

2019 ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases

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- * CVD is principle comorbid condition and mortality in patients with DM**
- * cerebrovascular disease PAD, HF, AF**
- * CHD, CV mortality , two to fourfold**
- * Stroke \times 2 increase**
- * HF \times 2-5**
- * increased mortality and morbidity in HF**
- * AF increased**

ESC Classes of recommendations

	Definition	Wording to use
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended or is indicated
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy.	Should be considered
Class IIb	Usefulness/efficacy is less well established by evidence/opinion.	May be considered
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

ESC Levels of evidence

Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

CV risk categories in patients with DM

Very high-risk	Patients with DM and established CVD or other target organ damage ^a or three or more major risk factors ^b or early onset T1DM of long duration (>20 years)
High-risk	Patients with DM duration ≥ 10 years without target organ damage plus any other additional risk factor
Moderate-risk	Young patients (T1DM <35 years; T2DM <50 years) with DM duration <10 years, without other risk factors

^aProteinuria, renal impairment defined as eGFR < 30mL/min/1.73m², left ventricular hypertrophy, or retinopathy.

^bAge, hypertension, dyslipidaemia, smoking, obesity

Recommendations for lifestyle modifications in DM and pre-DM (1)

Recommendations	Class	Level
Smoking cessation guided by structured advice is recommended in all individuals with DM and pre-DM.	I	A
Lifestyle intervention is recommended to delay or prevent the conversion of pre-DM states, such as IGT, to T2DM.	I	A
Reduced calorie intake is recommended for lowering excessive body weight in individuals with pre-DM and DM.	I	A

Recommendations for lifestyle modifications in DM and pre-DM (2)

Recommendations	Class	Level
Moderate-to-vigorous physical activity, notably a combination of aerobic and resistance exercise, for ≥ 150 min/week is recommended for the prevention and control of DM, unless contraindicated, such as when there are severe comorbidities or a limited life expectancy.	I	A
A Mediterranean diet, rich in polyunsaturated and monounsaturated fats, should be considered to reduce CV events.	IIa	B
Vitamin or micronutrient supplementation to reduce the risk of DM or CVD in DM is not recommended.	III	B

Recommendations for glycaemic control in individuals with DM

Recommendations	Class	Level
It is recommended to apply tight glucose control, targeting a near-normal HbA1c (<7.0% or <53 mmol/mol), to decrease microvascular complications in DM.	I	A
It is recommended that HbA1c targets are individualized according to duration of DM, comorbidities, and age.	I	C
Avoidance of hypoglycaemia is recommended.	I	C
The use of structured self-monitoring of blood glucose and/or continuous glucose monitoring should be considered to facilitate optimal glycaemic control.	IIa	A
An HbA1c target of <7.0% (or <53 mmol/mol) should be considered for the prevention of macrovascular complications in individuals with DM.	IIa	C

Recommendations for the management of BP in patients with DM and pre-DM (1)

Recommendations	Class	Level
Treatment targets		
Antihypertensive drug treatment is recommended for people with DM when office BP is >140/90 mmHg.	I	A
It is recommended that patients with hypertension and DM are treated in an individualized manner. The BP goal is to target SBP to 130 mmHg and <130 mmHg if tolerated, but not <120 mmHg. In older people (aged >65 years), the SBP goal is to a range of 130 - 139 mmHg.	I	A
It is recommended to target DBP <80 mmHg, but not <70 mmHg.	I	C
An on-treatment SBP of <130 mmHg may be considered in patients at particularly high risk of a cerebrovascular event, such as those with a history of stroke.	IIb	C

Recommendations for the management of BP in patients with DM and pre-DM (2)

Recommendations	Class	Level
Treatment and evaluation		
Lifestyle changes (weight loss if overweight, physical activity, alcohol restriction, sodium restriction, and increased consumption of fruits [e.g. 2–3 servings], vegetables [e.g. 2–3 servings], and low-fat dairy products) are recommended in patients with DM and pre-DM with hypertension.	I	A
A RAAS blocker (ACEI or ARB) is recommended in the treatment of hypertension in DM, particularly in the presence of microalbuminuria, albuminuria, proteinuria, or LV hypertrophy.	I	A

Recommendations for the management of BP in patients with DM and pre-DM (3)

Recommendations	Class	Level
Treatment and evaluation		
It is recommended that treatment is initiated with a combination of a RAAS blocker with a calcium channel blocker or thiazide/thiazide-like diuretic.	I	A
In patients with IFG or IGT, RAAS blockers should be preferred to beta-blockers or diuretics to reduce the risk of new-onset DM.	IIa	A
The effects of GLP1-RAs and SGLT2 inhibitor on BP should be considered.	IIa	C

Recommendations for the management of BP in patients with DM and pre-DM (4)

Recommendations	Class	Level
Treatment and evaluation		
Home BP self-monitoring should be considered in patients with DM on antihypertensive treatments to check that their BP is appropriately controlled.	IIa	C
24-h ABPM should be considered to assess abnormal 24-h BP patterns and adjust antihypertensive treatment.	IIa	C

Recommendations for the management of dyslipidaemia with lipid-lowering drugs (1)

Recommendations	Class	Level
Targets		
In patients with T2DM at moderate CV risk, an LDL-C target of <2.6 mmol/L (<100 mg/dL) is recommended.	I	A
In patients with T2DM at high CV risk, an LDL-C target of <1.8 mmol/L (<70 mg/dL) and LDL-C reduction of at least 50% is recommended.	I	A
In patients with T2DM at very high CV risk, an LDL-C target of <1.4 mmol/L (<55 mg/dL) and LDL-C reduction of at least 50% is	I	B
In patients with T2DM, a secondary goal of a non-HDL-C target of <2.2 mmol/L (<85 mg/dL) in very high CV risk patients, and <2.6 mmol/L (<100 mg/dL) in high CV risk patients, is recommended.	I	B

Recommendations for the management of dyslipidaemia with lipid-lowering drugs (2)

Recommendations	Class	Level
Treatment		
Statins are recommended as the first-choice lipid-lowering treatment in patients with DM and high LDL-C levels: administration of statins is defined based on the CV risk profile of the patient and the recommended LDL-C (or non-HDL-C) target levels.	I	A
If the target LDL-C is not reached, combination therapy with ezetimibe is recommended.	I	B
In patients at very high CV risk, with persistent high LDL-C despite treatment with maximum tolerated statin dose, in combination with ezetimibe or in patients with statin intolerance, a PCSK9 inhibitor is recommended.	I	A

Recommendations for the management of dyslipidaemia with lipid-lowering drugs (3)

Recommendations	Class	Level
Treatment		
Lifestyle intervention (with a focus on weight reduction and decreased consumption of fast-absorbed carbohydrates and alcohol) and fibrates should be considered in patients with low HDL-C and high triglyceride levels.	IIa	B
Intensification of statin therapy should be considered before the introduction of combination therapy.	IIa	C

Recommendations for the management of dyslipidaemia with lipid-lowering drugs (4)

Recommendations	Class	Level
Treatment		
Statins should be considered in patients with T1DM at high CV risk irrespective of the baseline LDL-C level.	IIa	A
Statins may be considered in asymptomatic patients with T1DM beyond the age of 30 years.	IIb	C
Statins are not recommended in women of child-bearing potential.	III	A

Recommendations for antiplatelet therapy in primary prevention in DM

Recommendations	Class	Level
In patients with DM at high/very high risk, aspirin (75–100 mg/day) may be considered in primary prevention in the absence of clear contraindications.	IIb	A
In patients with DM at moderate CV risk, aspirin for primary prevention is not recommended.	III	B
Gastric protection		
When low-dose aspirin is used, proton pump inhibitors should be considered to prevent gastrointestinal bleeding.	IIa	A

Summary of treatment targets for managing patients with DM (1)

Risk factor	Target
BP	<ul style="list-style-type: none">• Target SBP 130 mmHg for most adults, <130 mmHg if tolerated, but not <120 mmHg• Less stringent targets, SBP 130–139 in older patients (>65 years)
Glycaemic control HbA1c	<ul style="list-style-type: none">• HbA1c target for most adults is <7.0% (<53 mmol/mol)• More stringent HbA1c goals of <6.5% (48 mmol/mol) may be suggested on a personalized basis if this can be achieved without significant hypoglycaemia or other adverse effects of treatment• Less stringent HbA1c goals of <8% (64 mmol/mol) or up to 9% (75 mmol/mol) may be adequate for elderly patients.

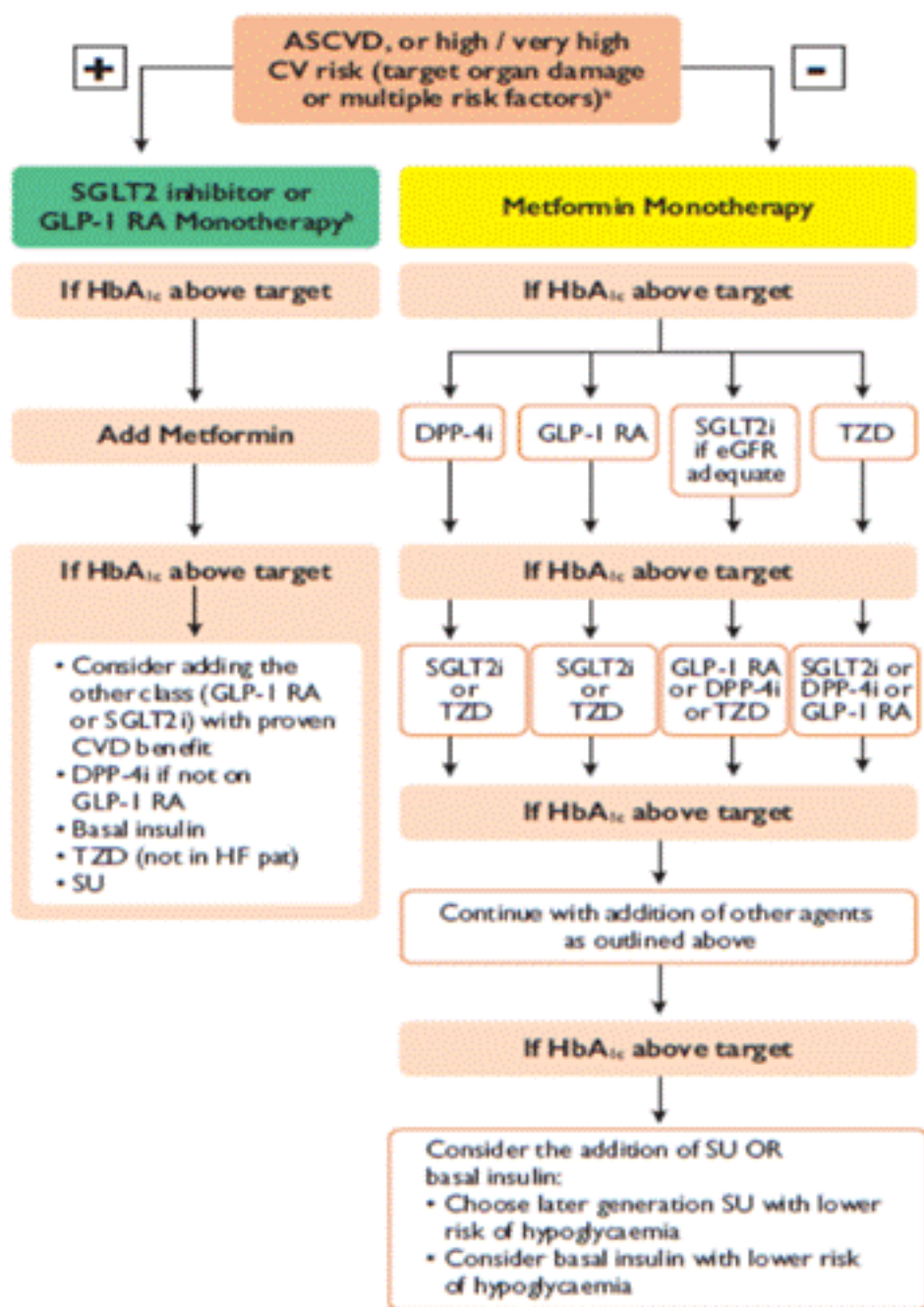
Summary of treatment targets for managing patients with DM (2)

Risk factor	Target
Lipid profile LDL-C	<ul style="list-style-type: none">• In patients with DM at very high CV risk, target LDL-C to <1.4 mmol/L (<55 mg/dL) and LDL-C reduction of at least 50%.• In patients with DM at high risk, target LDL-C to <1.8 mmol/L (<70 mg/dL) and LDL-C reduction of at least 50%.• In patients with DM at moderate CV risk aim for an LDL-C target of LDL-C <2.6 mmol/L (<100 mg/dL).
Platelet inhibition	In DM patients at high/very high CV risk
Smoking	Cessation obligatory

Summary of treatment targets for managing patients with DM (3)

Risk factor	Target
Physical activity	Moderate to vigorous, ≥ 150 min/week, combined aerobic and resistance training.
Weight	Aim for weight stabilization in overweight or obese patients with DM, based on calorie balance, and weight reduction in subjects with IGT, to prevent development of DM.
Dietary habits	Reduction in caloric intake is recommended in obese patients with T2DM to lower body weight; there is no ideal percentage of calories from carbohydrate, protein, and fat for all people with DM.

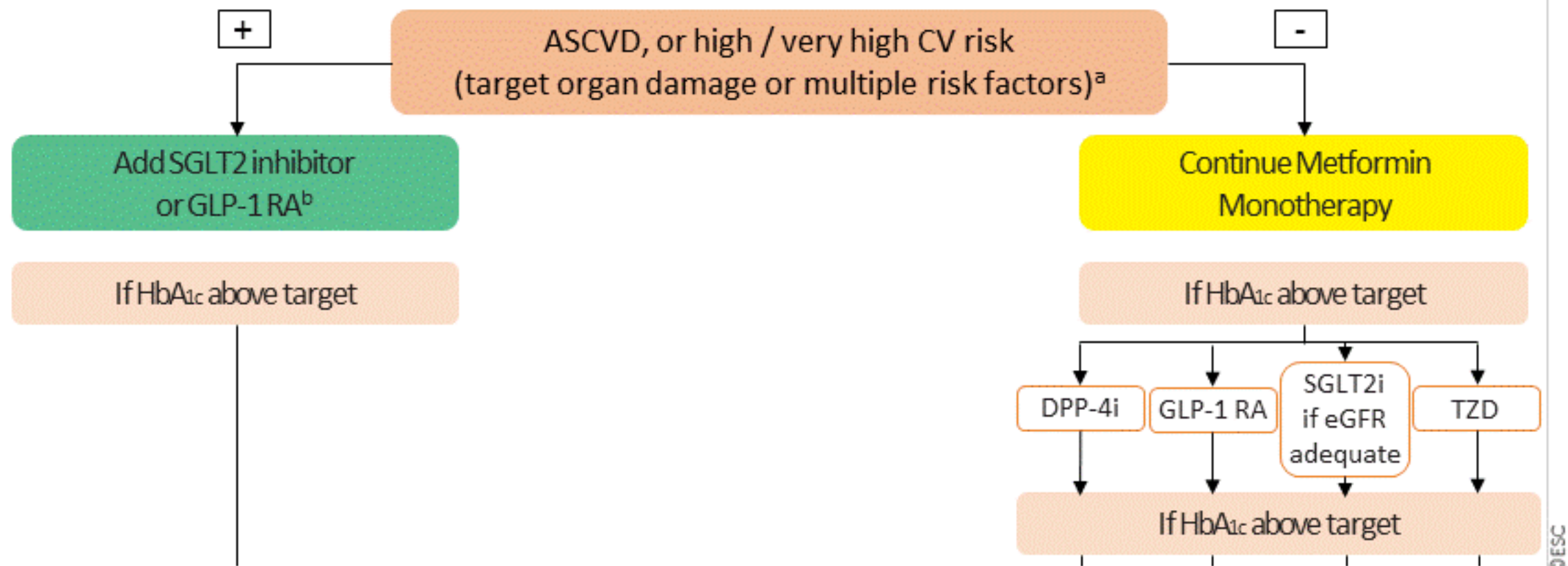
A Type 2 DM - Drug naïve patients



Treatment algorithm in patients with T2DM and ASCVD or high/very high CV risk - drug naïve

Treatment algorithm in patients with T2DM and ASCVD or high/very high CV risk - metformin treated (1)

b) Type 2 DM - On metformin



Recommendations for glucose-lowering treatment in DM (1)

Recommendations	Class	Level
SGLT2 inhibitors		
Empagliflozin, canagliflozin, or dapagliflozin are recommended in patients with T2DM and CVD or at very high/high CV risk to reduce CV events.	I	A
Empagliflozin is recommended in patients with T2DM and CVD to reduce the risk of death.	I	B

Recommendations for glucose-lowering treatment in DM (2)

Recommendations	Class	Level
GLP1-RAs		
Liraglutide, semaglutide or dulaglutide are recommended in patients with T2DM and CVD or at very high/high CV risk to reduce CV events.	I	A
Liraglutide is recommended in patients with T2DM and CVD or at very high/high CV risk to reduce the risk of death.	I	B

Recommendations for glucose-lowering treatment in DM (3)

Recommendations	Class	Level
Biguanides		
Metformin should be considered in overweight patients with T2DM without CVD and at moderate CV risk.	IIa	C
Insulin		
Insulin-based glycaemic control should be considered in patients with ACS with significant hyperglycaemia (>10 mmol/L or >180 mg/dL), with the target adapted according to comorbidities.	IIa	C

Recommendations for glucose-lowering treatment in DM (4)

Recommendations	Class	Level
Thiazolidinediones		
Thiazolidinediones are not recommended in patients with HF.	III	A
DPP4 inhibitors		
Saxagliptin is not recommended in patients with T2DM and a high-risk of HF.	III	B

Recommendations for the management of patients with DM and ACS or CCS (1)


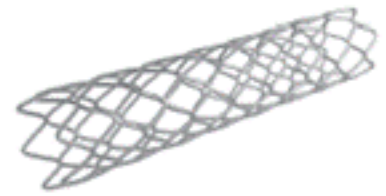
Recommendations	Class	Level
ACEIs or ARBs are indicated in patients with DM and CAD to reduce the risk of CV events.	I	A
Statin therapy is recommended in patients with DM and CAD to reduce the risk of CV events.	I	A
Aspirin at a dose of 75–160 mg/day is recommended as secondary prevention in DM.	I	A
Treatment with a P2Y ₁₂ receptor blocker, ticagrelor or prasugrel, is recommended in patients with DM and ACS for 1 year with aspirin, and in those who undergo PCI or CABG.	I	A

Recommendations for the management of patients with DM and ACS or CCS (2)

Recommendations	Class	Level
Concomitant use of a proton pump inhibitor is recommended in patients receiving DAPT or oral anticoagulant monotherapy who are at high risk of gastrointestinal bleeding.	I	A
Clopidogrel is recommended as an alternative antiplatelet therapy in case of aspirin intolerance.	I	B
Prolongation of DAPT beyond 12 months should be considered, for up to 3 years, in patients with DM who have tolerated DAPT without major bleeding complications.	IIa	A

Recommendations for the management of patients with DM and ACS or CCS (3)

Recommendations	Class	Level
The addition of a second antithrombotic drug on top of aspirin for long-term secondary prevention should be considered in patients without high bleeding risk.	IIa	A
Beta-blockers may be considered in patients with DM and CAD.	IIb	B

CABG	PCI
	
1-vessel or 2-vessel CAD, no proximal LAD	
1-vessel or 2-vessel CAD, proximal LAD	
3-vessel CAD	
Low complexity	
Intermediate or high complexity	
Left main CAD	
Low complexity	
Intermediate complexity	
High complexity	
Class I	Class IIa
Class IIb	Class III

Recommendations for coronary revascularization

2019 new recommendations (7)

Revascularization

Same revascularization techniques are recommended in patients with and without DM

Treatment of HF in DM

Device therapy with an ICD, CRT, or CRT-D is recommended

Sacubitril/valsartan instead of ACEIs is recommended in HFrEF and DM remaining symptomatic despite treatment with ACEIs, beta-blockers, and mineralocorticoid receptor antagonists

CABG is recommended in HFrEF and DM and two- or three-vessel CAD

Ivabradine should be considered in patients with HF and DM in sinus rhythm and with a resting heart rate ≥ 70 beats per minute if symptomatic despite full HF treatment

Aliskiren (direct renin inhibitor) in HFrEF and DM is not recommended



**THANK YOU
FOR YOUR
ATTENTION**

Change in recommendations (3)

2013	2019
Antiplatelet therapy	
Aspirin for primary prevention is not recommended in DM at low CVD risk	Aspirin (75–100 mg/day) for primary prevention may be considered in patients with DM at very high/high risk in the absence of clear contraindications
	Aspirin for primary prevention is not recommended in patients with DM at moderate CV risk

Change in recommendations (1)

2013	2019
BP targets	
BP target <140/85 mmHg is recommended for all	<p>Individualized BP targets are recommended SBP to 130 mmHg and, if well tolerated, <130 mmHg, but not <120 mmHg In older people (>65 years) target SBP to a range of 130–139 mmHg DBP to <80 mmHg but not <70 mmHg</p> <p>On-treatment SBP to <130 mmHg should be considered for patients at high risk of cerebrovascular events or diabetic kidney disease</p>

Change in recommendations (4)

2013	2019
Glucose-lowering treatment	
Metformin should be considered as first-line therapy in patients with DM	Metformin should be considered in overweight patients with T2DM without CVD and at moderate CV risk
Revascularization	
DES rather than BMS is recommended in DM	Same techniques are recommended in patients with and without DM (see 2018 ESC/EACTS myocardial revascularization guidelines)

Change in recommendations (5)

2013	2019
Revascularization	
PCI may be considered as an alternative to CABG in patients with DM and less complex CAD (SYNTAX score ≤ 22)	One- or two-vessel CAD, no proximal LAD
	CABG (orange) PCI (green)
	One- or two-vessel CAD, proximal LAD
	CABG (green) PCI (green)
	Three-vessel CAD, low complexity
CABG (green) PCI (orange)	
Left main CAD, low complexity	
CABG (green) PCI (green)	

Change in recommendations (6)

2013	2019
Revascularization	
CABG recommended in complex CAD (SYNTAX score >22)	Three-vessel CAD, intermediate or high complexity
	CABG (green) PCI (red)
	Left main CAD, intermediate complexity
	CABG (green) PCI (yellow)
High complexity	
CABG (green) PCI (red)	

Change in recommendations (7)

Management of arrhythmias

Oral anticoagulation in AF (paroxysmal or persistent)

VKAs or NOACs (e.g. dabigatran, rivaroxaban, or apixaban) are recommended

It is recommended to give preference to NOACs (e.g. dabigatran, rivaroxaban, apixaban, or edoxaban)

2019 new recommendations (1)

CV risk assessment

Resting ECG is recommended in patients with DM with hypertension or suspected CVD

Carotid or femoral ultrasound should be considered for plaque detection as CV risk modifier

Screening for CAD with coronary CT angiography and functional imaging may be considered

CAC scoring may be considered as risk modifier

ABI may be considered as risk modifier

Carotid ultrasound intima-media thickness for CV risk is not recommended

2019 new recommendations (2)

Prevention of CVD

Lifestyle intervention is recommended to delay/prevent conversion from pre-DM to T2DM

Glycaemic control

Use of self-monitoring of blood glucose should be considered to facilitate optimal glycaemic control in T2DM

It is recommended to avoid hypoglycaemia

2019 new recommendations (3)

BP management

Lifestyle changes are recommended in hypertension

RAAS blockers rather than beta-blockers/diuretics are recommended for BP control in pre-DM

It is recommended to initiate pharmacological treatment with the combination of a RAAS blocker with a calcium-channel blocker or thiazide/thiazide-like diuretic

Home BP self-monitoring should be considered in patients with DM

24-h ABPM should be considered for BP assessment, and adjustment of antihypertensive treatment

2019 new recommendations (4)

Dyslipidaemia

In patients at very high-risk, with persistent high LDL-C despite treatment with maximum tolerated statin dose in combination with ezetimibe or in patients with intolerance to statins, a PCSK9 inhibitor is recommended

Statins may be considered in asymptomatic patients with T1DM aged >30 years

Statins are not recommended in women of childbearing potential.

2019 new recommendations (5)

Antiplatelet and antithrombotic drugs

Concomitant use of a proton pump inhibitor is recommended in patients receiving aspirin monotherapy, DAPT, or oral anticoagulant monotherapy who are at high risk of gastrointestinal bleeding

Prolongation of DAPT beyond 12 months should be considered for up to 3 years in patients with DM at very high risk who have tolerated DAPT without major bleeding complications

2019 new recommendations (6)

Glucose-lowering treatment

Empagliflozin, canagliflozin, or dapagliflozin are recommended in patients with T2DM and CVD or at very high/high CV risk to reduce CV events

Empagliflozin is recommended in patients with T2DM and CVD to reduce the risk of death

Liraglutide, semaglutide or dulaglutide are recommended in patients with T2DM and CVD or very high/ high CV risk to reduce CV events

Liraglutide is recommended in patients with T2DM and CVD or at very high/high CV risk to reduce the risk of death

Saxagliptin is not recommended in patients with T2DM and a high risk of HF

2019 new recommendations (7)

Revascularization

Same revascularization techniques are recommended in patients with and without DM

Treatment of HF in DM

Device therapy with an ICD, CRT, or CRT-D is recommended

Sacubitril/valsartan instead of ACEIs is recommended in HFrEF and DM remaining symptomatic despite treatment with ACEIs, beta-blockers, and mineralocorticoid receptor antagonists

CABG is recommended in HFrEF and DM and two- or three-vessel CAD

Ivabradine should be considered in patients with HF and DM in sinus rhythm and with a resting heart rate ≥ 70 beats per minute if symptomatic despite full HF treatment

Aliskiren (direct renin inhibitor) in HFrEF and DM is not recommended

2019 new recommendations (9)

DM treatment to reduce HF risk

SGLT2 inhibitors (empagliflozin, canagliflozin, and dapagliflozin) are recommended to lower risk of HF hospitalization if eGFR >30 mL/min/1.73 m²

Metformin should be considered in patients with DM and HF if eGFR >30 mL/min/1.73 m²

GLP1-RAs and DPP4 inhibitors sitagliptin and linagliptin have a neutral effect on risk of HF and may be considered

Insulin treatment in HF may be considered

DPP4 inhibitor saxagliptin in HF is not recommended

Thiazolidinediones (pioglitazone, rosiglitazone) in HF is not recommended

2019 new recommendations (10)

Management of arrhythmias

Attempts to diagnose structural heart disease should be considered in patients with DM with frequent premature ventricular contractions

Hypoglycaemia should be avoided as it can trigger arrhythmias

Diagnosis and management of PAD

Low-dose rivaroxaban 2.5 mg twice daily plus aspirin 100 mg once daily may be considered in patients with DM and symptomatic LEAD

Management of CKD

SGLT2 inhibitors are recommended to reduce progression of diabetic kidney disease

2019 revised concepts (1)

Risk assessment in DM and pre-DM

Classification of CV risk (moderate to very high risk) adapted from the 2016 ESC Guidelines on CVD prevention in clinical practice to the DM setting

Lifestyle

Moderate alcohol intake should not be promoted as a means to protect against CVD

BP control

Detailed recommendations for individualized BP targets are now provided

2019 revised concepts (2)

Glucose-lowering treatment (a paradigm shift after recent CVOTs)

For the first time we have evidence from several CVOTs that indicate CV benefits from the use of SGLT2 inhibitors and GLP1-RAs in patients with CVD or at very high/high CV risk

Revascularization

The recommendations have been extended following the addition of several RCTs, and the choice between CABG and PCI depends on the complexity of the CAD

HF

Treatment recommendations have been updated following positive results from CVOTs

2019 revised concepts (3)

PAD

New evidence on diagnostic methods and management

CKD

A CKD classification by eGFR and albuminuria is presented to stratify severity of disease and guide treatment