Cập nhật điều trị rối loạn lipid máu ở người bệnh đái tháo đường

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Hà nội, 13.9.2025

Được tài trợ bởi AstraZeneca vì mục đích cập nhật & giáo dục y khoa

ESC 2025

Khi nào cần dùng thuốc điều trị RLLP máu?

Table 4 Intervention strategies as a function of total cardiovascular risk and untreated low-density lipoprotein cholesterol levels

Total CV risk	Untreated LDL-C levels					
	<1.4 mmol/L (<55 mg/dL)	1.4 to <1.8 mmol/L (55 to <70 mg/dL)	1.8 to <2.6 mmol/L (70 to <100 mg/dL)	2.6 to <3.0 mmol/L (100 to <116 mg/dL)	3.0 to <4.9 mmol/L (116 to <190 mg/dL	≥4.9 mmol/L (≥190 mg/dL)[a]
Low	Lifestyle advice	Lifestyle advice	Lifestyle advice	Lifestyle advice	Lifestyle modification, consider adding drug if uncontrolled	N/A[a]
Moderate	Lifestyle advice	Lifestyle advice	Lifestyle advice	Lifestyle modification, consider adding drug if uncontrolled	Lifestyle modification, consider adding drug if uncontrolled	N/A[a]
High	Lifestyle advice	Lifestyle advice	Lifestyle modification, consider adding drug if uncontrolled	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention
Very high: primary prevention	Lifestyle modification, consider adding drug	Lifestyle modification, consider adding drug	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention
Very high: secondary prevention	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention	Lifestyle modification and concomitant drug intervention

CV, cardiovascular; LDL-C, low-density lipoprotein cholesterol; N/A, not applicable.
[a]In individuals with untreated LDL-C levels ≥4.9 mmol/L, total CV risk is already at least high (*Table 3*).

European Heart Journal (2025) 00, 1–20 https://doi.org/10.1093/eurheartj/ehaf190

Theo ESC 2025, mọi BN ĐTĐ (type 1 hay type 2) đều được xếp vào nhóm nguy cơ tim mạch từ trung bình trở lên, tức là không còn nhóm nguy cơ thấp như trong ESC 2023

Table 3 Cardiovascular risk categories

Very high risk	People with any of the following: • Documented ASCVD, either clinical or unequivocal on imaging. Documented ASCVD includes previous ACS (MI or unstable angina), chronic coronary syndromes, coronary revascularization (PCI, CABG, and other arterial revascularization procedures), stroke and TIA, and peripheral arterial disease. Unequivocally documented ASCVD on imaging includes those findings that are known to be predictive of clinical events, such as significant plaque[a] on coronary angiography or CT scan or on carotid or femoral ultrasound or markedly elevated CAC score by CT[b] • DM with target organ damage,[c] or at least three major risk factors, or early onset of T1DM of long duration (>20 years) • Severe CKD (eGFR <30 mL/min/1.73 m^2) • A calculated SCORE2 or SCORE2-OP ≥20% for 10 year risk of fatal or non-fatal CVD • FH with ASCVD or with another major risk factor
High risk	People with any of the following: • Markedly elevated single risk factors, in particular TC >8 mmol/L (>310 mg/dL), LDL-C >4.9 mmol/L (>190 mg/dL), or BP ≥180/110 mmHg • Patients with FH without other major risk factors • Patients with DM without target organ damage,[c] with DM duration ≥10 years or another additional risk factor • Moderate CKD (eGFR 30–59 mL/min/1.73 m^2) • A calculated SCORE2 or SCORE2-OP ≥10% and <20% for 10 year risk of fatal or non-fatal CVD
Moderate risk	People with any of the following: • Young patients (T1DM <35 years; T2DM <50 years) with DM duration <10 years, without other risk factors • Calculated SCORE2 or SCORE2-OP ≥2% and <10% for 10 year risk of fatal or non-fatal CVD
Low risk	• Calculated SCORE2 or SCORE2-OP <2% for 10 year risk of fatal or non-fatal CVD

ASCVD, atherosclerotic cardiovascular disease; ACS, acute coronary syndromes; BP, blood pressure; CABG, coronary artery bypass graft surgery; CAC, coronary artery calcium; CKD, chronic kidney disease; CT, computed tomography; CVD, cardiovascular disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; FH, familial hypercholesterolaemia; LDL-C, low-density lipoprotein cholesterol; MI, myocardial infarction; PCI, percutaneous coronary intervention; SCORE2, Systematic Coronary Risk Evaluation 2; SCORE2-OP, Systematic Coronary Risk Evaluation 2-Older Persons; T1DM, type 1 DM; T2DM, type 2 DM; TC, total cholesterol; TIA, transient ischaemic attack.
[a]Typically defined by >50% stenosis.
[b]e.g. CAC score >300.
[c]Target organ damage is defined as microalbuminuria, retinopathy, or neuropathy.

Table 7 Cardiovascular risk categories in type 2 diabetes

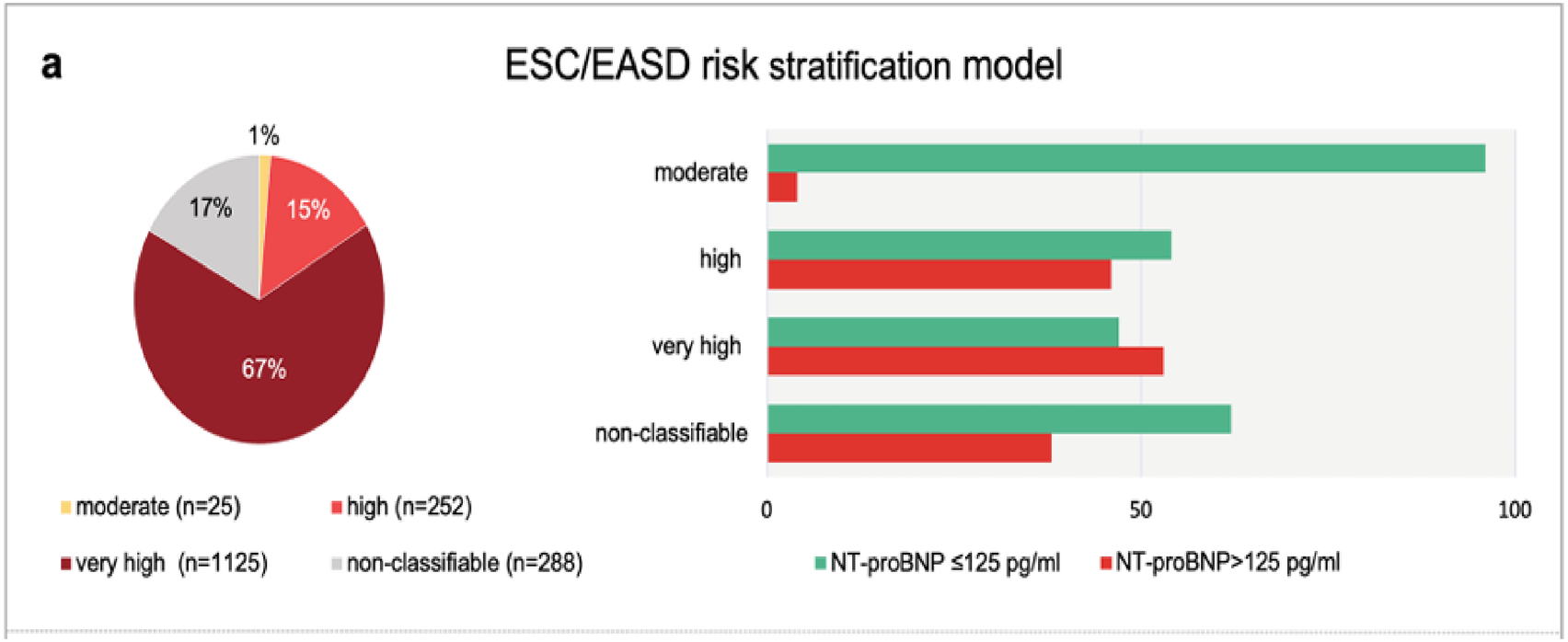
Very high CV risk	Patients with T2DM with: • Clinically established ASCVD or • Severe TOD or • 10-year CVD risk ≥20% using SCORE2-Diabetes
High CV risk	Patients with T2DM not fulfilling the very high-risk criteria and a: • 10-year CVD risk 10 to <20% using SCORE2-Diabetes
Moderate CV risk	Patients with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

ASCVD, atherosclerotic cardiovascular disease; CV, cardiovascular; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate; SCORE2-Diabetes, type 2 diabetes-specific 10-year CVD risk score; T2DM, type 2 diabetes mellitus; TOD, target-organ damage; UACR, urinary albumin-to-creatinine ratio.
Severe TOD defined as eGFR <45 mL/min/1.73 m^2 irrespective of albuminuria; or eGFR 45–59 mL/min/1.73 m^2 and microalbuminuria (UACR 30–300 mg/g; stage A2); or proteinuria (UACR >300 mg/g; stage A3); or presence of microvascular disease in at least three different sites [e.g. microalbuminuria (stage A2) plus retinopathy plus neuropathy].[43–45]

2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes. Eur Heart J. 2023;44:4043–4140.

European Heart Journal (2025) 00, 1–20 https://doi.org/10.1093/eurheartj/ehaf190

Số liệu đời thực, khoảng > 80% BN T2DM thuộc nhóm nguy cơ TM cao và rất cao theo ESC



From December 2005 through January 2010 a total of 2186 patients with T2DM from 4 diabetes outpatient clinics were included in a prospective registry.

Prausmüller et al. Cardiovasc Diabetol https://doi.org/10.1186/s12933-021-01221-w

Theo ACC, ADA

Hầu hết BN ĐTĐ đều được xếp từ nguy cơ cao trở lên

Theo ACC 2022

TABLE 1. **Criteria for Defining Patients at Very High Risk* of Future ASCVD Events**

Major ASCVD Events
Recent ACS (within the past 12 mo)
History of MI (other than recent ACS event listed above)
History of ischemic stroke
Symptomatic PAD (history of claudication with ABI <0.85 or previous revascularization or amputation)
High-Risk Conditions
Age ≥65 y
Heterozygous familial hypercholesterolemia
History of prior coronary artery bypass surgery or percutaneous coronary intervention outside of the major ASCVD event(s)
Diabetes
Hypertension
CKD (eGFR 15-59 mL/min/1.73 m^2)
Current smoking
Persistently elevated LDL-C (LDL-C ≥100 mg/dL [≥2.6 mmol/L]) despite maximally tolerated statin therapy and ezetimibe
History of congestive HF

*Very high risk includes a history of multiple major ASCVD events or one major ASCVD event and multiple high-risk conditions.
ABI = ankle-brachial index; ACS = acute coronary syndrome; ASCVD = atherosclerotic cardiovascular disease; CKD = chronic kidney disease; eGFR = estimated glomerular filtration rate; HF = heart failure; LDL-C = low-density lipoprotein cholesterol; MI = myocardial infarction; PAD = peripheral artery disease

JACC VOL. 80, NO. 14, 2022 OCTOBER 4, 2022: 1366–1418

Diabetes - 2025, ADA khẳng định:

"Diabetes itself confers independent ASCVD risk"

Diabetes Care 2025;48(Supplement_1):S207–S238 https://doi.org/10.2337/dc25-S010

LDL-c vẫn là mục tiêu chính, thậm chí tích cực hơn trong việc giảm LDL-c ở một số trường hợp

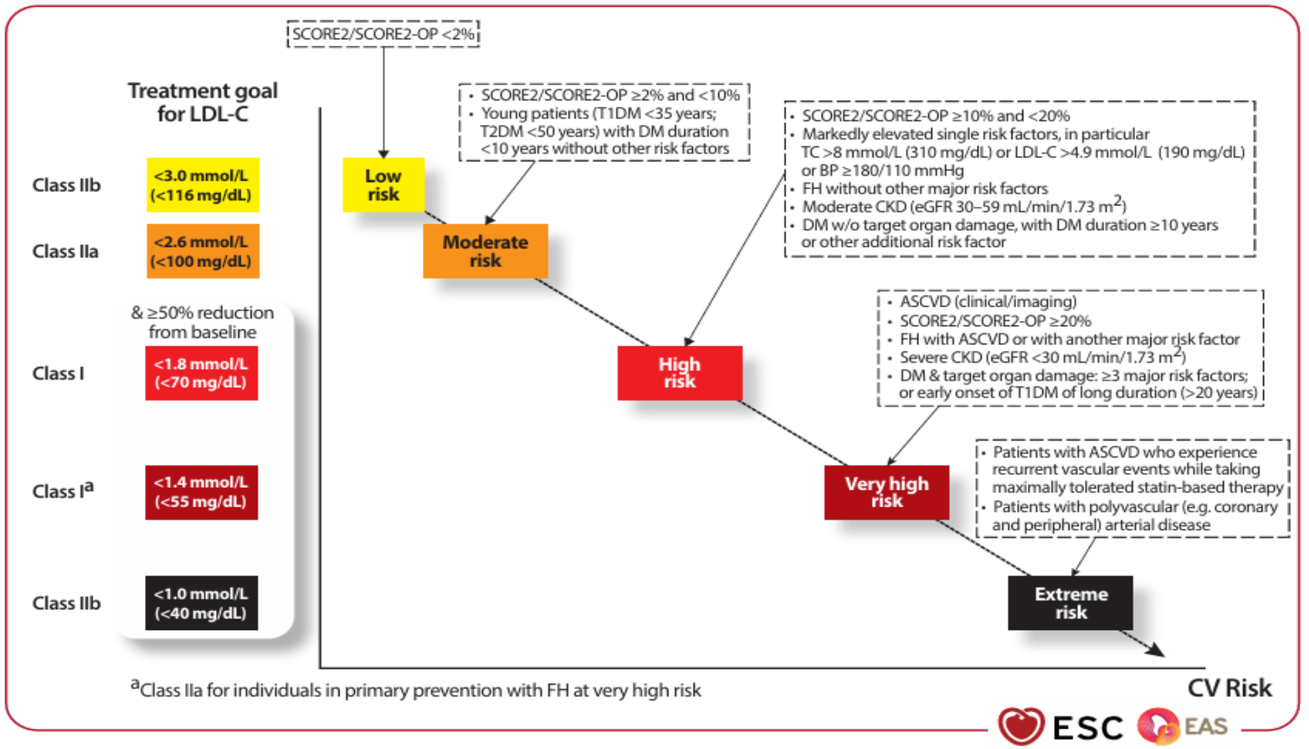


Figure 1 Treatment goals for low-density lipoprotein cholesterol across categories of total cardiovascular risk. ASCVD, atherosclerotic cardiovascular disease; BP, blood pressure; CKD, chronic kidney disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; FH, familial hypercholesterolaemia; LDL-C, low-density lipoprotein cholesterol; SCORE2, Systematic Coronary Risk Evaluation 2; SCORE2-OP, Systematic Coronary Risk Evaluation 2-Older Persons; T1DM, type 1 DM; T2DM, type 2 DM; TC, total cholesterol.

European Heart Journal (2025) 00, 1–20 https://doi.org/10.1093/eurheartj/ehaf190

Lipid Targets for Patients with Diabetes Based on Professional Society Guidelines

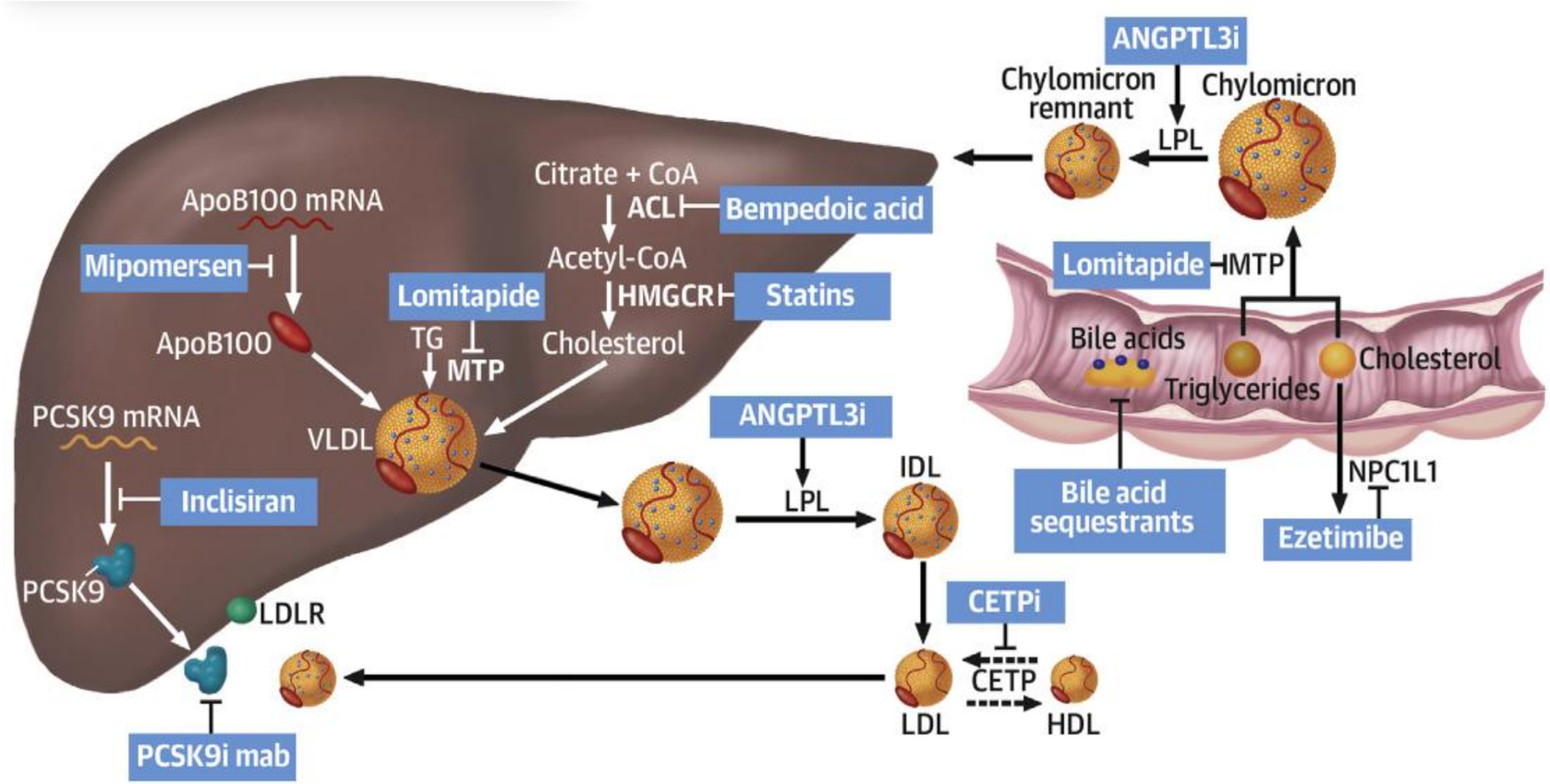
Lipid Targets for Patients with Diabetes Based on Professional Society Guidelines

	LDL-C	TG	Non-HDL-C	ApoB
ESC/EAS[38]				
High risk	≥50% reduction from baseline and <70 mg/dL	No goal, but <150 mg/dL indicates lower risk	<100 mg/dL	<80 mg/dL
Very high risk	≥50% reduction from baseline and <55 mg/dL	No goal, but <150 mg/dL indicates lower risk	<85 mg/dL	<65 mg/dL
Very high risk + Recurrent ASCVD	≥50% reduction from baseline and <55 mg/dL	No goal, but <150 mg/dL indicates lower risk	<70 mg/dL	<55 mg/dL
AACE[76]				
Increased risk of ASCVD or + ASCVD	<70 mg/dL	<150 mg/dL	NA	NA
ADA[1]				
≥1 ASCVD risk factor	<70 mg/dL	NA	NA	NA
+ASCVD	≥50% reduction from baseline and <55 mg/dL	<150 mg/dL	NA	NA
NICE[61]				
Primary prevention	NA	NA	>40% reduction	NA
Secondary prevention	<2.0 mmol/L (~77 mg/dL)	NA	<2.6 mmol/L (~100 mg/dL)	NA

Abbreviations: AACE = American Association of Clinical Endocrinology; ADA = American Diabetes Association; ApoB = apolipoprotein B; ASCVD = atherosclerotic cardiovascular disease; ESC/EAS = European Society of Cardiology/European Atherosclerosis Society; LDL-C = low density lipoprotein cholesterol; NICE = National Institute for Health and Care Excellence; non-HDL-C = non-high density lipoprotein cholesterol; TG = triglyceride.

Y. Tsushima and B. Hatipoglu, Endocrine Practice 31 (2025) 677e685 https://doi.org/10.1016/j.eprac.2025.03.011

Các thuốc non-statin trong liệu pháp giảm LDL-c



Mechanisms of action of discussed therapies. Mipomersen targets hepatic apolipoprotein B100 (apoB100) mRNA. Inclisiran blocks translation of proprotein convertasesubtilisin–kexin type 9 (PCSK9) mRNA. PCSK9 inhibiting monoclonal antibodies (PCSK9i) block PCSK9 binding to low-density lipoprotein receptor (LDLR). Lomitapideinterferes with very low-density lipoprotein (VLDL) and chylomicron assembly through microsomal triglyceride transfer protein (MTP) inhibitionin the liver and smallintestine. Bempedoic acid prevents cholesterol synthesis by inhibition of ATP citrate lyase (ACL). Statins block 3-hydroxy-3-methylglutaryl coenzyme reductase(HMGCR). Angiopoetin-like 3 protein inhibitors (ANGPTL3i) enhance lipoprotein lipase (LPL) function. Bile acid sequestrants bind bile acids in the small intestine.Ezetimibe inhibits Niemann-Pick-like protein 1C1 (NPC1L1), preventing transport of sterols into enterocytes. Cholesteryl ester transfer protein inhibitors (CETPi) impairtransfer of cholesterol esters from high-density lipoprotein (HDL) to apoB particles, mainly low-density lipoprotein (LDL) particles.JACCVOL.77,NO.12,2021Nurmohamedetal.MARCH 30, 2021:1564–75Therapies for Reduction of LDL-C and Apolipoprotein B1571

Nurmohamed, N.S. et al. J Am Coll Cardiol. 2021;77(12):1564–75.

New low-density lipoprotein cholesterol-lowering therapies

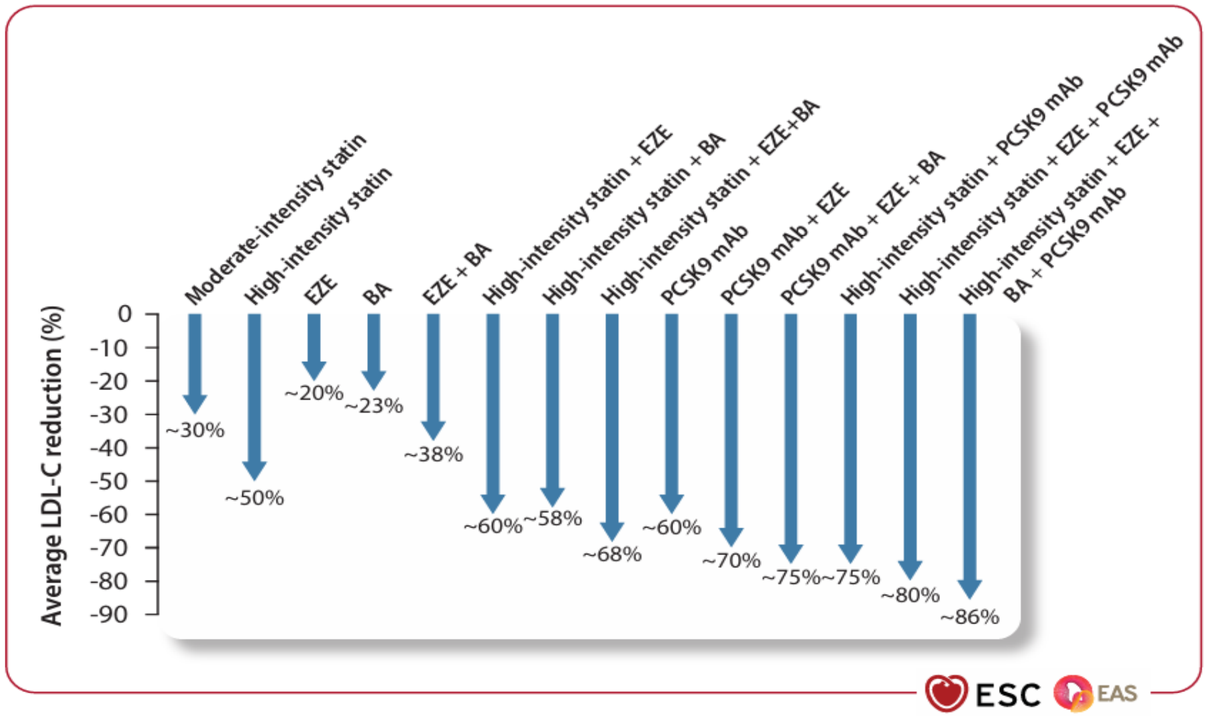


Figure 2 Average reduction in low-density lipoprotein cholesterol levels with different pharmacological therapies with proven cardiovascular benefits. BA, bempedoic acid; EZE, ezetimibe; LDL-C, low-density lipoprotein cholesterol; PCSK9 mAb, proprotein convertase subtilisin/kexin type 9 monoclonal antibody.

Recommendations on low-density lipoprotein cholesterol (LDL-C)-lowering therapies, including two new agents for LDL-C-lowering treatment (bempedoic acid and evinacumab specifically for patients with homozygous familial hypercholesterolaemia)(FH).

European Heart Journal (2025) 00, 1–20 https://doi.org/10.1093/eurheartj/ehaf190

Liệu pháp statin tích cực liều TB - Cao là nền tảng trong phòng tiên phát và thứ phát ở BN có nguy cơ cao, rất cao

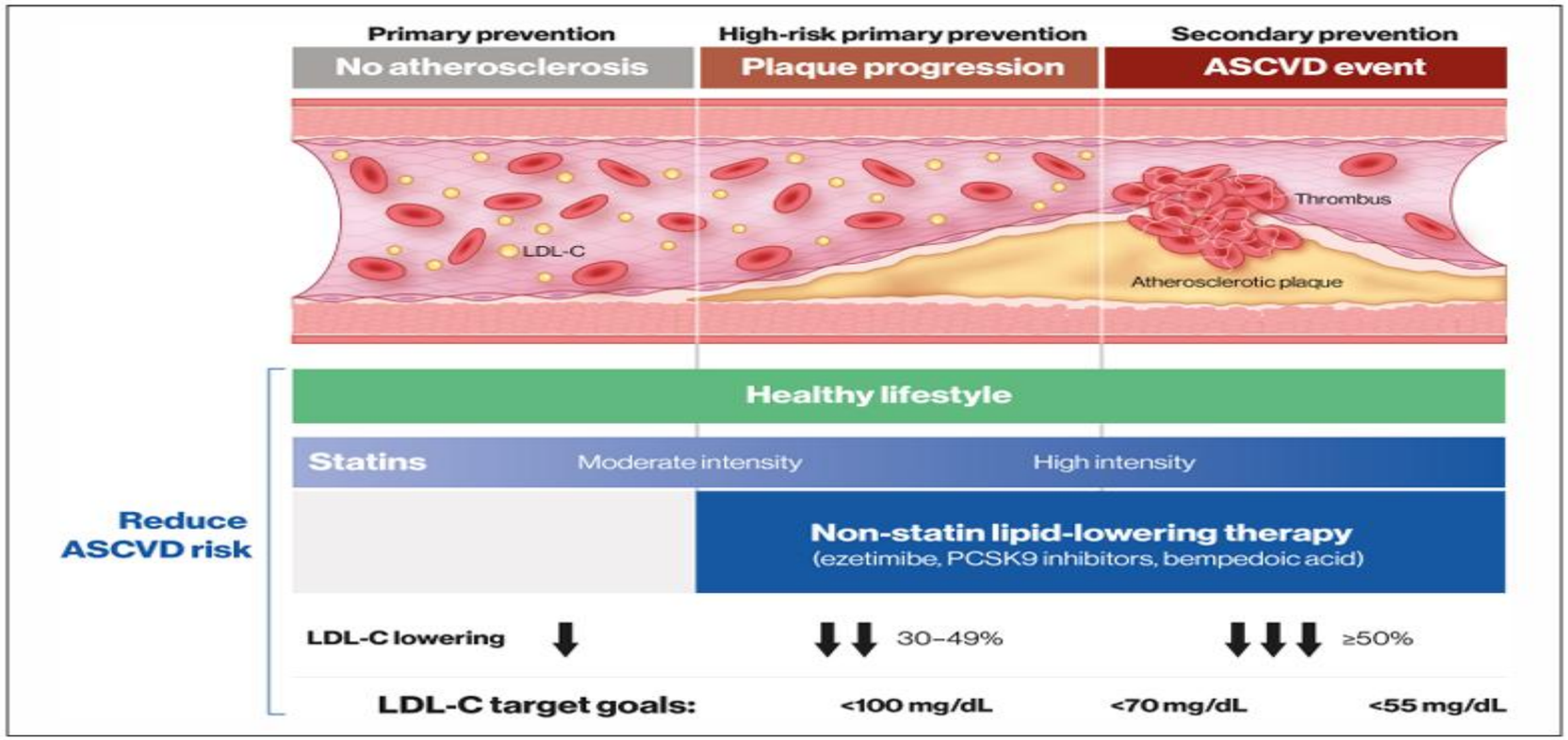
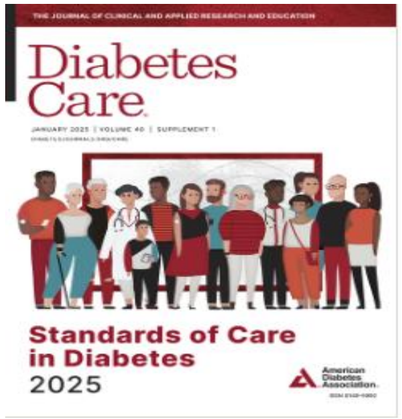


Figure 4. The continuum of atherosclerotic cardiovascular disease (ASCVD) risk.
Management of low-density lipoprotein cholesterol (LDL-C) levels across the continuum of ASCVD risk to prevent first and subsequent cardiovascular events. PCSK9 indicates proprotein convertase subtilisin/kexin type 9.

J Am Heart Assoc. 2023;12:eJAHA/2022/028892. DOI: 10.1161/JAHA.122.028892



Lipid Management for Primary Prevention of Atherosclerotic Cardiovascular Disease Events in People With Diabetes in Addition to Healthy Behavior Modification

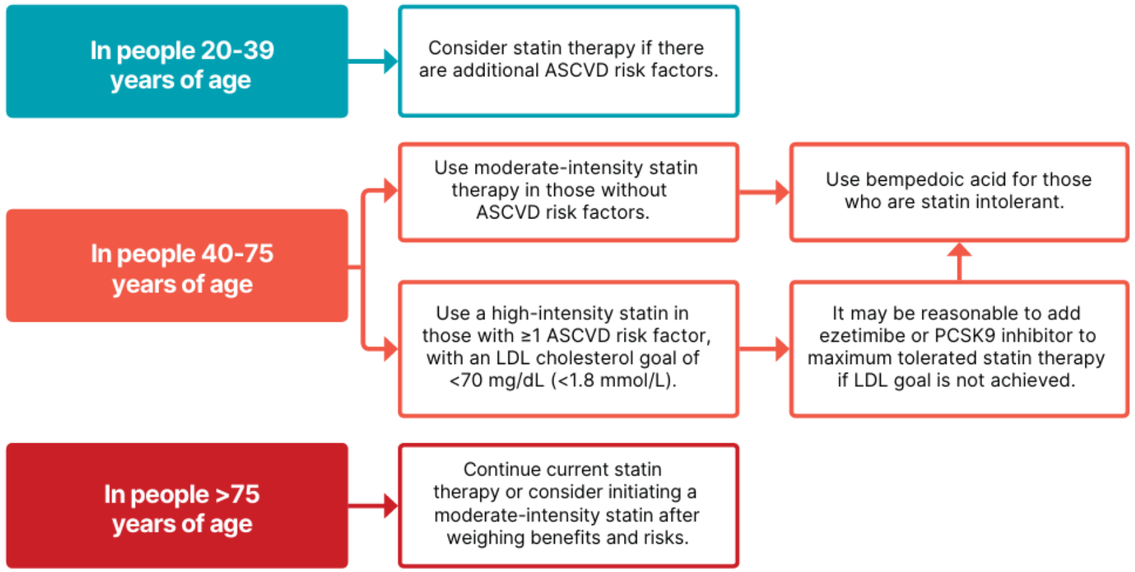


Figure 10.3—Recommendations for primary prevention of atherosclerotic cardiovascular disease (ASCVD) in people with diabetes using cholesterol-lowering therapy. Adapted from *"Standards of Care in Diabetes—2024* Abridged for Primary Care Professionals" (325).

Lipid Management for Secondary Prevention of Atherosclerotic Cardiovascular Disease Events in People With Diabetes

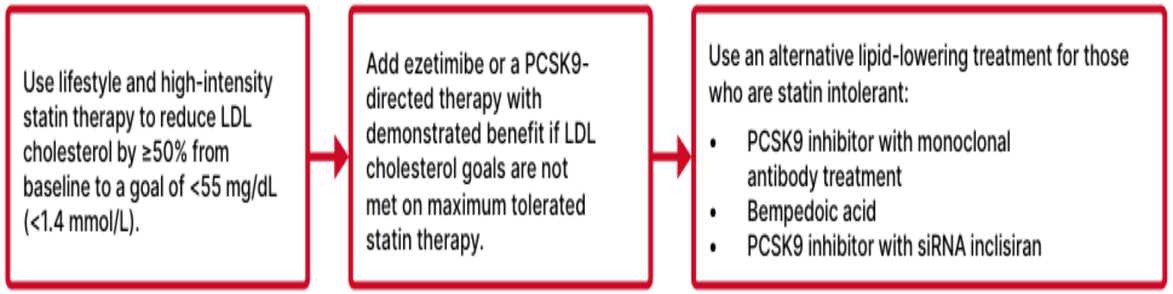


Figure 10.4—Recommendations for secondary prevention of atherosclerotic cardiovascular disease (ASCVD) in people with diabetes using cholesterol-lowering therapy. Adapted from *"Standards of Care in Diabetes—2024* Abridged for Primary Care Professionals" (325).

Diabetes Care Volume 48, Supplement 1, January 2025

Endocrine Practice 31 (2025) 263–265

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Discussion

Highlights of the 2025 American Association of Clinical Endocrinology Clinical Practice Guideline on Pharmacologic Management of Adults With Dyslipidemia

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Table

Comparison of Recent American Association of Clinical Endocrinology Clinical Practice Guidelines on Dyslipidemia

Recommendation topic	2025	Difference from 2017
ASCVD risk assessment using a validated risk assessment tool	Recommends use of validated ASCVD risk assessment tool (good practice statement).	No change
Use of ASCVD risk enhancers (CAC, ApoB, and Lpa)	No recommendation. Current evidence does not support routine addition of nontraditional risk factors to standard risk assessment.	Change in recommendation type and strength
Statins	Statins considered first-line treatment.	No change
PCSK9 mAb	Conditional recommendation for use in persons with or at increased risk for ASCVD.	Change in recommendation strength and level of evidence
Inclisiran	No recommendation; insufficient evidence for outcomes of interest.	Not included
Bempedoic acid	Conditional recommendation for use in persons with ASCVD or at increased risk and statin intolerant.	Not included
EPA	Conditional recommendation for use in persons with or at increased risk for ASCVD; insufficient evidence for individuals with severe hypertriglyceridemia.	Change in recommendation strength and certainty of evidence
EPA + DHA	Conditional recommendation against use in persons with or at increased risk for ASCVD; insufficient evidence for individuals with severe hypertriglyceridemia.	Change in recommendation direction, strength, and certainty of evidence
Niacin	Strong recommendation against use in persons with or at increased risk for ASCVD; insufficient evidence for individuals with severe hypertriglyceridemia.	Change in recommendation direction, strength, and certainty of evidence
Fibrates	Not included	Not prioritized as an intervention due to lack of evidence for outcomes of interest
LDL-C treatment goal	Conditional recommendation for treatment goal of <70 mg/dL in persons with or at increased risk for ASCVD.	Change in recommendation strength, language, and certainty/ of evidence

Abbreviations: ApoB = apolipoprotein B; ASCVD = atherosclerotic cardiovascular disease; CAC = coronary artery calcium; DHA = docosahexaenoic acid; EPA = eicosapentaenoic acid; IPE = icosapent ethyl; LDL-C = low-density lipoprotein cholesterol; Lpa = lipoprotein a; mAb = monoclonal antibody.

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Sử dụng statin liều dung nạp cao nhất để đạt MT LDL-c sớm nhất có thể trong ACS

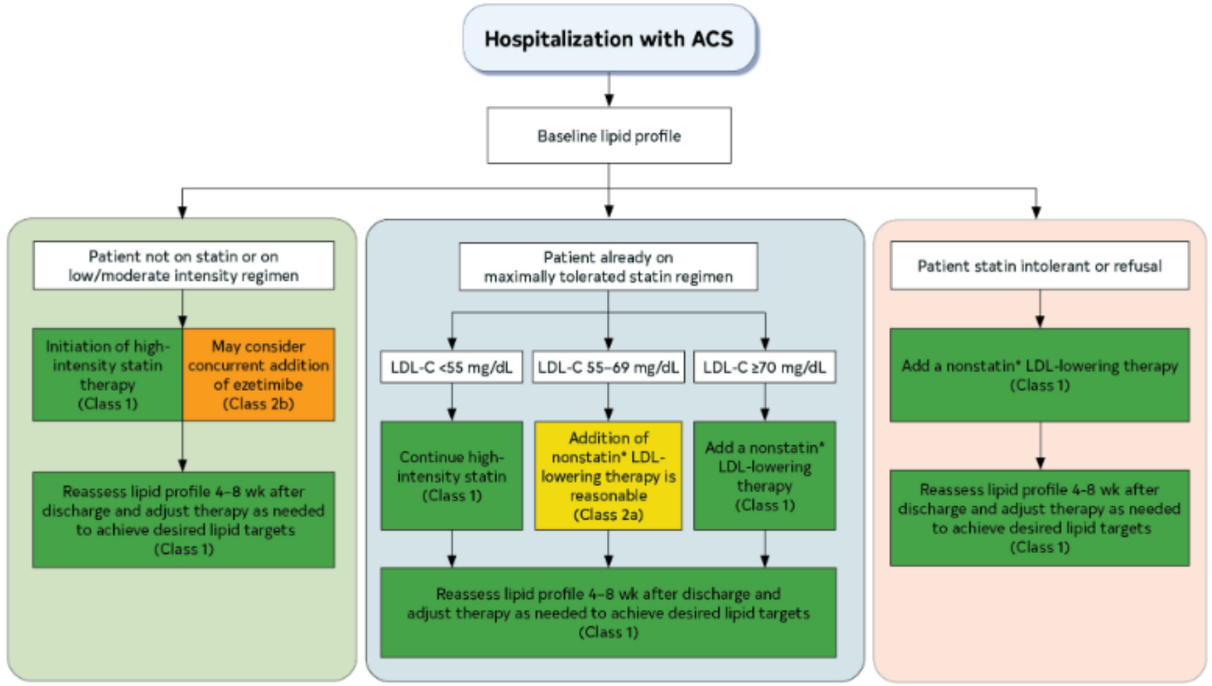

Figure 5. Management of Lipid-Lowering Therapy for Patients With ACS.

Recommendation Table 3 — Recommendations for lipid-lowering therapy in patients with acute coronary syndromes (see also Supplementary data online, Evidence Table 3)

Recommendations	Class[a]	Level[b]
Intensification of lipid-lowering therapy during the index ACS hospitalization is recommended for patients who were on any lipid-lowering therapy before admission in order to further lower LDL-C levels.	I	C
Initiating combination therapy with high-intensity statin plus ezetimibe during index hospitalization for ACS should be considered in patients who were treatment-naïve and are not expected to achieve the LDL-C goal with statin therapy alone.[66]	IIa	B

This table complements the ESC 2019 ESC/EAS Guidelines table and does not replace it.
ACS, acute coronary syndromes; LDL-C, low-density lipoprotein cholesterol.
[a]Class of recommendation.
[b]Level of evidence.

Circulation. 2025;151:e771–e862. DOI: 10.1161/CIR.0000000000001309

Hypertriglyceridaemia

Recommendation Table 5 — Recommendations for drug treatment of patients with hypertriglyceridaemia (see also Supplementary data online, Evidence Table 5)

Recommendations	Class[a]	Level[b]
High-dose icosapent ethyl (2 × 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 level 135–499 mg/dL or 1.52–5.63 mmol/L) to reduce the risk of cardiovascular events.[8,111]	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.[6,117]	IIa	B

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

7. Hypertriglyceridaemia

Triglyceride levels are associated with CV risk independent of LDL-C levels.[102–104] With respect to pharmacological treatment of hypertriglyceridaemia, this Task Force continues to recommend statins as the first drug of choice to reduce CVD risk in high-risk patients.[1]

Currently available fibrates (gemfibrozil, fenofibrate, bezafibrate) have moderate triglyceride-lowering effects.[105–107] Fenofibrate and bezafibrate lead to small decreases in LDL-C, but have not reduced MACE (MI, ischaemic stroke, CV mortality) or total mortality in patients treated with statins. A reduction in non-fatal MI was only seen in subgroup analyses of patients with atherogenic dyslipidaemia (low HDL-C and high triglycerides) in these trials.[105,106] In a pre-specified subgroup ana-

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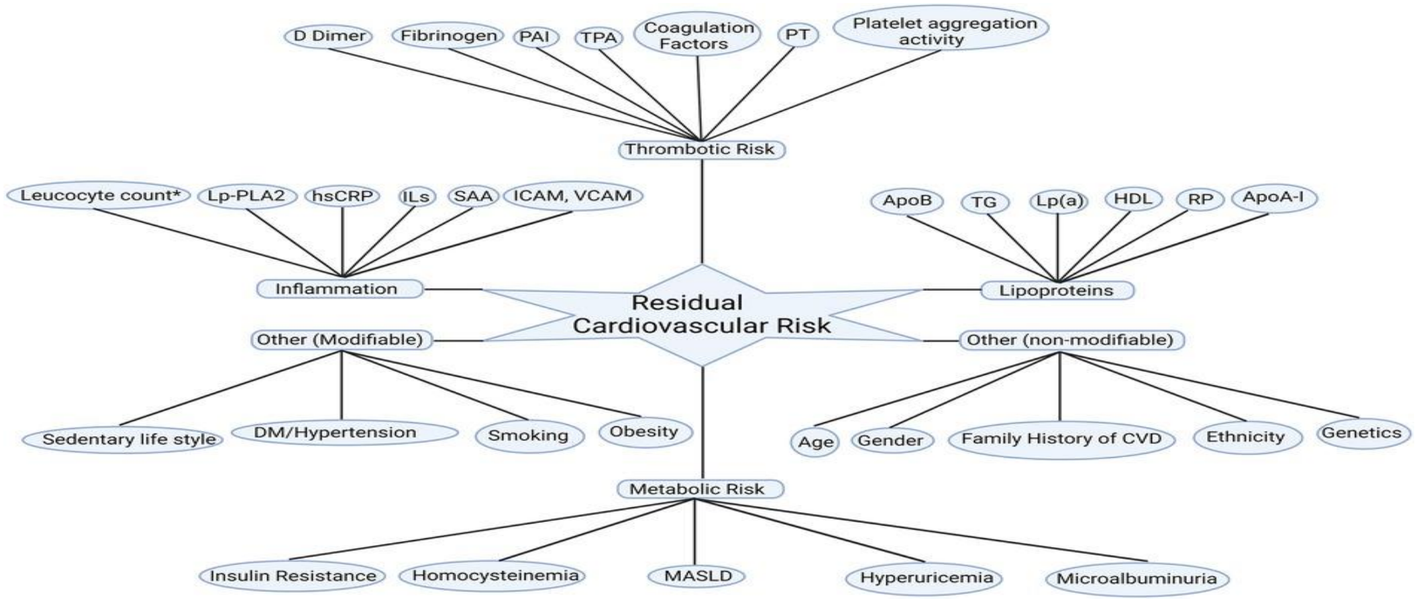
Ngay cả khi đạt mục tiêu LDL-c, nguy cơ tim mạch tồn dư còn cao đặc biệt ở BN đái tháo đường

Even though efficacy of statins in primary prevention of ASCVD in type 2 diabetes mellitus was well demonstrated in the Collaborative Atorvastatin Diabetes Study (CARDS), **12.5%** of statin recipients **had an ASCVD event** despite achieving median on-treatment LDL-C 2.0 mmol/L (77 mg/dl) during median follow **up of 3.9 years** [1]

ASCVD là NN hàng đầu gây tử vong và là bệnh lý thường gặp nhất ở BN ĐTĐ [2]

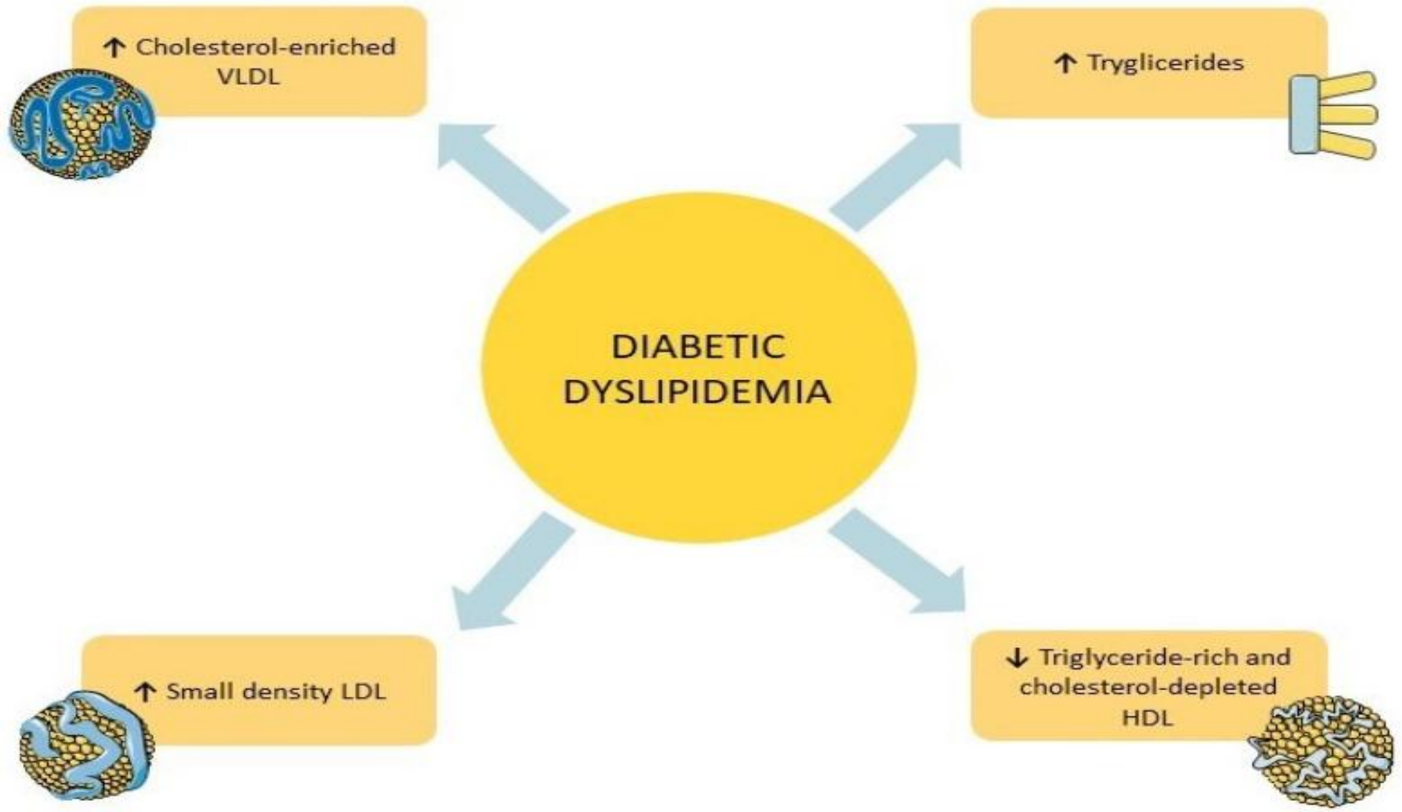


1. Colhoun HM, et al. Primary prevention of cardiovascular disease with atorvastatin in type 2 diabetes in the collaborative atorvastatin diabetes study (CARDS): multicentre randomised placebo-controlled trial. *Lancet*. (2004) 364(9435):685–96

2. Diabetes Care 2025;48(Supplement_1):S207–S238

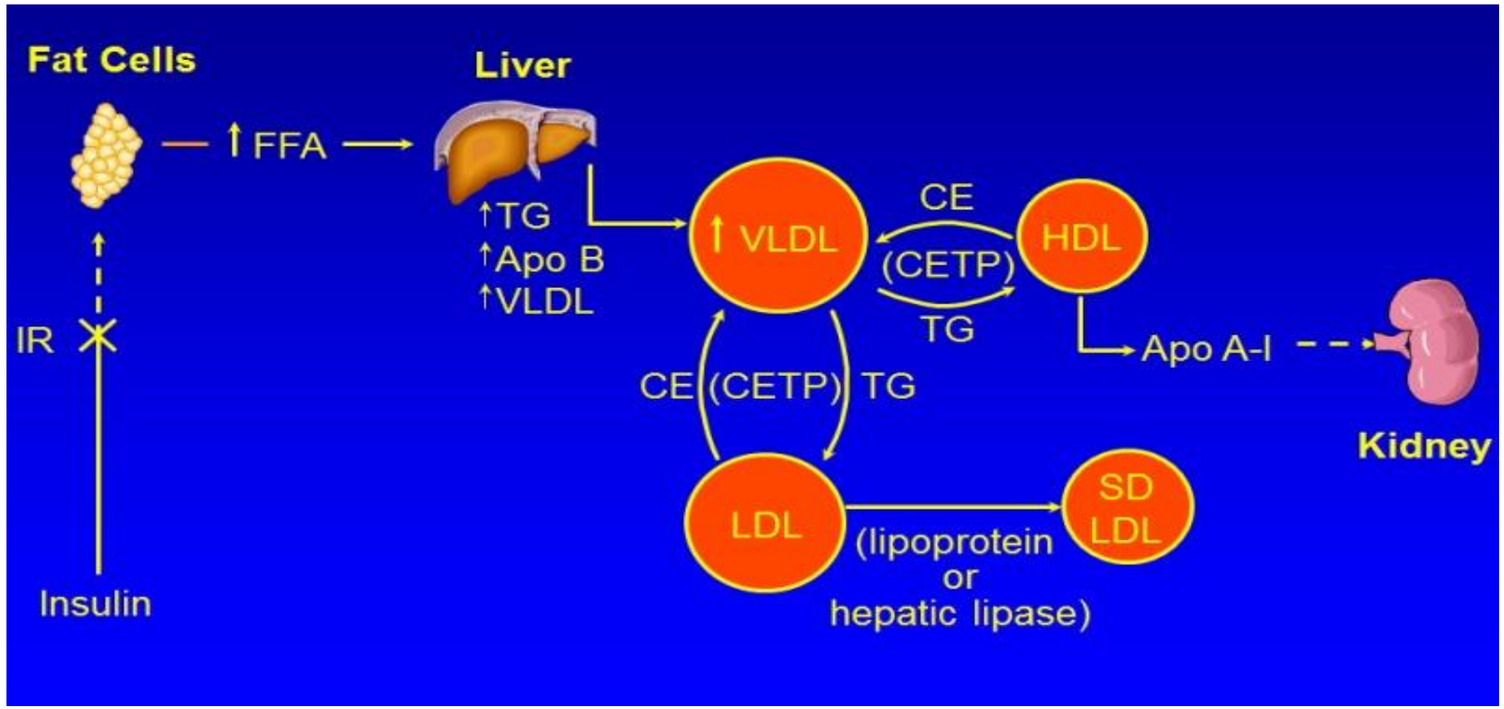
Front. Cardiovasc. Med., 07 August 2024
Sec. Lipids in Cardiovascular Diseas Volume 11 - 2024 | https://doi.org/10.3389/fcvm.2024.1389106

Đặc điểm RLLP máu kiểu sinh xơ vữa ở BN đái tháo đường



Int. J. Mol. Sci. 2023, 24, 10164. https://doi.org/10.3390/ijms241210164

Cơ chế rối loạn lipid ở bệnh nhân đái tháo đường



T1DM	Lipid profile is similar to controls if glycemic control is good
T2DM	Increased TG, VLDL, IDL, and non-HDL-C. Decreased HDL-C. Normal LDL-C but increase in small dense LDL, LDL particle number, and apolipoprotein B.
Poor glycemic control	Increased TG, VLDL, IDL, and non-HDL-C. Decreased HDL-C. Modest increase in LDL-C with increase in small dense LDL, LDL particle number, and apolipoprotein B.

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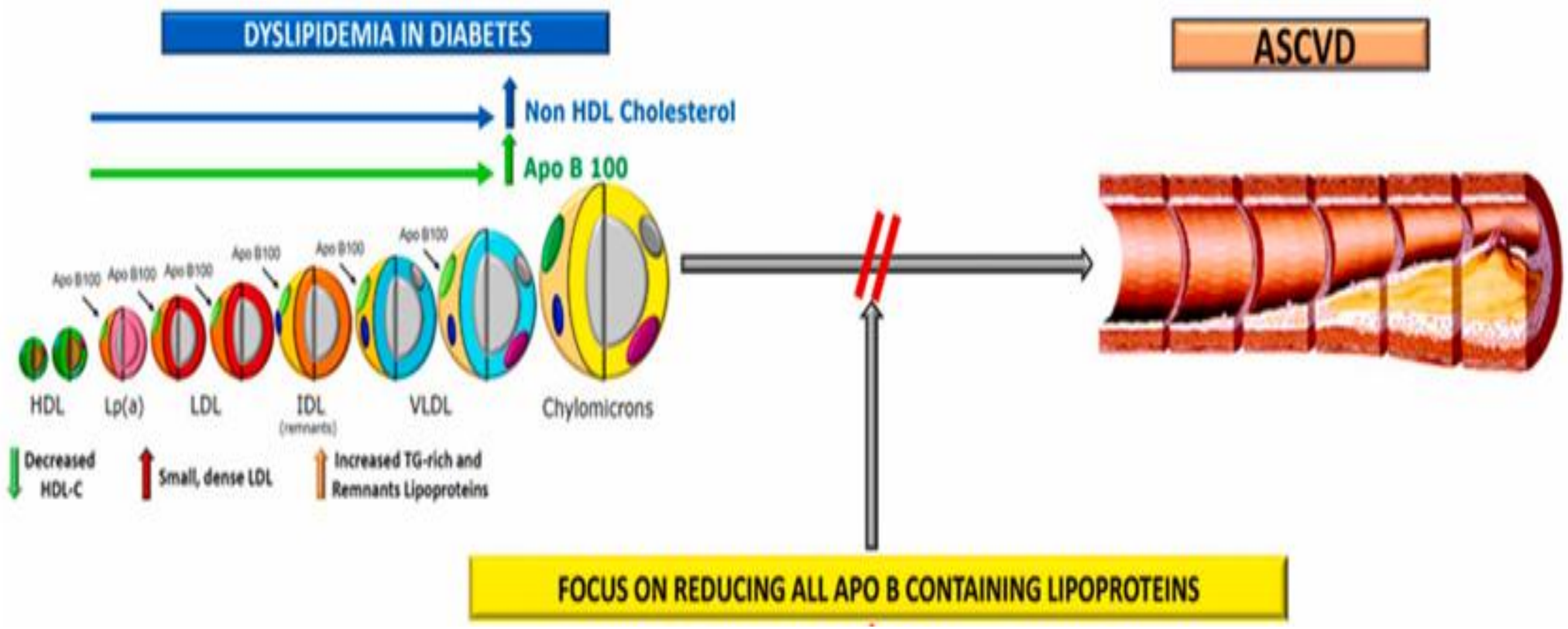
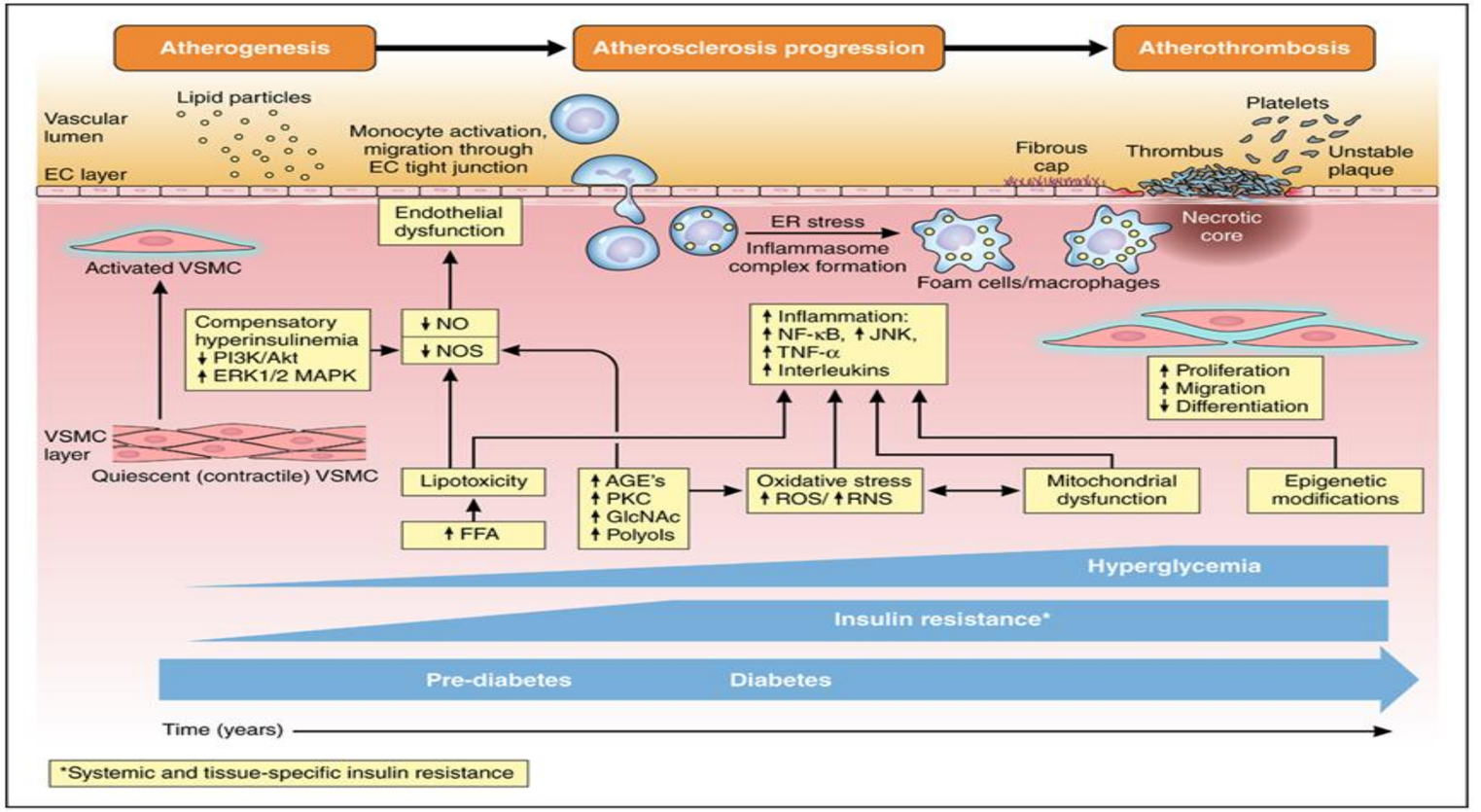
Mục đích chính
của điều trị rối loạn lipid máu ở BN đái tháo đường



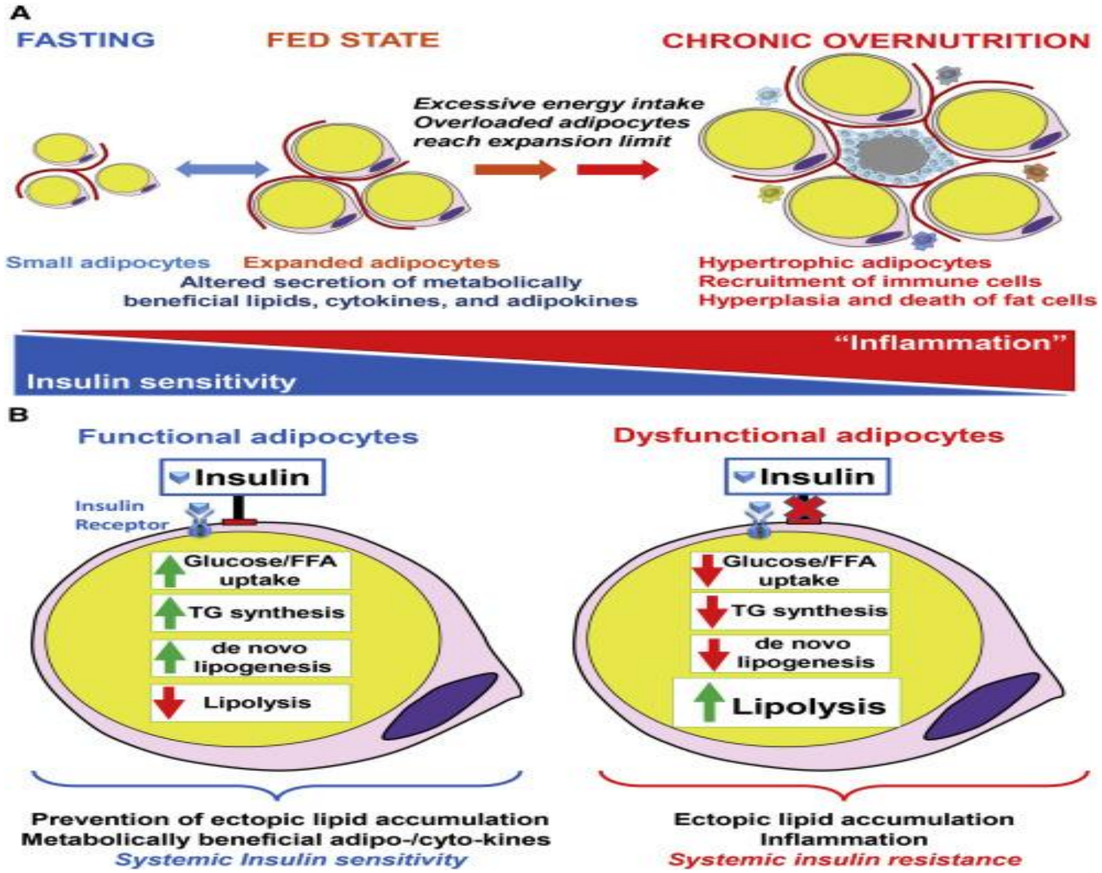
Atherosclerosis 394 (2024) 117313

Mối liên hệ ĐTĐ - XVĐM: Vai trò của Lipid, đường huyết, kháng insulin và viêm mạn tính



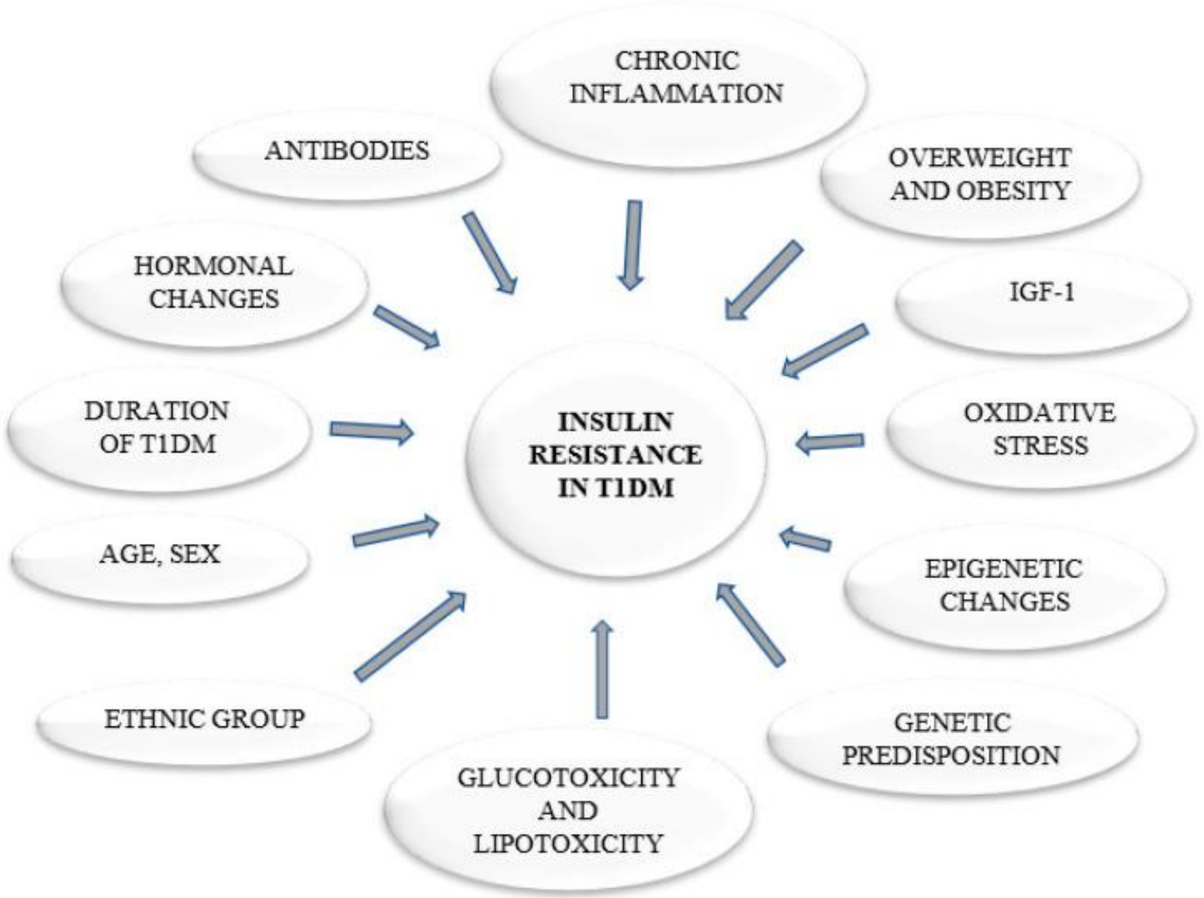
Circulation. 2016;133:2459–2502. DOI: 10.1161/CIRCULATIONAHA.116.022194

Tình trạng Viêm – mô mỡ nội tạng – kháng insulin:
Thúc đẩy RLLP và ASCVD, khởi phát nhiều năm trước khi ĐTĐ được chẩn đoán



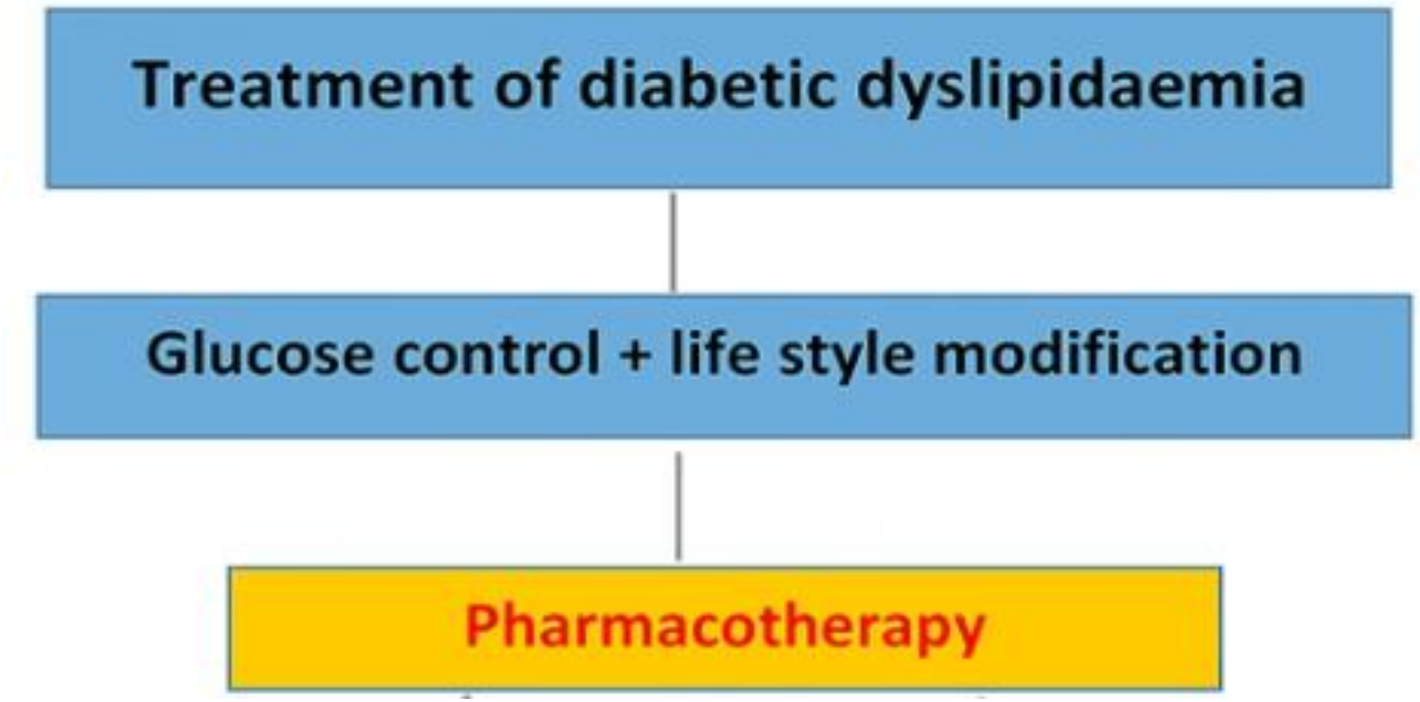
Cell Metabolism 33, April 6, 2021
https://doi.org/10.1016/j.cmet.2021.03.019

The causes of insulin resistance in type 1 diabetes



Int. J. Environ. Res. Public Health 2020, 17, 8651; doi:10.3390/ijerph17228651

Diabetic dyslipidaemia: which drugs to use

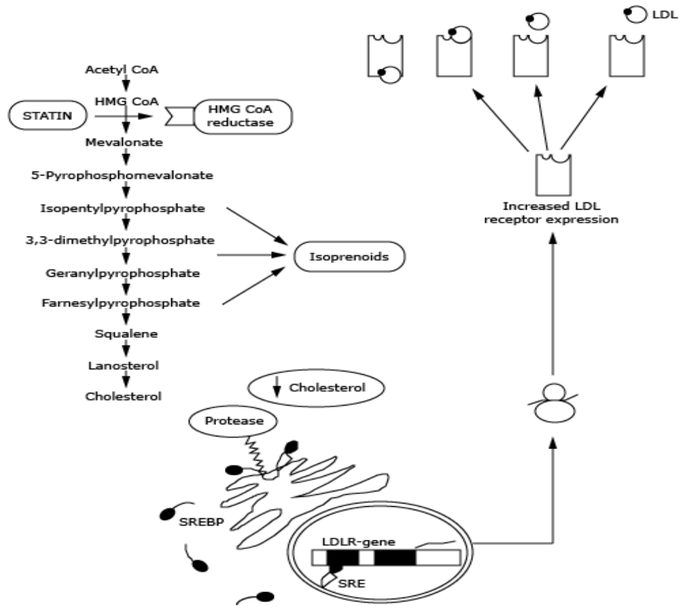


Điều trị RLLP ở BN ĐTĐ ngoài thuốc RLLP máu, cần tập trung kiểm soát tốt glucose máu, giảm thể tích mô mỡ đặc biệt mỡ nội tạng và chống viêm bên cạnh thay đổi lối sống

Diabetic dyslipidaemia: which drugs to use Vol. 19, N° 6 - 02 Dec 2020 (ESC)

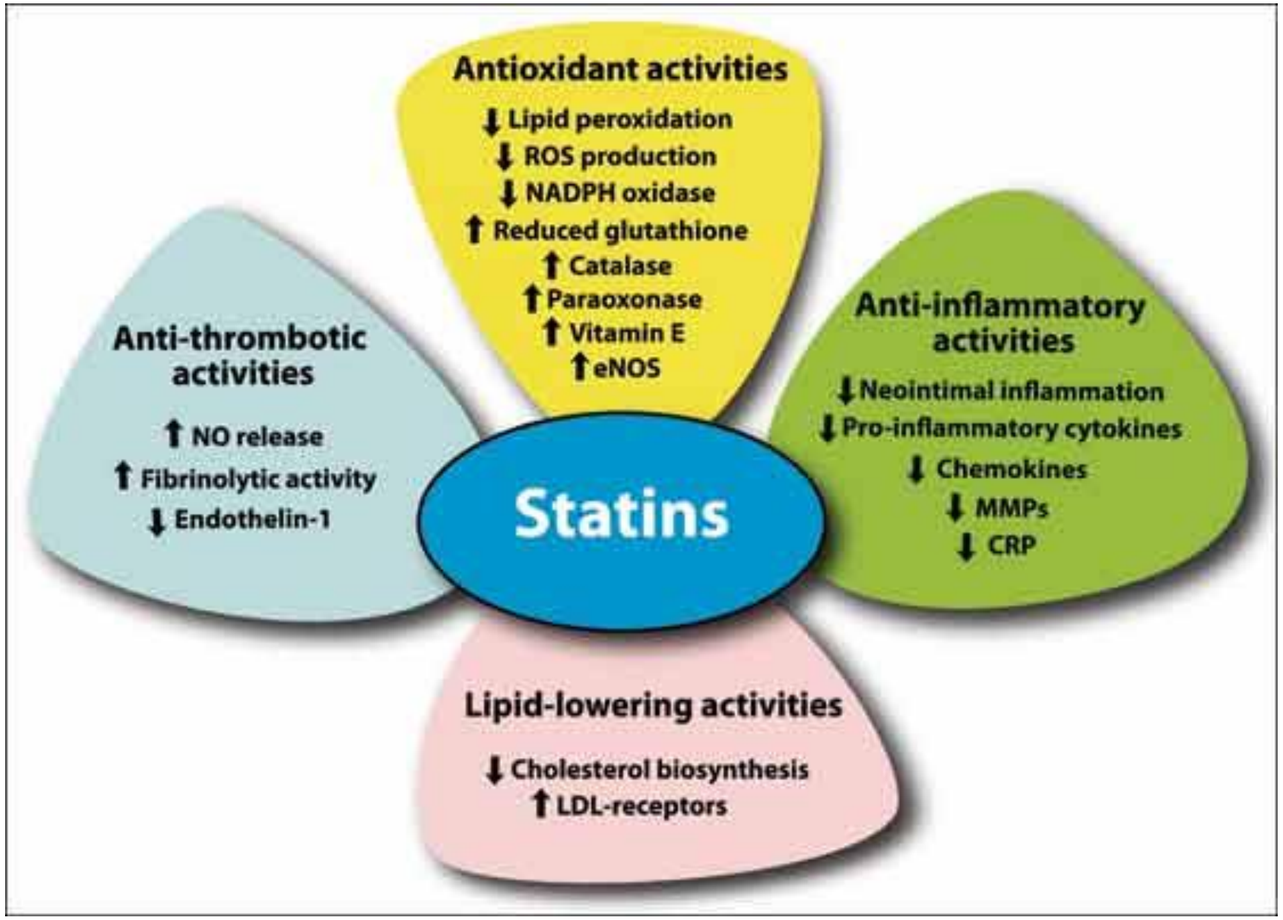
Cơ chế và tác dụng đa phương diện của statin

Statins and cholesterol synthesis



Inhibition of HMG CoA reductase reduces intracellular cholesterol levels; this activates a protease, which in turn cleaves SREBPs from the endoplasmic reticulum. The SREBPs translocate to the nucleus where they upregulate expression of the LDL receptor gene. Enhanced LDL receptor expression increases receptor-mediated endocytosis of LDL and thus lowers serum LDL. Inhibition of HMG CoA reductase also reduces intracellular levels of isoprenoids, which are intermediates in cholesterol biosynthesis.

HMG: hydroxymethylglutaryl; LDL: low-density lipoprotein; LDLR: LDL receptor; SRE: sterol regulatory element; SREBP: SRE binding proteins.



Adam Oesterle (2017) Pleiotropic Effects of Statins on the Cardiovascular System Circulation Research;120:229–243

Effect of antidiabetic drugs on lipoproteins

Diabetic dyslipidaemia: which drugs to use

Vol. 19, N° 6 - 02 Dec 2020 (ESC)

DRUG	TOTAL CHOLESTEROL	LDL	HDL	TRG
Metformin	- /0	-	0/+	- /0
DPP-4 inhibitors				
Sitagliptin	0	0	0/+	0
Vildagliptin	0	0	0/+	0
Saxagliptin	0	0	0	0
Linagliptin	0	0	0	0
GLP1 analogues				
Liraglutide	0	0	0	-
Exenatide	-/0	0/+	0/+	-
SGLT2 inhibitors				
Empaglifozin	0/+	0/+	0/+	-
Dapaglifozin	0/+	0/+	0/+	-/0
Canaglifozin	+	+	+	+
Insulin	-/0	-	0/+	-

DPP-4: dipeptidyl peptidase-4; GLP1: glucagon-like peptide-1; SGLT2: sodium/glucose cotransporter 2; LDL: low-density lipoprotein; HDL: high-density lipoprotein; TRG: triglyceride

0: no effect **+**: increase **-**: decrease

0/+: no effect or increase **-/0**: no effect or decrease

Tác động của SGLT2i lên quá trình chuyển hóa lipid

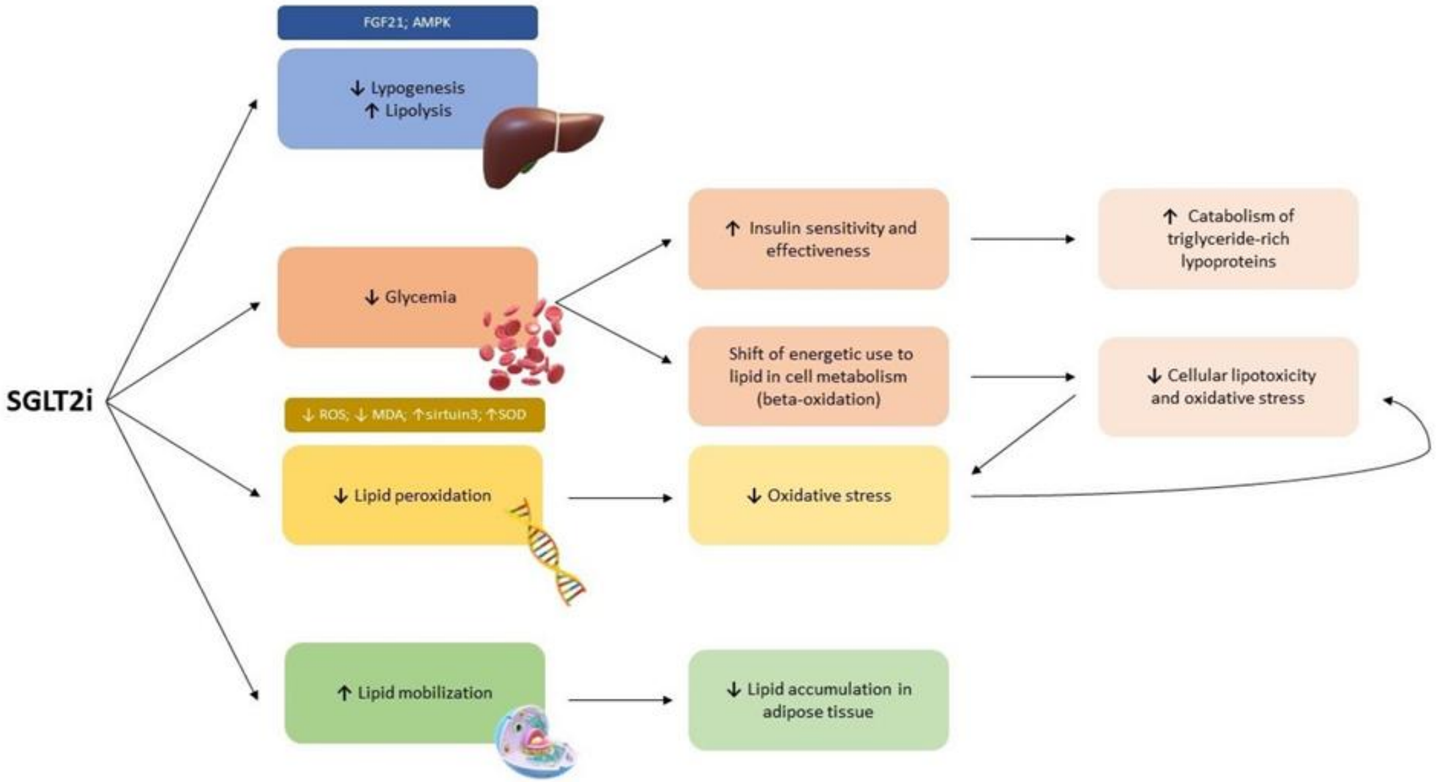


Figure 2. Modifications on lipid metabolism induced by SGLT2i. AMPK = adenosine monophosphate-activated protein kinase. FGF21 = fibroblast growth factor-21. MDA = malondialdehyde. ROS = reactive oxygen species. SOD = superoxide dismutase. SGLT2i = sodium glucose transporter 2 inhibitors. ↑ = raised. ↓ = reduced. oxygen species. SOD = superoxide dismutase. SGLT2i = sodium glucose transporter 2 inhibitors. = raised. = reduced

Int. J. Mol. Sci. 2023, 24, 10164. https://doi.org/10.3390/ijms241210164

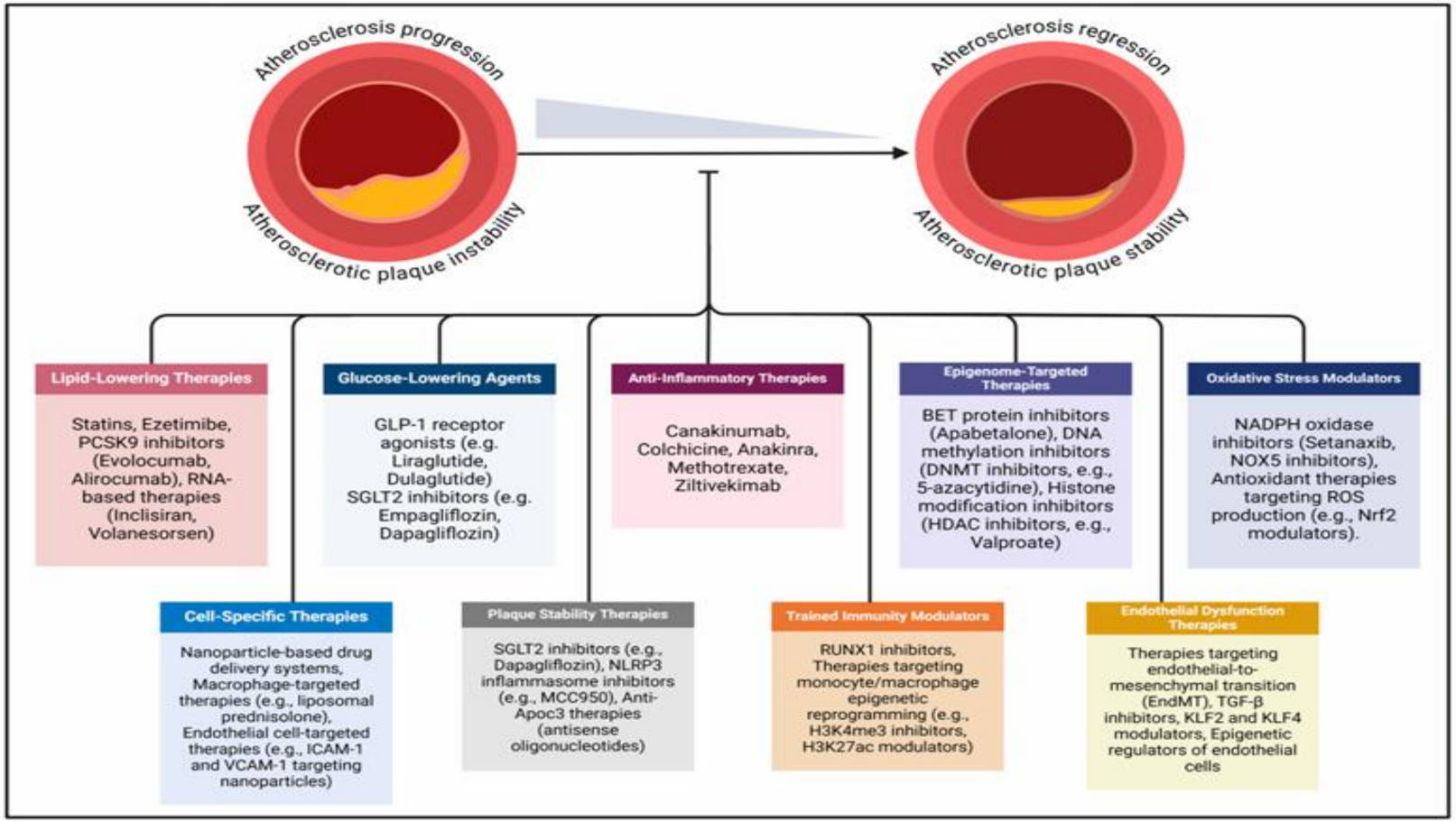
Tác động chống viêm của thuốc đái tháo đường

Metabolic and anti-inflammatory effects of modern antidiabetic preparations.

Group of Preparation	Mechanism of Action	Metabolic Effects	Anti-Inflammatory Effects
Sulfonylurea preparations	Bind to the sulfonylurea receptor (SUR) of ATP-sensitive potassium channel on pancreatic β cells	Enhance the release of insulin from the pancreatic islets	- Inhibit the NLRP3 inflammasome [142], decrease production of pro-inflammatory cytokines (IL-1β, IL-6, and TNF-α) [143]; - Inhibit AGEs-induced pro-inflammatory mediators (NO, reactive oxygen species, i-NOS) [143]; - Enhance production of anti-inflammatory cytokines (IL-10 and TGF-β) [143].
Biguanides	Block the breakdown of fatty acids through activation of AMP-dependent protein kinase	Reduce glucose production in liver by decreasing gluconeogenesis and stimulating glycolysis	- Activation of AMP-activated protein kinase (AMPK) [144,145]; - Inhibit mTOR and NF-κB pro-inflammatory signaling [145]; - Reduce inflammatory cytokines IL-6 and TNF-α [146].
PPAR agonists	Activate PPARα/γ/δ receptors	Enhance insulin effects, decrease insulin resistance, decrease dyslipidemia	- Downregulate the inflammatory pathway NF-κB [147]; - Regulate adipokine production and secretion [148]; - Inhibit of pro-inflammatory molecules in liver [149].
α-Glucosidase inhibitors	Inhibit enzymes in the small intestine	Prevent the absorption of glucose in the intestine	- Decrease TNF-α and other inflammatory mediators [150]; - Ameliorate vascular endothelial dysfunction [151]; - Decrease C-reactive protein (CRP) [151].
SGLT2 inhibitors	inhibit SGLT-2	Promote the excretion of glucose in the urine by inhibiting the reabsorption of glucose from the urine in the proximal tubules of the kidneys	- Improve endothelial function [12]; - Reduce inflammatory mediators IL-6, TNF-α, MCP-1, and CRP in plasma and liver [152]; - Inhibit NLRP3 inflammasome [153]; - Cause M2 macrophage polarization [153].
GLP-1 agonists (GLP-1RA)	Activate GLP-1 receptor	Increase insulin secretion in a glucose-dependent manner and suppress glucagon secretion	- Reduce production of IL-6, TNF-α, and MCP-1 in adipose tissue [154]; - Inhibit NF-κB and JNK pathways [155]; - Decrease CRP [154].
DPP-4 inhibitors	Inhibit DPP-4 receptor	Stimulate insulin secretion and decrease glucagon secretion, improve B-cell function and regeneration	- Reduce inflammatory cytokines IL-2, TNF-α, IL-1β, and IL-6 gene expression [156]; - Decrease NLRP3 inflammasome and TLR-4 activity [157]; - Suppress NF-κB activation [158].

Nedosugova, L.V.; Inflammatory Mechanisms of Diabetes and Its Vascular Complications. Biomedicines 2022, 10, 1168. https://doi.org/10.3390/biomedicines10051168

Emerging mechanism-based therapeutic strategies for diabetes-associated atherosclerosis are gaining attention due to limitations in current treatments for atherosclerotic cardiovascular disease



Karakasis, et al. Diabetes-Driven Atherosclerosis: Updated Mechanistic Insights and Novel Therapeutic Strategies. Int. J. Mol. Sci. 2025, 26, 2196. https:// doi.org/10.3390/ijms26052196

ESC European Society of Cardiology

European Heart Journal (2021) **00**, 1–2
doi:10.1093/eurheartj/ehab765

CARDIOPULSE

Braunwald's Corner

SGLT2 inhibitors: the statins of the 21st century

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A relatively small number of drugs have been responsible for major advances in medical practice. The discovery, development, and elucidation of the mechanisms of action of aspirin, penicillin, and statins are remarkable success stories, each with some surprises and each crowned by a Nobel Prize. The sodium glucose co-transporter inhibitors have been proven effective in the treatment of type 2 diabetes mellitus, various forms of heart failure, and kidney failure and represent *the, or one of the*, major pharmacological advances in cardiovascular medicine in the 21st century.

Kết luận

- Điều trị rối loạn lipid máu là một phần không thể tách rời trong quản lý toàn diện bệnh nhân đái tháo đường.
- Statin vẫn là nền tảng trong điều trị, nhưng cần cá thể hóa và phối hợp đa liệu pháp
- Kiểm soát đường huyết tốt góp phần cải thiện rối loạn lipid máu và giảm nguy cơ tim mạch đặc biệt khi sử dụng những thuốc đã được chứng minh lợi ích trên CaReMe ví dụ nhóm SGLT2i.