

2019 ESC Guidelines on the diagnosis and management of chronic coronary syndromes

New data and evidence that have impacted on CCS guidelines

The Guidelines have been revised to focus on Chronic Coronary Syndromes (CCS) instead of stable CAD.

The prevalence of CAD in symptomatic population has decreased leading to lower pre-test probability of disease. This has major impact on the use of diagnostic testing.

Imaging has advanced – both anatomy and function are available invasively and non-invasively. The role of CT is increasing.

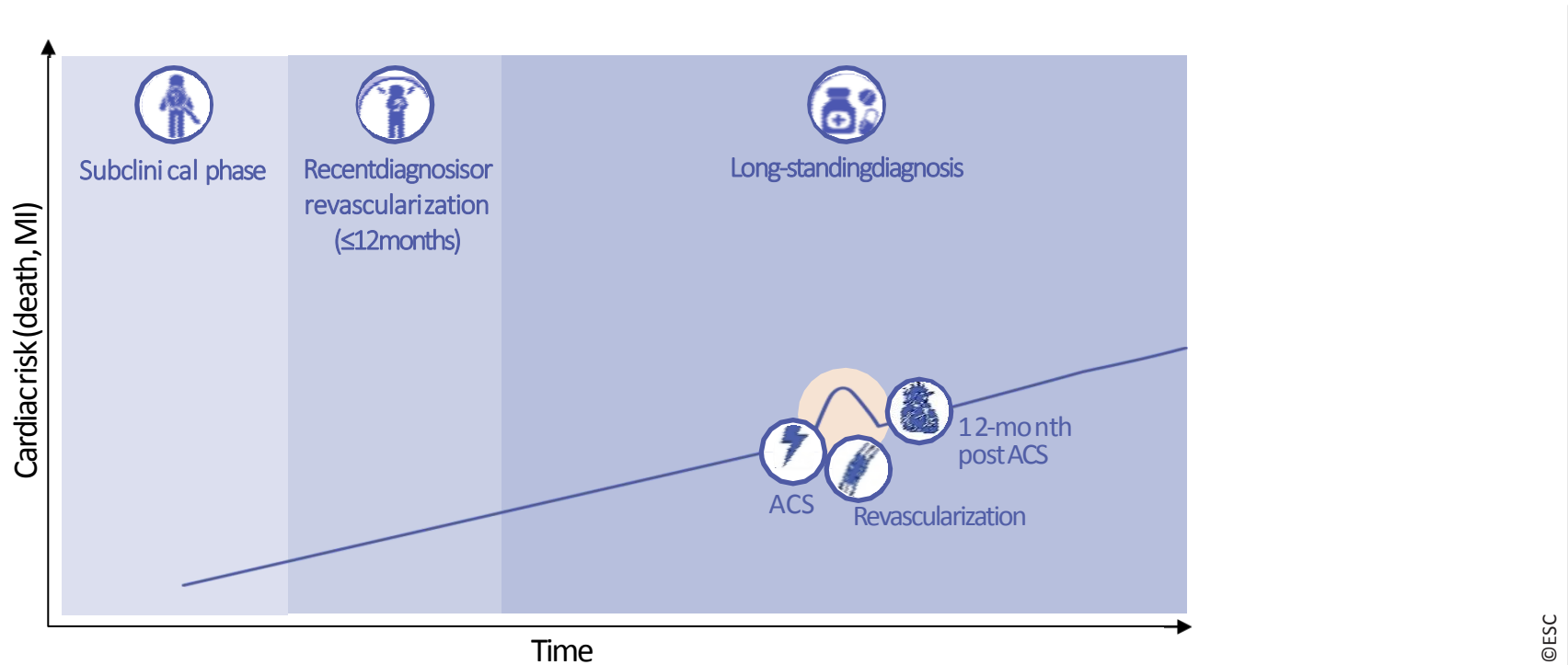
New evidence on intensified antithrombotic therapy.

Revascularization has prognostic impact on prevention of MI.

New antidiabetic drugs for patients with diabetes and CAD.

Natural history of chronic coronary syndromes

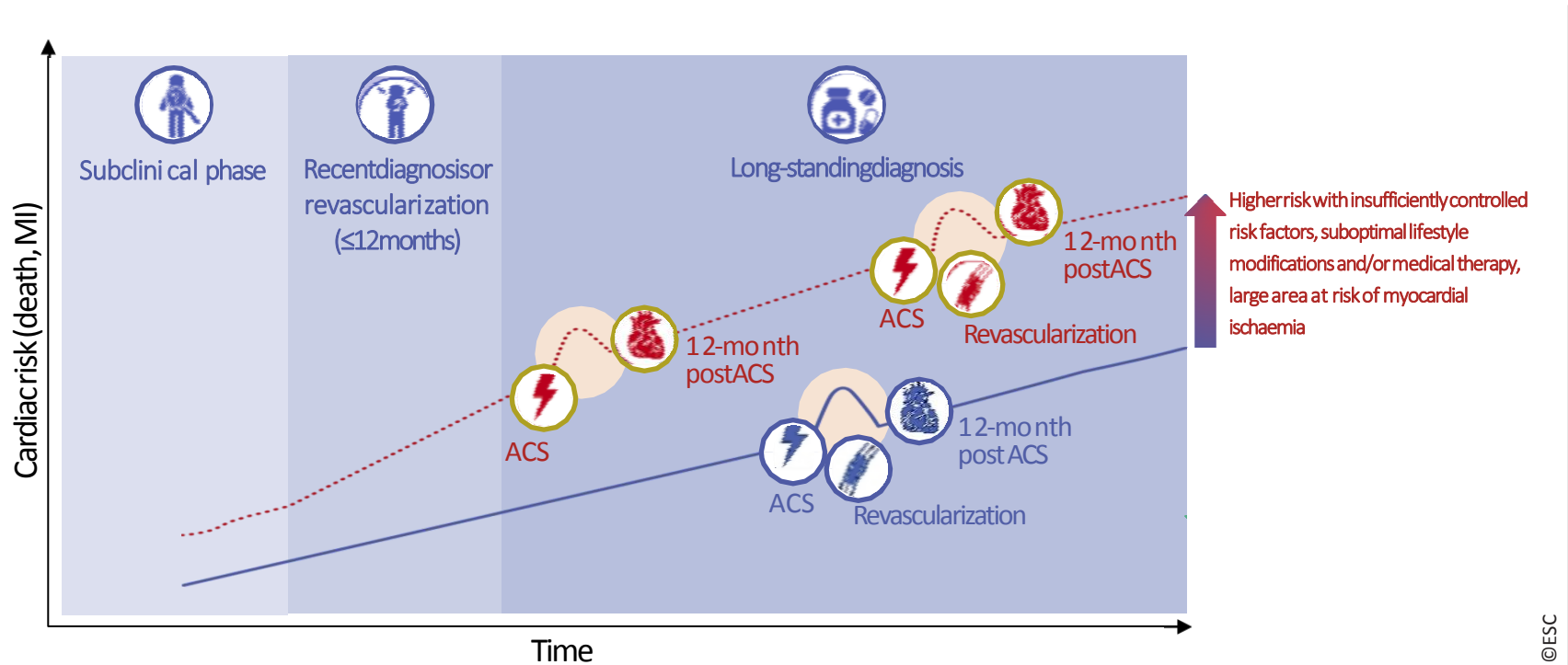
A dynamic process



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Natural history of chronic coronary syndromes

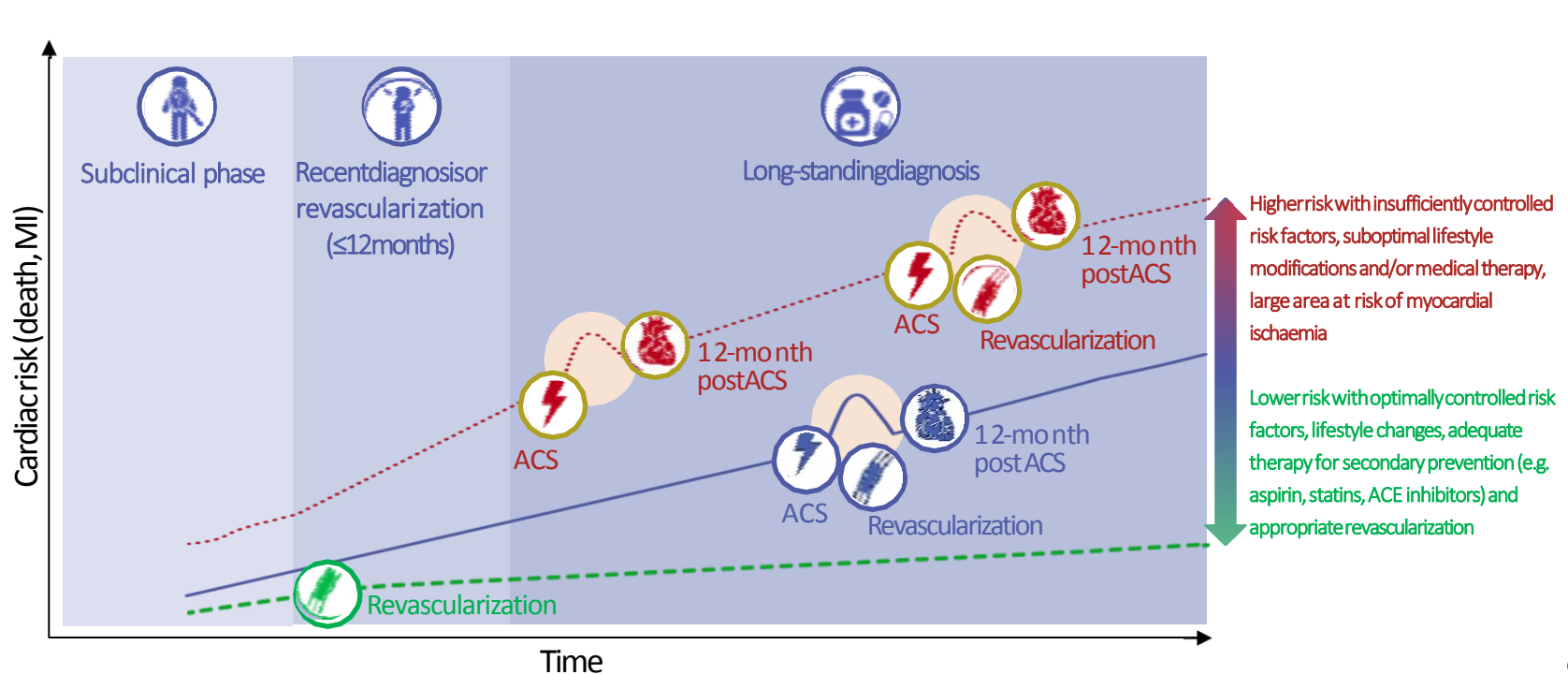
A dynamic process



Natural history of chronic coronary syndromes

A dynamic process

From recent to long-standing diagnosis of CCS



Chronic coronary syndromes

Six common scenarios at outpatient clinics



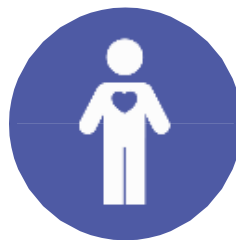
Patients with suspected CAD and 'stable' anginal symptoms, and/or dyspnoea



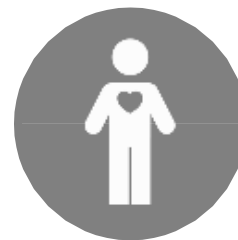
Patients with new onset of HF or LV dysfunction and suspected CAD



Patients with stabilized symptoms <1 year after an ACS or patients with recent revascularization



Patients >1 year after initial diagnosis or revascularization



Patients with angina and suspected vasospastic or microvascular disease



Asymptomatic subjects in whom CAD is detected at screening

What is new in the 2019 Guidelines?

New recommendations (1)

Basic testing, diagnostics, and risk assessment

Non-invasive functional imaging or coronary CTA as the initial test for diagnosing CAD.

Initial non-invasive diagnostic test based on the clinical likelihood of CAD, patient characteristics, local expertise and availability.

Functional imaging for myocardial ischaemia if coronary CTA has shown CAD of uncertain functional significance or is not diagnostic.

Invasive angiography to diagnose CAD in patients with high clinical likelihood and severe symptoms refractory to medical therapy

typical angina at low level of exercise and clinical evaluation that indicates high event risk.

Invasive functional assessment must be available and used to evaluate stenoses before revascularization, unless very high grade (>90% diameter stenosis).

Invasive coronary angiography with availability of invasive functional evaluation for confirmation of CAD diagnosis in patients with uncertain diagnosis on non-invasive testing.

Coronary CTA as an alternative to invasive angiography if another non-invasive test is equivocal or non-diagnostic.

Coronary CTA when any conditions make good image quality unlikely.

What is new in the 2019 Guidelines?

New recommendations (2)

Antithrombotic therapy in patients with CCS and sinus rhythm	Antithrombotic therapy in patients with CCS and atrial fibrillation	Antithrombotic therapy in post-PCI patients with indication for OAC
Adding a second antithrombotic drug to aspirin for long-term secondary prevention in patients with high-risk of ischaemic events and without high bleeding risk.	NOAC is recommended in preference to a VKA.	Full dose NOAC is recommended in preference to a VKA.
	Long-term OAC therapy in patients with AF and a CHA ₂ DS ₂ -VASc score ≥2 in males and ≥3 in females.	Rivaroxaban 15 mg over 20 mg. Dabigatran 110 mg over 150 mg. Early cessation (≤1 week) of aspirin.
Adding a second antithrombotic drug to aspirin for long-term secondary prevention in patients with at least a moderately increased risk of ischaemic events and without high bleeding risk.	Long-term OAC therapy in patients with AF and a CHA ₂ DS ₂ -VASc score 1 in males and 2 in females.	Triple therapy for 1 to 6 months.
		INR 2.0-2.5 and TTR >70% if VKA.
		Dual therapy with prasugrel or ticagrelor over clopidogrel.

■ Class I
 ■ Class IIa
 ■ Class IIb
 ■ Class III

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What is new in the 2019 Guidelines?

New recommendations (3)

Other pharmacological therapy

Screening for CAD in asymptomatic subjects

A PPI in patients receiving aspirin monotherapy, DAPT, or OAC monotherapy who are at high risk of gastrointestinal bleeding.	A sodium-glucose co-transporter-2 inhibitors in patients with diabetes mellitus and CVD	Carotid ultrasound IMT for cardiovascular risk assessment is not recommended.
Ezetimibe if lipid goals not achieved with statins	A glucagon-like peptide-1 receptor agonist in patients with diabetes mellitus and CVD	Treatment options for refractory angina
A PCSK9 inhibitor in patients at very high risk who do not achieve lipid goals with statins and ezetimibe	ACE inhibitors in patients at very high risk of cardiovascular adverse events	Coronary sinus constriction for debilitating angina refractory to optimal medical and revascularization strategies.

■ Class I ■ Class IIa ■ Class IIb ■ Class III

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What is new in the 2019 Guidelines?

Changes in major recommendations (1)

2013

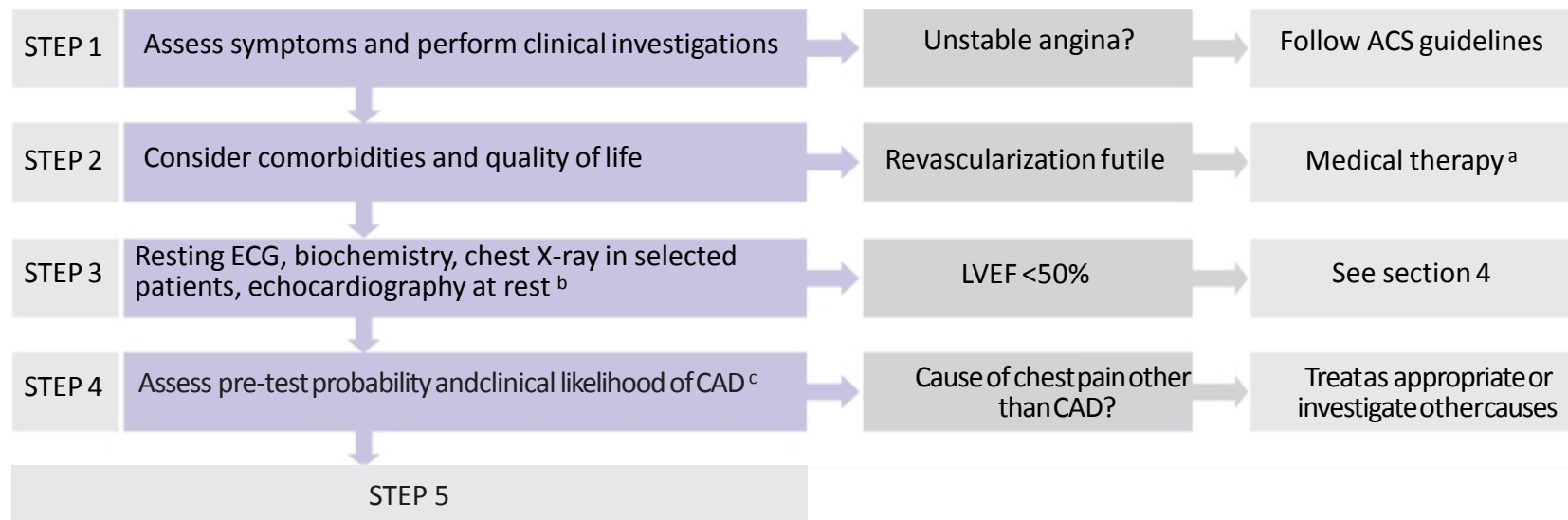
2019

Exercise ECG for diagnosis of stable CAD in patients with intermediate PTP.	I	Exercise ECG for risk assessment.	I
		Exercise ECG to rule-in or rule-out CAD.	IIb
Exercise ECG to evaluate control of symptoms and ischaemia.	IIa	Exercise ECG to evaluate control of symptoms and ischaemia.	IIb
For second-line treatment add long-acting nitrates, ivabradine, nicorandil, or ranolazine.	IIa	Long-acting nitrates for second-line treatment after attempts with BB and/or a non-DHP-CCB	IIa
For second-line treatment, add trimetazidine.	IIb	Nicorandil, ranolazine, ivabradine, or trimetazidine for second-line treatment after attempts with BB, CCB and long-acting nitrates.	IIa
		Combination of a BB or a CCB with second-line drugs as a first-line treatment.	IIb

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Patients with angina and/or dyspnoea and suspected coronary artery disease

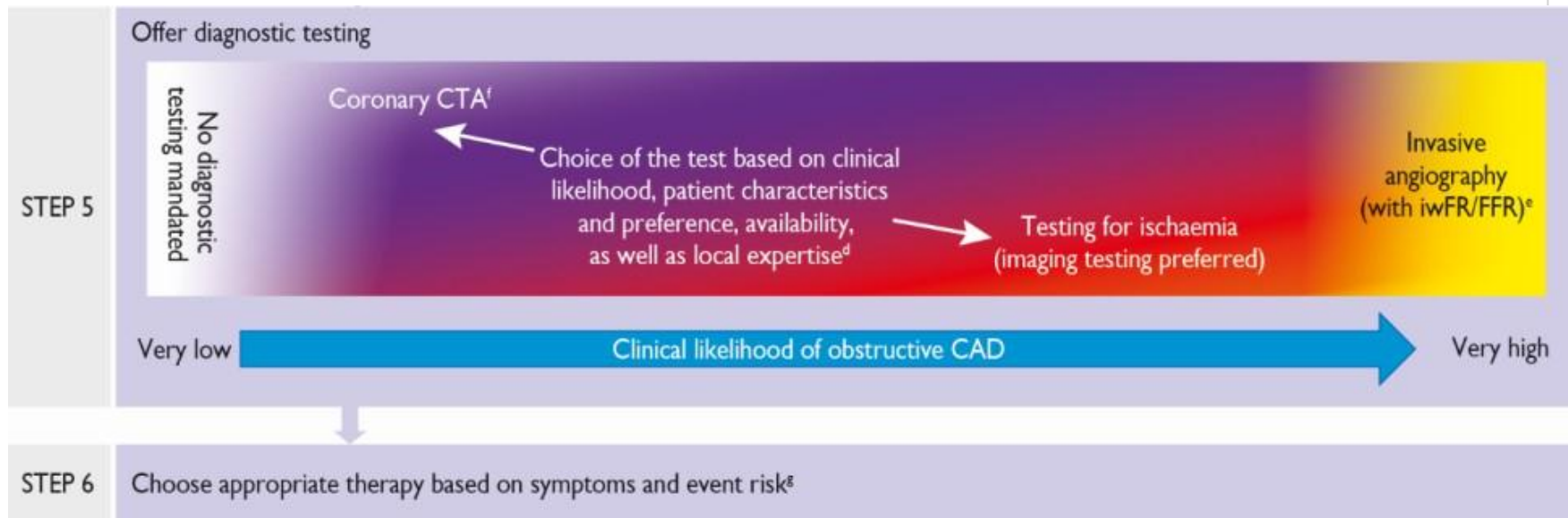
Diagnostic approach (1)



^a If the diagnosis of CAD is uncertain, establishing a diagnosis using non-invasive functional imaging for myocardial ischaemia before treatment may be reasonable. ^b May be omitted in very young and healthy patients with a high suspicion of an extracardiac cause of chest pain, and in multimorbid patients in whom the echocardiography result has no consequence for further patient management. ^c Consider exercise ECG to assess symptoms, arrhythmias, exercise tolerance, BP response, and event risk in selected patients.

Patients with angina and/or dyspnoea and suspected coronary artery disease

Diagnostic approach (2)



^d Ability to exercise, individual test-related risks, and likelihood of obtaining diagnostic test result. ^e High clinical likelihood and symptoms inadequately responding to medical treatment, high event risk based on clinical evaluation (such as ST-segment depression, combined with symptoms at a low workload or systolic dysfunction indicating CAD), or uncertain diagnosis on non-invasive testing. ^f Functional imaging for myocardial ischaemia if coronary CTA has shown CAD of uncertain grade or is non-diagnostic. ^g Consider also angina without obstructive disease in the epicardial coronary arteries (see section 6 of full text).

Patients with angina and/or dyspnoea and suspected coronary artery disease

Clinical classification of suspected angina

Typical angina	Meets the following three characteristics: <ol style="list-style-type: none">1. Constricting discomfort in the front of the chest or in the neck, jaw, shoulder, or arm;2. Precipitated by physical exertion;3. Relieved by rest or nitrates within 5 min.
Atypical angina	Meets two of these characteristics.
Non-anginal chest pain	Meets only one or none of these characteristics.

Patients with angina and/or dyspnoea and suspected coronary artery disease

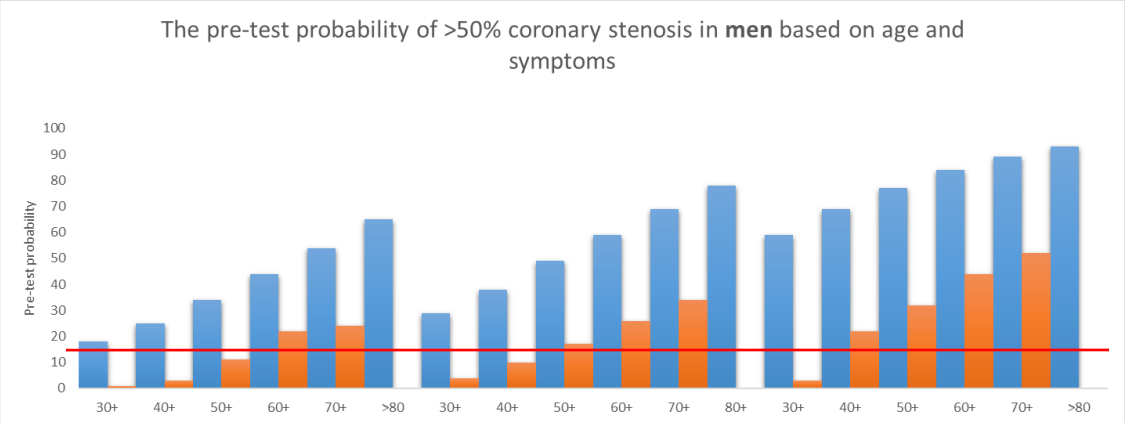
Canadian Cardiovascular Society grading of effort angina severity

Class	Description of angina severity	
I	Angina only with strenuous exertion	Presence of angina during strenuous, rapid, or prolonged ordinary activity (walking or climbing the stairs).
II	Angina with moderate exertion	Slight limitation of ordinary activities when they are performed rapidly, after meals, in cold, in wind, under emotional stress, or during the first few hours after waking up, but also walking uphill, climbing more than one flight of ordinary stairs at a normal pace, and in normal conditions.
III	Angina with mild exertion	Having difficulties walking one or two blocks, or climbing one flight of stairs, at normal pace and conditions.
IV	Angina at rest	No exertion needed to trigger angina.

Patients with angina and/or dyspnoea and suspected coronary artery disease – Basic biochemistry testing

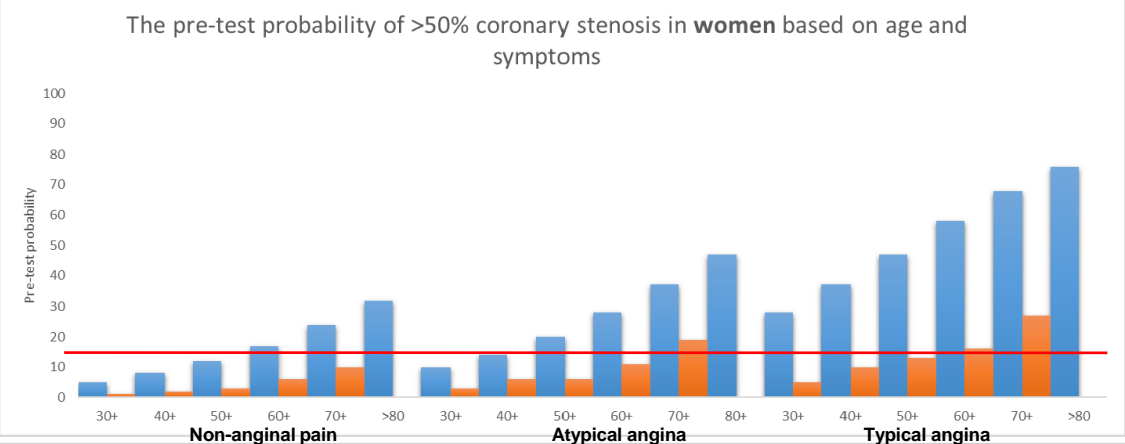
Recommendations	Class	Level
If evaluation suggests clinical instability or ACS, repeated measurements of troponin, preferably using high-sensitivity or ultrasensitive assays, are recommended to rule out myocardial injury associated with ACS.	I	A
The following blood tests are recommended in all patients:		
• Full blood count (including haemoglobin);	I	B
• Creatinine measurement and estimation of renal function;	I	A
• A lipid profile (including LDL-C);	I	A
It is recommended that screening for type 2 diabetes mellitus in patients with suspected and established CCS is implemented with HbA1c and fasting plasma glucose measurements, and that an oral glucose tolerance test is added if HbA1c and fasting plasma glucose results are inconclusive.	I	B
Assessment of thyroid function is recommended in case of clinical suspicion of thyroid disorders.	I	C

Pre-test probability of coronary artery disease 2013 → 2019



■ *Genders et al 2011:*
ESC SCAD 2013
guidelines

■ *Juarez-Orozco et al.*
EHJ CI 2019
ESC CCS 2019
guidelines



In 2019 57% of pts with chest pain has PTP<15%

Patients with angina and/or dyspnoea and suspected coronary artery disease

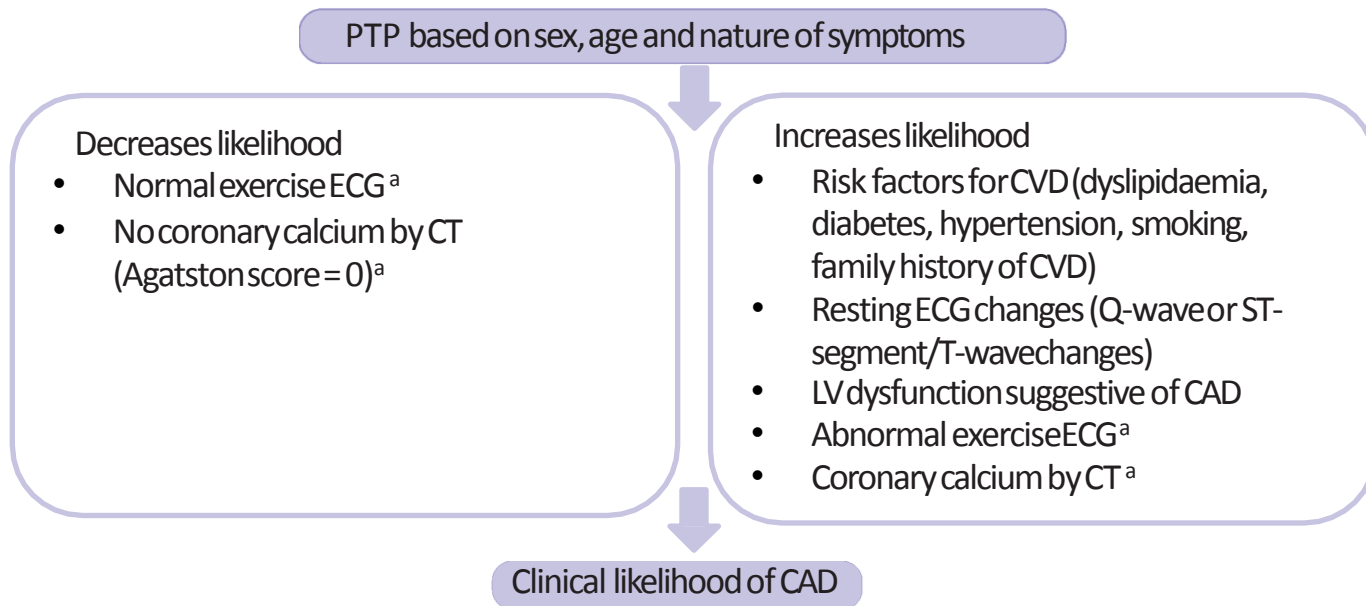
Pre-test probability of coronary artery disease

Age	Typical		Atypical		Non-anginal		Dyspnoea ^a	
	M	W	M	W	M	W	M	W
30–39	3%	5%	4%	3%	1%	1%	0%	3%
40–49	22%	10%	10%	6%	3%	2%	12%	3%
50–59	32%	13%	17%	6%	11%	3%	20%	9%
60–69	44%	16%	26%	11%	22%	6%	27%	14%
70+	52%	27%	34%	19%	24%	10%	32%	12%

^a In addition to the classic Diamond and Forrester classes, patients with dyspnoea only or dyspnoea as the primary symptom are included. The dark green shaded regions denote the groups in which non-invasive testing is most beneficial (pre-test probability >15%). The light green shaded regions denote the groups with pre-test probability of CAD between 5-15% in which the testing for diagnosis may be considered after assessing the overall clinical likelihood based on modifiers of pre-test probability.

Patients with angina and/or dyspnoea and suspected coronary artery disease

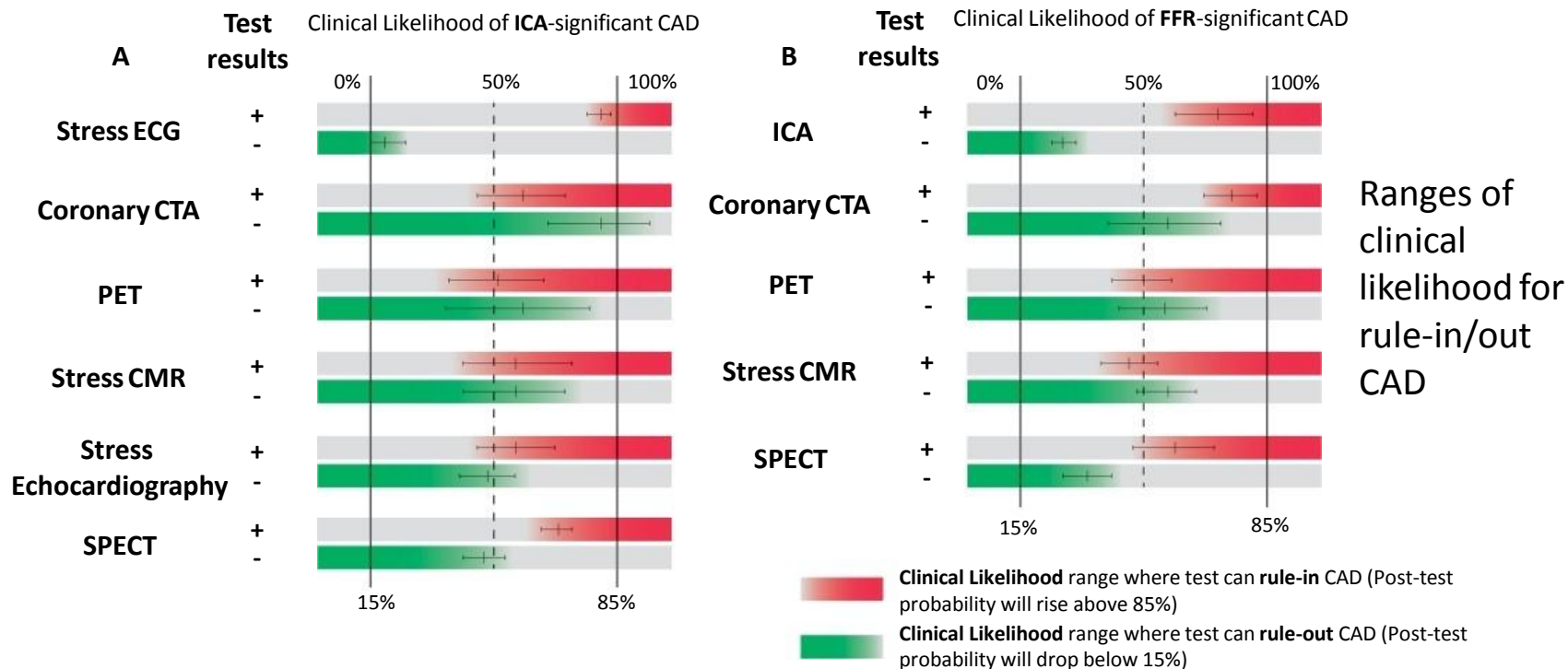
Determinants of clinical likelihood of CAD



^a if available.

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Patients with angina and/or dyspnoea and suspected coronary artery disease



Patients with angina and/or dyspnoea and suspected coronary artery disease

Use of exercise electrocardiogram

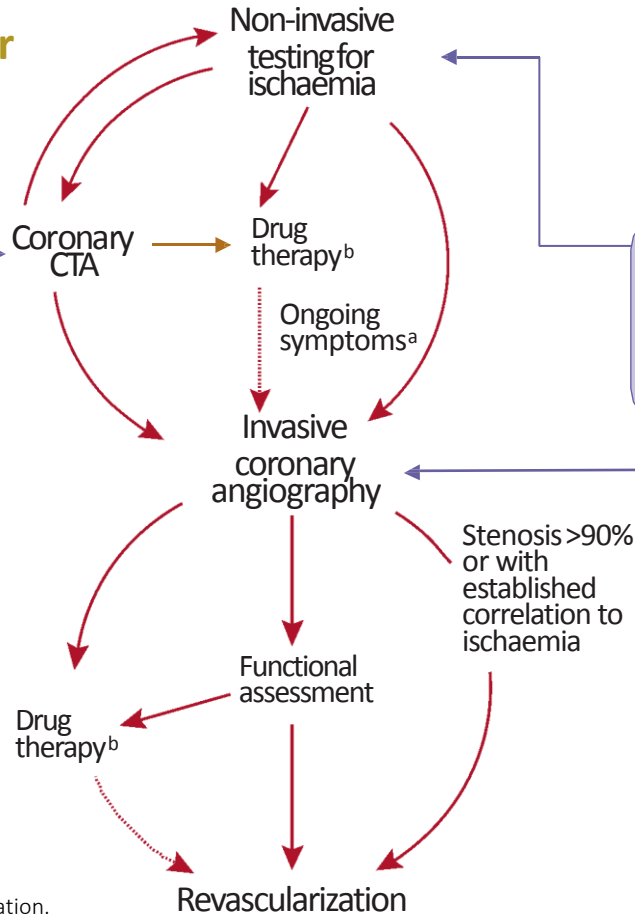
Recommendations	Class	Level
Exercise ECG is recommended for the assessment of exercise tolerance, symptoms, arrhythmias, BP response, and event risk in selected patients. ^a	I	C
Exercise ECG may be considered as an alternative test to rule-in or rule-out CAD when non-invasive imaging is not available.	IIb	B
Exercise ECG may be considered in patients on treatment to evaluate control of symptoms and ischaemia.	IIb	C
Exercise ECG is not recommended for diagnostic purposes in patients with ≥ 0.1 mV ST-segment depression on resting ECG or who are being treated with digitalis.	III	C

^a When this information will have an impact on diagnostic strategy or management.

Patients with angina and/or dyspnoea and suspected coronary artery disease

Main diagnostic pathways

- Preferentially considered if:
- ▶ Low clinical likelihood
 - ▶ Patient characteristics suggest high image quality
 - ▶ Local expertise and availability
 - ▶ Information on atherosclerosis desired
 - ▶ No history of CAD



- Preferentially considered if:
- ▶ High clinical likelihood
 - ▶ Revascularization likely
 - ▶ Local expertise and availability
 - ▶ Viability assessment also required

- Preferentially considered if:
- ▶ High clinical likelihood and severe symptoms refractory to medical therapy
 - ▶ Typical angina at low level of exercise and clinical evaluation including exercise ECG indicates high-risk of events
 - ▶ LV dysfunction suggestive of CAD

^a Consider microvascular angina.

^b Antianginal medications and/or risk-factor modification.

Angina without obstructive disease in the epicardial coronary arteries - Suspected vasospastic angina

Recommendations	Class	Level
An ECG is recommended during angina if possible.	I	C
Invasive angiography or coronary CTA is recommended in patients with characteristic episodic resting angina and ST-segment changes, which resolve with nitrates and/or calcium antagonists, to determine the extent of underlying coronary disease.	I	C
Ambulatory ST-segment monitoring should be considered to identify ST-segment deviation in the absence of increased heart rate.	IIa	C
An intracoronary provocation test should be considered to identify coronary spasm in patients with normal findings or non-obstructive lesions on coronary arteriography and a clinical picture of coronary spasm, to diagnose the site and mode of spasm.	IIa	B

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Patients with angina and/or dyspnoea and suspected coronary artery disease

Definitions of high event risk for different tests

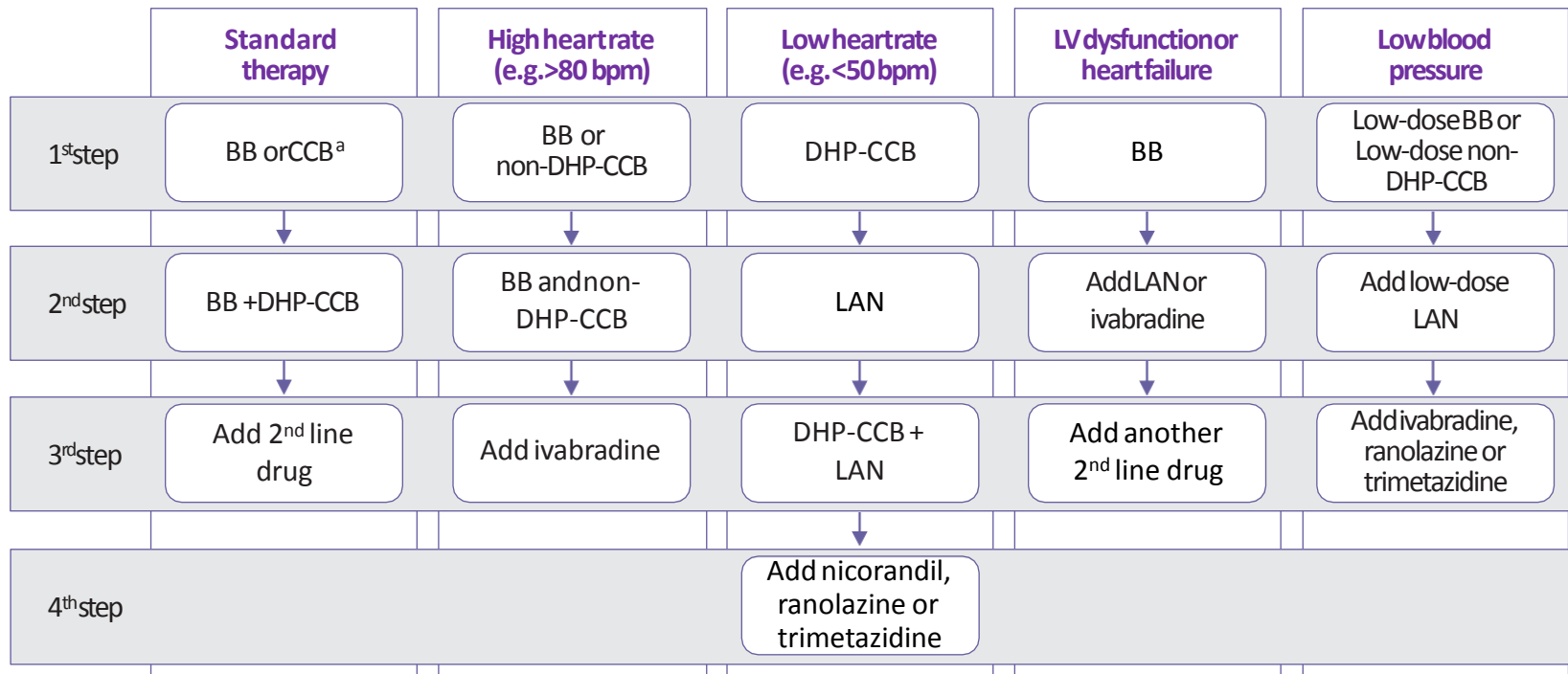
Exercise ECG	Cardiovascular mortality >3% per year according to Duke Treadmill Score.
SPECT or PET perfusion imaging	Area of ischaemia $\geq 10\%$ of the left ventricle myocardium.
Stress echocardiography	≥ 3 of 16 segments with stress-induced hypokinesia or akinesia.
CMR	≥ 2 of 16 segments with stress perfusion defects or ≥ 3 dobutamine-induced dysfunctional segments.
Coronary CTA or ICA	Three-vessel disease with proximal stenoses, LM disease, or proximal anterior descending disease.
Invasive functional testing	FFR ≤ 0.8 , iwFR ≤ 0.89 .

Patients with angina and/or dyspnoea and coronary artery disease

Lifestyle recommendations

Smoking cessation	Use pharmacological and behavioural strategies to help patients quit smoking. Avoid passive smoking.
Healthy diet	Diet high in vegetables, fruit, and wholegrains. Limit saturated fat to <10% of total intake. Limit alcohol to <100 g/week or 15 g/day.
Physical activity	30 - 60 min moderate physical activity most days, but even irregular activity is beneficial.
Healthy weight	Obtain and maintain a healthy weight (<25 kg/m ²), or reduce weight through recommended energy intake and increased physical activity.
Other	Take medications as prescribed. Sexual activity is low risk for stable patients not symptomatic at low-to-moderate activity levels.

Patients with angina and/or dyspnoea and coronary artery disease - Long term anti-ischaemic drug therapy



^a Combination of a BB with a DHP-CCB should be considered as first step; combination of a BB or a CCB with a second-line drug may be considered as a first step.

Patients with angina and/or dyspnoea and coronary artery disease - Anti-ischaemic drugs (1)

Recommendations	Class	Level
General considerations		
Medical treatment of symptomatic patients requires one or more drug(s) for angina/ischæmia relief in association with drug(s) for event prevention.	I	C
It is recommended that patients are educated about the disease, risk factors, and treatment strategy.	I	C
Timely review of the patient's response to medical therapies (e.g. 2-4 weeks after drug initiation) is recommended.	I	C

Patients with angina and/or dyspnoea and coronary artery disease - Anti-ischaemic drugs (2)

Recommendations	Class	Level
Angina relief		
Short-acting nitrates are recommended for immediate relief of effort angina.	I	B
First-line treatment is indicated with beta-blockers and/or CCBs to control heart rate and symptoms.	I	A
If angina symptoms are not successfully controlled on a beta-blocker or a CCB, the combination of a beta-blocker with a DHP-CCB should be considered.	IIa	C
Initial first-line treatment with the combination of a beta-blocker and a DHP-CCB should be considered.	IIa	B
Long-acting nitrates should be considered as a second-line treatment option when initial therapy with a beta-blocker and/or a non-DHP-CCB is contraindicated, poorly tolerated, or inadequate to control angina symptoms.	IIa	B
When long-acting nitrates are prescribed, a nitrate-free or low-nitrate interval should be considered to reduce tolerance.	IIa	B

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Patients with angina and/or dyspnoea and coronary artery disease - Anti-ischaemic drugs (3)

Recommendations	Class	Level
Angina relief		
Nicorandil, ranolazine, ivabradine, or trimetazidine should be considered as a second-line treatment to reduce angina frequency and improve exercise tolerance in subjects who cannot tolerate, have contraindications to, or whose symptoms are not adequately controlled by beta-blockers, CCBs, and long-acting nitrates.	IIa	B
In subjects with baseline low heart rate and low BP, ranolazine or trimetazidine may be considered as a first-line drug to reduce angina frequency and improve exercise tolerance.	IIb	C
In selected patients, the combination of a beta-blocker or a CCB with second-line drugs (ranolazine, nicorandil, ivabradine, and trimetazidine) may be considered for first-line treatment according to heart rate, BP, and tolerance.	IIb	B
Nitrates are not recommended in patients with hypertrophic obstructive cardiomyopathy and co-administration of phosphodiesterase inhibitors.	III	B

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Patients with angina and/or dyspnoea and coronary artery disease - Event prevention (1)

Recommendations	Class	Level
Antithrombotic therapy in patients with CCS and in sinus rhythm		
Aspirin 75-100 mg daily is recommended in patients with a previous MI or revascularization.	I	A
Clopidogrel 75 mg daily is recommended as an alternative to aspirin in patients with aspirin intolerance.	I	B
Clopidogrel 75 mg daily may be considered in preference to aspirin in symptomatic or asymptomatic patients, with either PAD or a history of ischaemic stroke or transient ischaemic attack.	IIb	B
Aspirin 75-100 mg daily may be considered in patients without a history of MI or revascularization, but with definitive evidence of CAD on imaging.	IIb	C

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Patients with angina and/or dyspnoea and coronary artery disease - Event prevention

Recommendations	Class	Level
Antithrombotic therapy in patients with CCS and in sinus rhythm		
Adding a second antithrombotic drug to aspirin for long-term secondary prevention should be considered in patients with high risk of ischaemic events ^a and without high bleeding risk. ^b	Ila	A
Adding a second antithrombotic drug to aspirin for long-term secondary prevention may be considered in patients with at least a moderately increased risk of ischaemic events ^c and without high bleeding risk. ^b	Ilb	A

^a Diffuse multivessel CAD with at least one of the following: diabetes mellitus requiring medication, recurrent MI, PAD, or CKD with eGFR 15-59 mL/min/1.73 m². ^b Prior history of intracerebral haemorrhage or ischaemic stroke, history of other intracranial pathology, recent gastrointestinal bleeding or anaemia due to possible gastrointestinal blood loss, other gastrointestinal pathology associated with increased bleeding risk, liver failure, bleeding diathesis or coagulopathy, extreme old age or frailty, or renal failure requiring dialysis or with eGFR <15 mL/min/1.73 m².

^c At least one of the following: multivessel/diffuse CAD, diabetes mellitus requiring medication, recurrent MI, PAD, HF, or CKD with eGFR 15-59 mL/min/1.73 m²

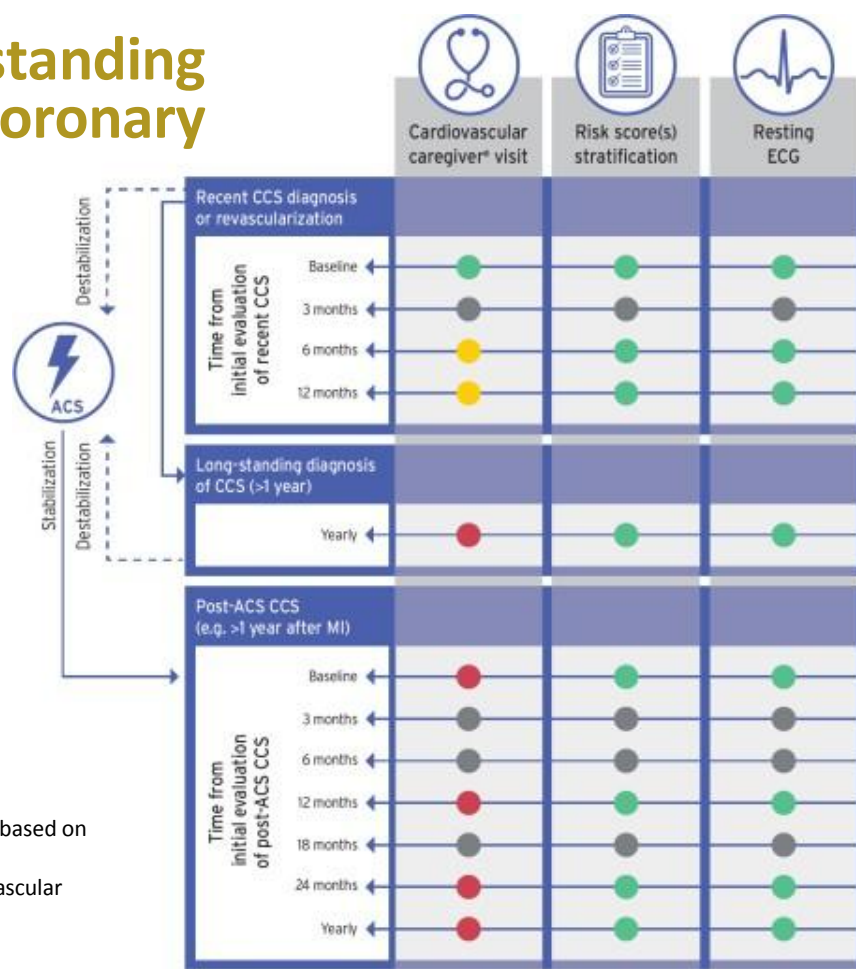
Patients with angina and/or dyspnoea and coronary artery disease

Treatment options for dual antithrombotic therapy

Drug option	Dose	Indication	Additional cautions
Clopidogrel	75 mg o.d.	Post-MI in patients who have tolerated DAPT for 1 year	
Prasugrel	10 mg o.d. or 5 mg o.d. if body weight <60 kg or age >75 years	Post-PCI for MI in patients who have tolerated DAPT for 1 year	Age >75 years
Rivaroxaban	2.5 mg b.i.d.	Post-MI >1 year or multivessel CAD	eGFR 15-29 mL/min/1.73 m ²
Ticagrelor	60 mg b.i.d.	Post-MI in patients who have tolerated DAPT for 1 year	

Patients with a long-standing diagnosis of Chronic Coronary Syndromes

Follow-up



The frequency of follow-up may be subject to variation based on clinical judgement.

* Cardiologist, internist, general practitioner, or cardiovascular nurse.

Chronic coronary syndromes in specific circumstances

Diabetes mellitus

Recommendations	Class	Level
Risk factor (BP, LDL-C, and HbA1c) control to targets is recommended in patients with CAD and diabetes mellitus.	I	A
In asymptomatic patients with diabetes mellitus, a periodic resting ECG is recommended for cardiovascular detection of conduction abnormalities, AF, and silent MI.	I	C
ACE inhibitor treatment is recommended in CCS patients with diabetes for event prevention.	I	B
The sodium-glucose co-transporter 2 inhibitors empagliflozin, canagliflozin, or dapagliflozin are recommended in patients with diabetes and CVD.	I	A
A glucagon-like peptide-1 receptor agonist (liraglutide or semaglutide) is recommended in patients with diabetes and CVD.	I	A
In asymptomatic adults (age >40 years) with diabetes, functional imaging or coronary CTA may be considered for advanced cardiovascular risk assessment.	IIb	B

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