in a Type 2 DM Without Hypertension

Diabetes Academy

Questions

Would you suspect heart failure based on this presentation?

Many diabetic patients experience fatigue—how do we avoid missing subtle HF?

What further tests would you order?

Would you now request NT-proBNP or stress testing?

At what point echocardiography should be considered?

Is this case an example of diabetic cardiomyopathy?

What is the pathophysiology behind HFpEF in this patient?

Would you change this patient's treatment?

Is this a good time to consider adding an SGLT2 inhibitor or GLP-1 RA?

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Heart Failure With Preserved Ejection Fraction (HFpEF) in Diabetes

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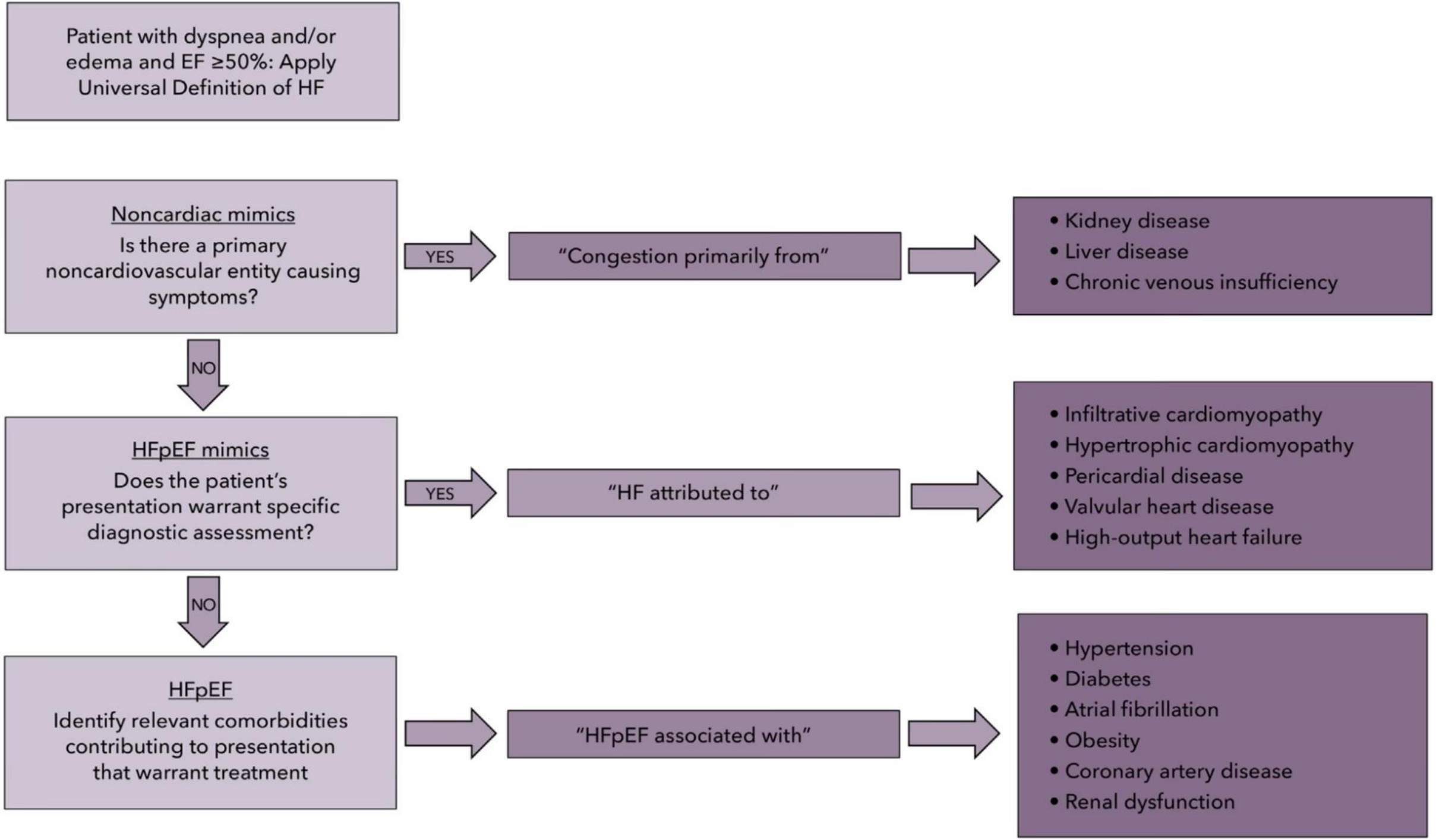
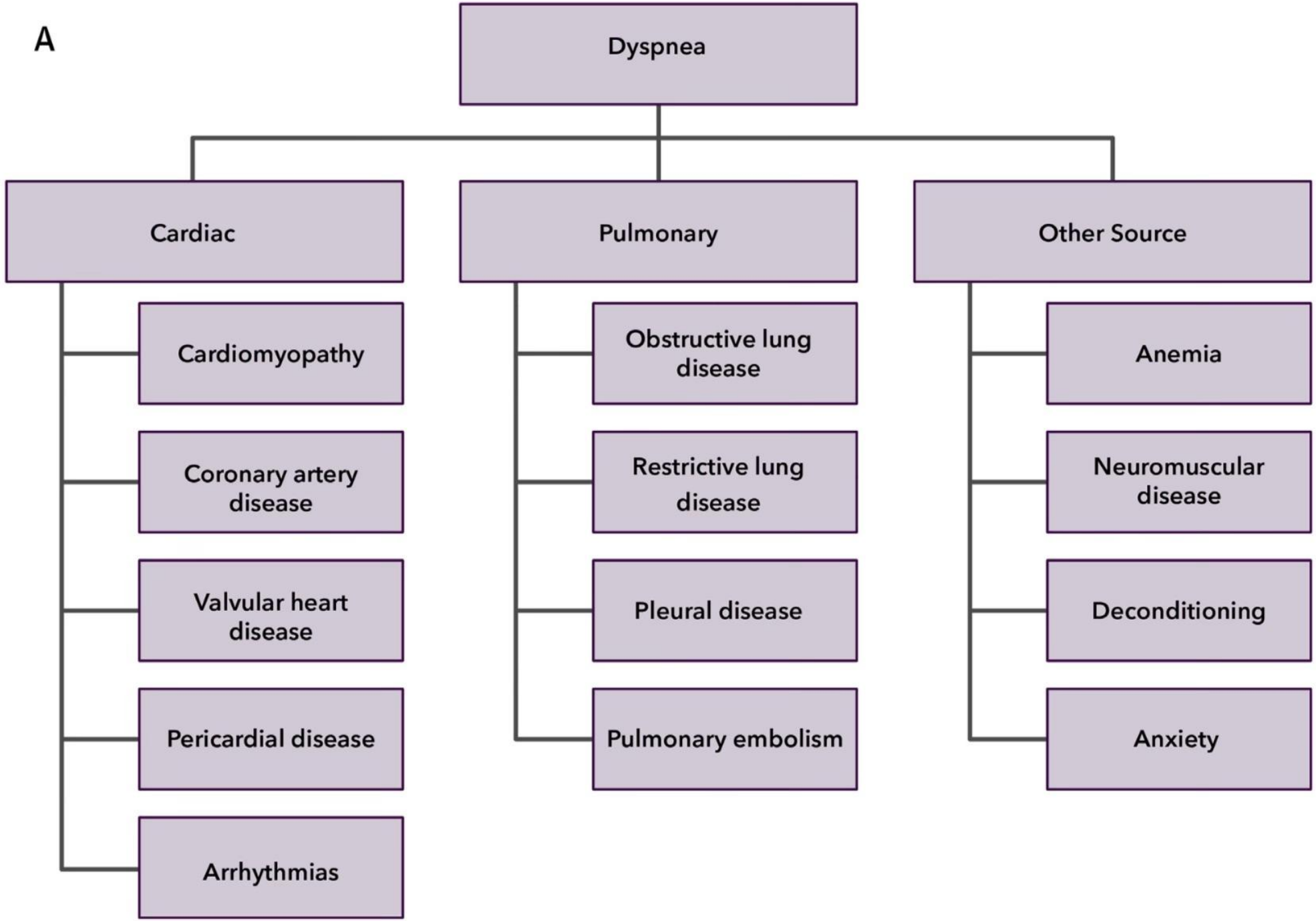
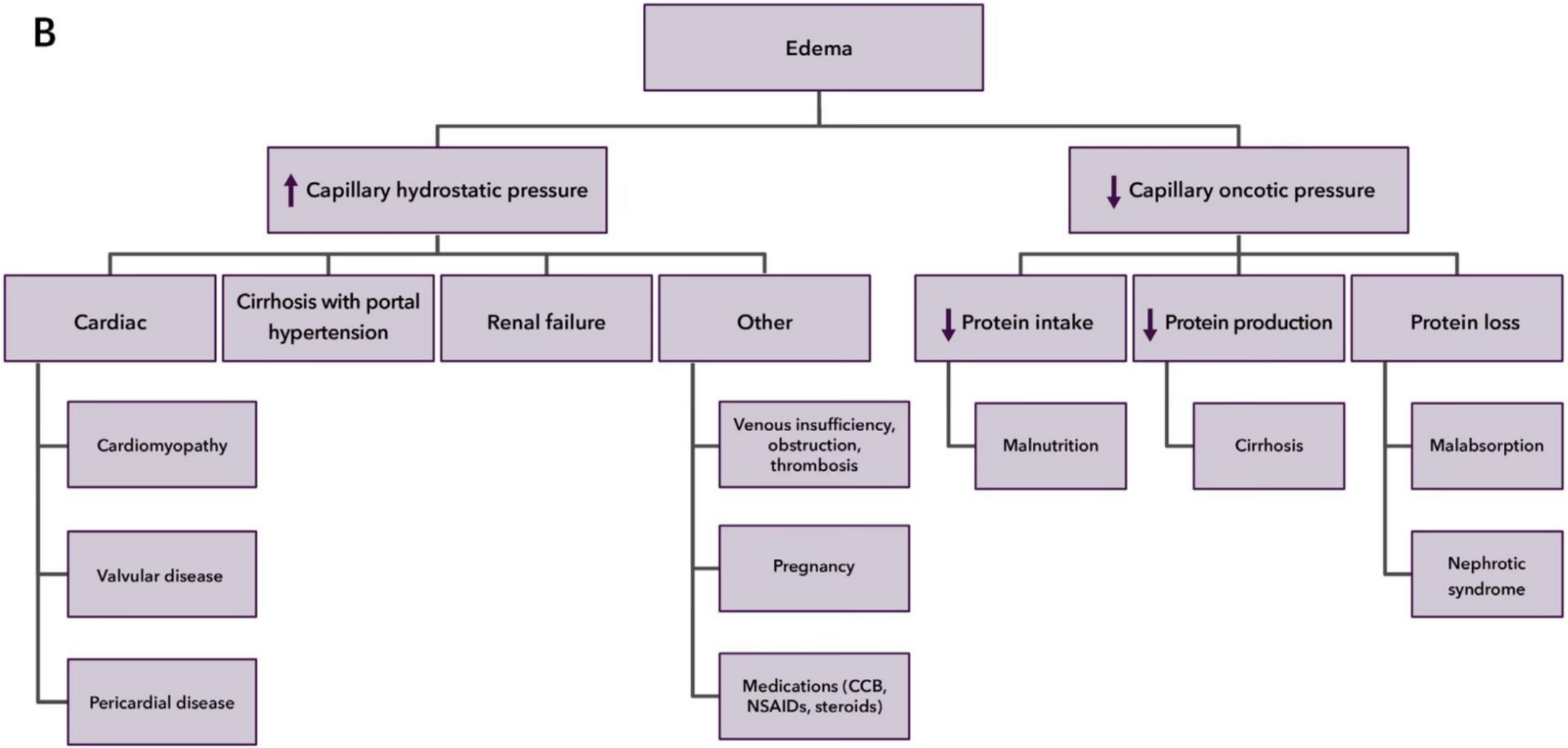
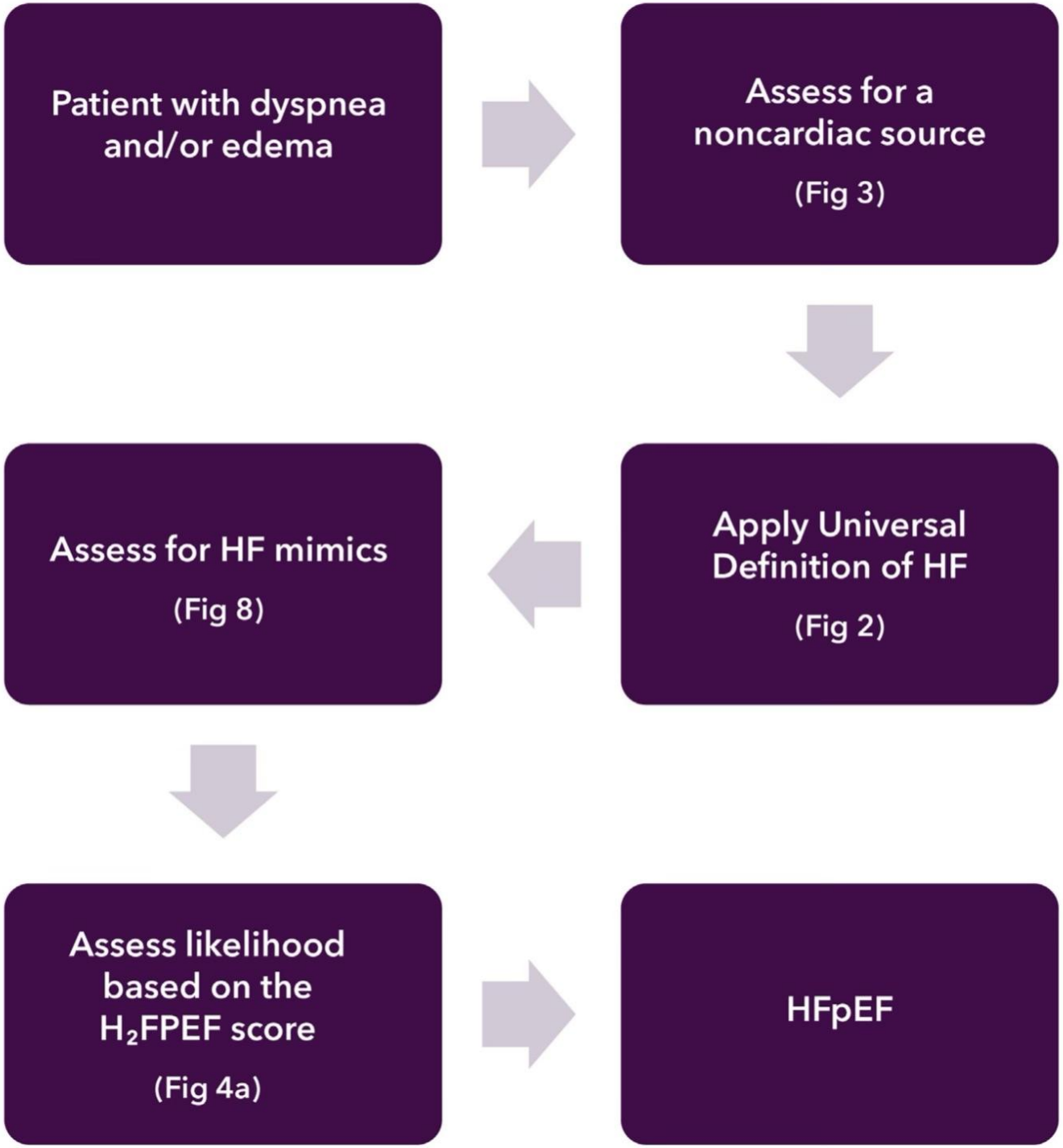

Patient with dyspnea and/or edema and EF ≥50%: Apply Universal Definition of HF
Noncardiac mimics
Is there a primary noncardiovascular entity causing symptoms?
YES
"Congestion primarily from"
• Kidney disease
• Liver disease
• Chronic venous insufficiency
NO
HFpEF mimics
Does the patient's presentation warrant specific diagnostic assessment?
YES
"HF attributed to"
• Infiltrative cardiomyopathy
• Hypertrophic cardiomyopathy
• Pericardial disease
• Valvular heart disease
• High-output heart failure
NO
HFpEF
Identify relevant comorbidities contributing to presentation that warrant treatment
"HFpEF associated with"
• Hypertension
• Diabetes
• Atrial fibrillation
• Obesity
• Coronary artery disease
• Renal dysfunction


A
Dyspnea
Cardiac
Pulmonary
Other Source
Cardiomyopathy
Coronary artery disease
Valvular heart disease
Pericardial disease
Arrhythmias
Obstructive lung disease
Restrictive lung disease
Pleural disease
Pulmonary embolism
Anemia
Neuromuscular disease
Deconditioning
Anxiety

B


Edema
↑ Capillary hydrostatic pressure
↓ Capillary oncotic pressure
Cardiac
Cirrhosis with portal hypertension
Renal failure
Other
↓ Protein intake
↓ Protein production
Protein loss
Cardiomyopathy
Valvular disease
Pericardial disease
Venous insufficiency, obstruction, thrombosis
Pregnancy
Medications (CCB, NSAIDs, steroids)
Malnutrition
Cirrhosis
Malabsorption
Nephrotic syndrome

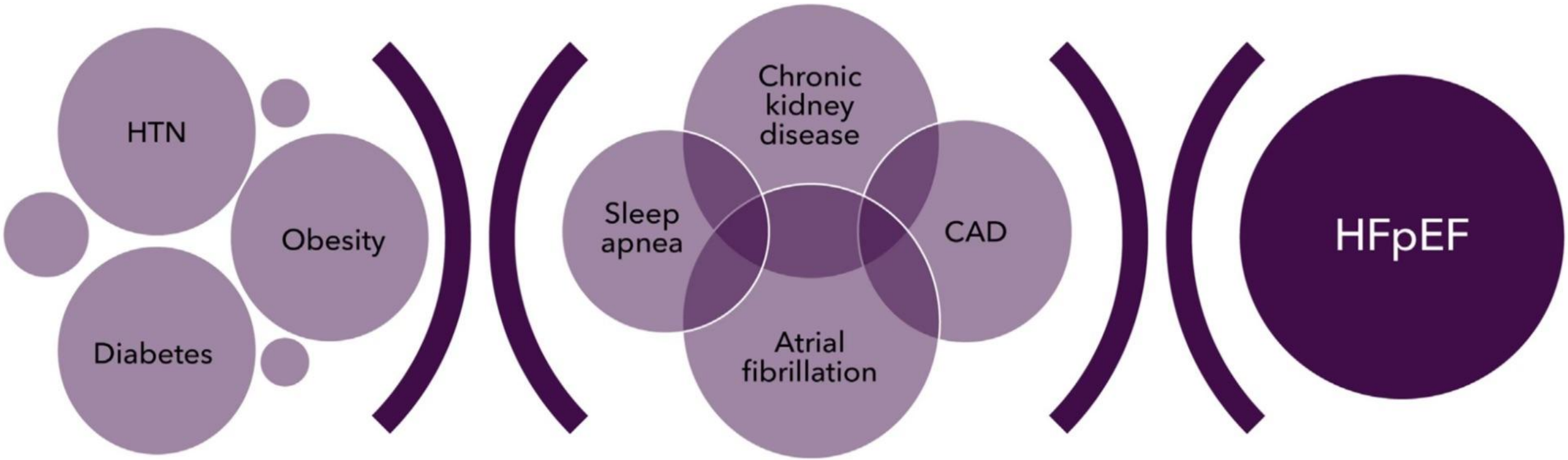


A

H_2FPEF

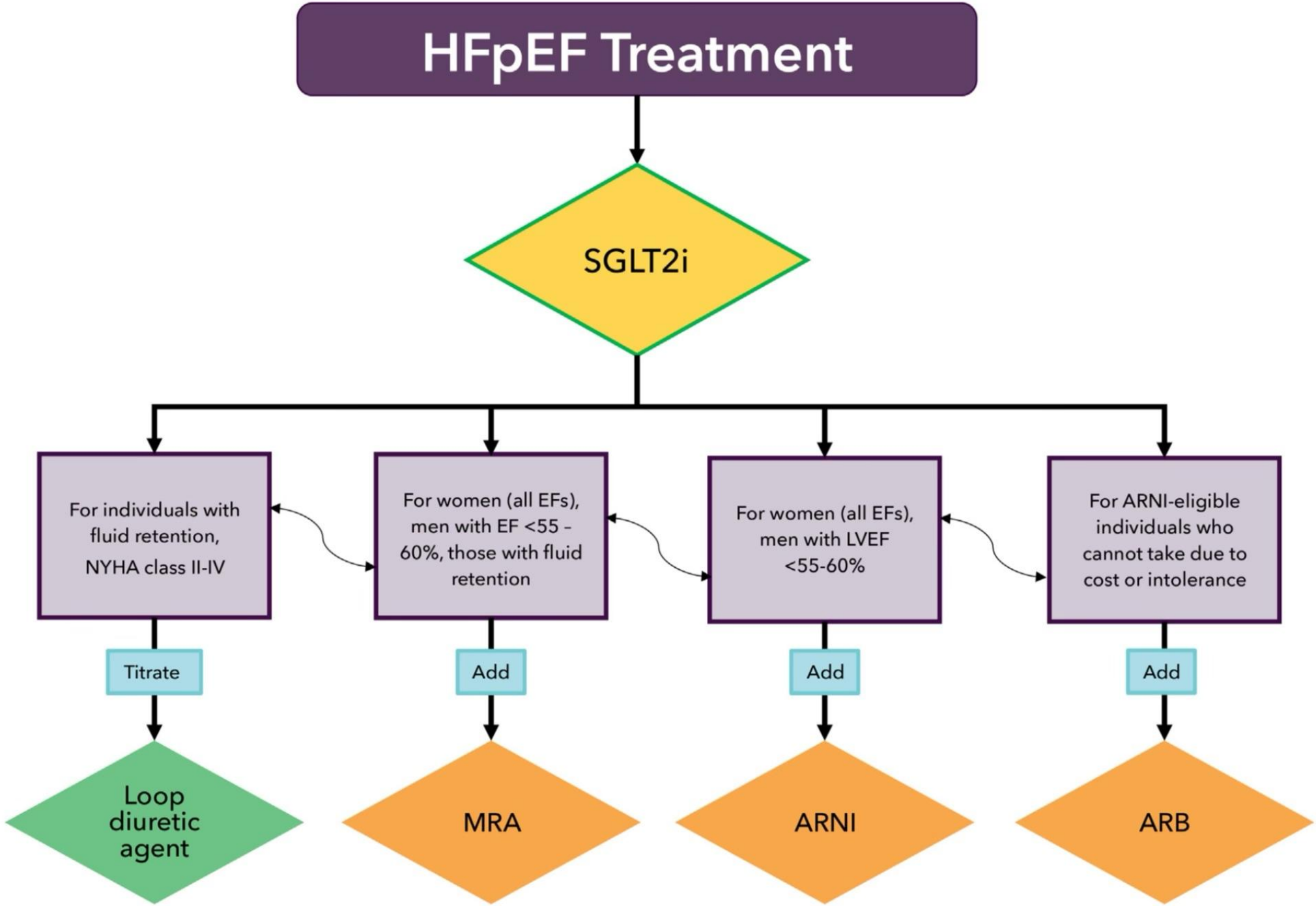
H_2	**H**eavy (BMI >30 kg/m^2) On ≥2 anti**H**ypertensives	2 1
F	Atrial **F**ibrilllation	3
P	**P**ulmonary hypertension (PASP >35 mm Hg on Doppler echocardiography	1
E	**E**lder (age >60 years)	1
F	**F**illing pressure (E/e' >9 on Doppler echocardiography)	1

≥6 points: highly diagnostic of HFpEF


HTN
Obesity
Diabetes
Chronic kidney disease
Sleep apnea
CAD
Atrial fibrillation
HFpEF

THE TREATMENT OF HEART FAILURE WITH PRESERVED LVEF (HFpEF)(LVEF ≥ 50%)

	HFrEF		HFpEF	
Targets				
Weight	Stable when euvolemic		Stable when euvolemic	
Blood pressure	Lowest blood pressure without symptoms > 90/60 mmHg		Normal pressure: 120-130/80 mmHg	
Heart rate	Sinus rhytm: 55-65/min Atrial fibrillation: < 70-90/min		Sinus rhythm : / Atrial fibrillation : < 90-110/min	
Drugs	Indicated?	Titratable?	Indicated?	Titratable?
Diuretics	In case of fluid retention	Yes, according to volume status	In case of fluid retention	Yes, according to volume status
ACEi / ARB / ARNI	yes	Yes, titrate to maximum tolerated dosage	No, only for arterial hypertension	no
Beta-blocker	yes	Yes, titrate to maximum tolerated dosage	No, only for arterial hypertension of rate control for arrhytmias	no
MRA	yes	Yes, 25 or 50 mg/day	Should be considered	no
SGLT2i	yes	no	yes	no


HFpEF Treatment
SGLT2i
For individuals with fluid retention, NYHA class II-IV
For women (all EFs), men with EF <55 – 60%, those with fluid retention
For women (all EFs), men with LVEF <55-60%
For ARNI-eligible individuals who cannot take due to cost or intolerance
Titrate
Add
Add
Add
Loop diuretic agent
MRA
ARNI
ARB

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Semaglutide in Patients with Heart Failure with Preserved Ejection Fraction and Obesity

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CONCLUSIONS

In patients with heart failure with preserved ejection fraction and obesity, treatment with semaglutide (2.4 mg) led to larger reductions in symptoms and physical limitations, greater improvements in exercise function, and greater weight loss than placebo. (Funded by Novo Nordisk; STEP-HFpEF ClinicalTrials.gov number, NCT04788511.)

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Tirzepatide for Heart Failure with Preserved Ejection Fraction and Obesity

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In this trial, weekly treatment with tirzepatide for a median of 2 years reduced the risk of a composite of worsening heart-failure events or death from cardiovascular causes while improving health status in patients with heart failure with preserved ejection fraction, obesity, and functional impairment.