





Key priorities for the implementation of the 2023 ESC Guidelines for the management of acute coronary syndromes in low-resource settings

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Received 21 November 2024; accepted 13 December 2024; online publish-ahead-of-print 28 March 2025

ESC Guidelines provide best practice, evidence-based recommendations for diagnosing and treating patients with cardiovascular diseases. It is not always possible for best practices to be followed, however, particularly in low-resource settings. To address this issue, a set of guideline-related documents were created to identify key priorities for users in these settings. The documents highlight the related recommendations and describe key strategies for clinicians to approach implementation of these recommendations or discuss alternatives which are in line with the intention of the recommendations, if not having all of the same advantages. The suggestions cannot be used as exact substitutes for the original recommendations in the guidelines, which have not been altered and continue to reflect best practice.

This document on key priorities for low-resource settings was developed by the task force Chairs and other members of the task force who produced the 2023 ESC Guidelines for the management of acute coronary syndromes, which are freely available on the ESC website (<https://www.escardio.org/Guidelines>). This document also underwent external review including international experts from within and beyond Europe and ESC partner organizations, including the Interamerican Society of Cardiology (IASC), the Pan-African Society of Cardiology (PASCAR), the Asian Pacific Society of Cardiology (APSC), and the ASEAN Federation of Cardiology (AFC).

Keywords

Acute coronary syndromes • STEMI, NSTEMI-ACS • Recommendation • Implementation •
Clinical practice guidelines

Introduction

Clinical practice guidelines evaluate and summarize the available evidence with the aim of assisting health care professionals in proposing the best diagnostic and therapeutic approaches for an individual patient with a given condition.¹ However, the implementation of guideline recommendations may vary based on local resources.² The 2023 European Society of Cardiology Guidelines for the management of patients with acute coronary syndromes (ACS) summarized the evidence and made recommendations for the management of patients presenting with all three subtypes of ACS [ST segment elevation myocardial infarction (STEMI), non-ST segment elevation myocardial infarction (NSTEMI) and unstable angina (UA)].¹

Countries can be classified as high-, middle-, or low-income as per their gross national income per capita, calculated using the World Bank Atlas method.³ A previous analysis has suggested that the local implementation of ESC Guideline recommendations is inversely correlated with the gross national income of a country.² This is an important issue, because low and middle income countries (LMICs) bear a disproportionate burden of cardiovascular disease and represent large populations worldwide.^{4,5} Wealth inequality distribution within a country, as measured by the Gini index, has also been reported to impact on clinical outcomes in patients with ACS.³ This may underpin some of the observed

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heterogeneity in healthcare provision, health inequality, and clinical guideline implementation within individual countries. In this document we suggest some key priorities for the implementation of the 2023 ESC Guidelines for the management of ACS in low-resource settings, within or outside of LMICs. We also highlight some key strategies that may be useful for implementation of some of the most important Class I recommendations from the guidelines.

PRIORITY 1. Increasing awareness amongst the general population of the symptoms of ACS and the importance of early diagnosis and treatment.

Increased awareness of the symptoms associated with ACS within the general population is associated with earlier recognition and treatment. Red flag symptoms, such as prolonged chest pain (>15 min) and/or recurrent pain within 1 h, should prompt patients or other members of the public to seek urgent medical help. Patients should also be made aware that diaphoresis, shoulder/arm pain, and indigestion/epigastric pain can all also be ACS symptoms. It is important to consider that ACS presentations may differ amongst different cultural groups. Continuous education, promotion, and advocacy efforts will facilitate awareness of this amongst the general population.

Key strategies for implementation of this priority in low-resource settings

Engagement with government, voluntary health organizations and the use of social media, local press and television to increase awareness amongst the general public of the symptoms of ACS, with a particular focus on the importance of early diagnosis and treatment. Engaging national educational authorities to include information regarding the symptoms and signs of ACS in educational curriculums. National strategic action plans for cardiovascular disease should be promoted and supported, local cardiological societies may play an important role in this regard.

PRIORITY 2. Early diagnosis of ACS.

The electrocardiogram (ECG) is central to the diagnosis and management of ACS. Recording and interpretation of a 12-lead ECG is recommended as soon as possible at the point of first medical contact (FMC), with a target time from FMC to ECG of <10 min. It is also recommended that emergency medical teams attending to patients with ACS have the ability to perform continuous ECG monitoring and defibrillation if required.

Relevant recommendations	Class	Level
Twelve-lead ECG recording and interpretation is recommended as soon as possible at the point of FMC, with a target of <10 min.	I	B
Continuous ECG monitoring and the availability of defibrillator capacity is recommended as soon as possible in all patients with suspected STEMI, in suspected ACS with other ECG changes or ongoing chest pain, and once the diagnosis of MI is made.	I	B

Key strategies for implementation of this priority in low-resource settings

Emergency medical services, hospitals and other centres attending patients should have easy access to an ECG machine/device in the emergency room. In situations where an ECG is not available, patients with symptoms suggestive of ACS should be transferred immediately to a centre with ECG capabilities. Personnel trained in interpretation of ECG should be present 24/7 in these centres. Increasing the availability and provision of ECG machines or devices in these settings would also have a positive impact on this. The use of telemedicine services for ECG interpretation and management guidance could also be used in conjunction with this in remote settings where there are no trained personnel to interpret the ECG. The establishment of chest pain units, where feasible, may help standardize the management of patients with ACS.

PRIORITY 3. Early reperfusion for patients with a working diagnosis of STEMI.

For patients with STEMI, myocardial reperfusion therapy is recommended in all patients with symptoms of ischemia of less than 12 h duration. Primary percutaneous coronary intervention (PPCI) is the recommended strategy if the anticipated time from STEMI diagnosis to PPCI is <120 min. In patients with a working diagnosis of STEMI who are presenting within 12 h of symptom onset, if PPCI cannot be performed within 120 min, intravenous fibrinolytic therapy is recommended. While a fibrin specific thrombolysis agent is recommended, non-fibrin specific agents (i.e. streptokinase) can be used when fibrin specific agents are not available. These patients should be transferred to a PCI centre as soon as feasible.

Relevant recommendations	Class	Level
Reperfusion therapy is recommended in all patients with a working diagnosis of STEMI (persistent ST-segment elevation or equivalents) and symptoms of ischaemia of ≤12 h duration.	I	A
A PPCI strategy is recommended over fibrinolysis if the anticipated time from diagnosis to PCI is < 120 min.	I	A

If timely PPCI (<120 min) cannot be performed in patients with a working diagnosis of STEMI, fibrinolytic therapy is recommended within 12 h of symptom onset in patients without contraindications.	I	A
Rescue PCI is recommended for failed fibrinolysis (i.e. ST-segment resolution < 50% within 60–90 min of fibrinolytic administration) or in the presence of haemodynamic or electrical instability, worsening ischaemia, or persistent chest pain.	I	A
When fibrinolysis is the reperfusion strategy, it is recommended to initiate this treatment as soon as possible after diagnosis in the pre-hospital setting (aim for target of <10 min to lytic bolus).	I	A
A fibrin-specific agent (i.e. tenecteplase, alteplase, or reteplase) is recommended.	I	B
In patients with a working diagnosis of STEMI and a time from symptom onset >12 h, a PPCI strategy is recommended in the presence of ongoing symptoms suggestive of ischaemia, haemodynamic instability, or life-threatening arrhythmias.	I	C

Key strategies for implementation of this priority in low-resource settings

Referral centres with 24/7 PPCI capabilities and trained personnel are needed. A challenge for the provision of this service in low-resource settings may include implementing a care network over a wider geographic area, encompassing a large population. Availability of ambulance services, community hospitals (with ECG devices), smart phones to photograph and transmit ECGs, and communication networks in the community will all help to facilitate the timely provision of reperfusion therapy. The availability of fibrinolytic agents in emergency room pharmacies is also required. The 'Stent for Life' initiative is a good example of how this can be implemented in real world practice.⁶

PRIORITY 4. Invasive angiography in patients with NSTEMI-ACS.

STEMI and NSTEMI-ACS should be considered as different phenotypes within the ACS spectrum. Invasive coronary angiography (ICA) is central to the management paradigm in patients with NSTEMI-ACS and is recommended in most patients. ICA facilitates delineation of the coronary anatomy, confirmation or refutation of the diagnosis and treatment via PCI, if indicated. A selective invasive strategy refers to performing ICA based on clinical assessment and/or non-invasive testing.

Relevant recommendations	Class	Level
An invasive strategy during hospital admission is recommended in NSTEMI-ACS patients with high-risk* criteria or a high index of suspicion for unstable angina.	I	A
A selective invasive approach is recommended in patients without very high- or high-risk* NSTEMI-ACS criteria and with a low index of suspicion for NSTEMI-ACS.	I	A
An immediate invasive strategy is recommended in patients with a working diagnosis of NSTEMI-ACS and with at least one of the following very high-risk criteria: <ul style="list-style-type: none"> • Haemodynamic instability or cardiogenic shock • Recurrent or refractory chest pain despite medical treatment • In-hospital life-threatening arrhythmias • Mechanical complications of MI • Acute heart failure presumed secondary to ongoing myocardial ischaemia • Recurrent dynamic ST-segment or T wave changes, particularly intermittent ST-segment elevation. 	I	C

*A patient with ACS is considered high risk criteria if they meet any one of the following criteria; a confirmed diagnosis of NSTEMI based on current recommended ESC hs-cTn algorithms, dynamic ST-segment or T wave changes, transient ST-segment elevation and/or a GRACE risk score >140.

Key strategies for implementation of this priority in low-resource settings

Referral centres with 24/7 PCI capabilities and trained personnel covering wide areas of the population are required. Patients with NSTEMI-ACS should be transferred to these centres as part of their management during their index admission. Centres should also be able to refer patients to cardiac surgery if required. Training of ambulance staff in recognizing very-high and high risk NSTEMI-ACS may help ensure appropriate risk stratification and transportation to referral centres.

PRIORITY 5. Antithrombotic therapy.

Administration of antithrombotic therapy, including aspirin, a P2Y₁₂ inhibitor and parenteral anticoagulation, is the cornerstone of pharmacological treatment for patients with ACS. At discharge, prescription of lifelong aspirin and an oral P2Y₁₂ inhibitor for 12 months [dual antiplatelet therapy (DAPT)] is recommended in patients with a confirmed diagnosis of ACS. However, patients taking long term oral anticoagulation (OAC) can discontinue antiplatelet treatment at 12 months after the ACS event and remain on OAC monotherapy.

Relevant recommendations	Class	Level
Aspirin is recommended for all patients without contraindications at an initial oral loading dose of 150–300 mg (or 75–250 mg i.v.) and a maintenance dose of 75–100 mg once daily for long-term treatment.	I	A
Parenteral anticoagulation is recommended for all patients with ACS at the time of diagnosis.	I	A
In all ACS patients, a P2Y ₁₂ receptor inhibitor is recommended in addition to aspirin, given as an initial oral loading dose followed by a maintenance dose for 12 months unless there is high bleeding risk.	I	A
If patients presenting with ACS stop DAPT to undergo CABG, it is recommended they resume DAPT after surgery for at least 12 months.	I	C
Clopidogrel (300–600 mg loading dose, 75 mg once daily maintenance dose) is recommended when prasugrel or ticagrelor are not available, cannot be tolerated, or are contraindicated.	I	C
Prasugrel is recommended in P2Y ₁₂ receptor inhibitor-naïve patients proceeding to PCI (60 mg LD, 10 mg o.d. MD, 5 mg o.d. MD for patients aged ≥75 years or with a body weight <60 kg).	I	B
Ticagrelor is recommended irrespective of the treatment strategy (invasive or conservative) (180 mg LD, 90 mg b.i.d. MD).	I	B
As the default strategy for patients with atrial fibrillation and CHA ₂ DS ₂ -VASc score ≥1 in men and ≥2 in women, after up to 1 week of triple antithrombotic therapy following the ACS event, dual antithrombotic therapy using a NOAC at the recommended dose for stroke prevention and a single oral antiplatelet agent (preferably clopidogrel) for up to 12 months is recommended.	I	A

Key strategies for implementation of this priority in low-resource settings

While potent P2Y₁₂ inhibitors (i.e. ticagrelor or prasugrel) are recommended in preference to clopidogrel in the guidelines, the prescription of clopidogrel is a reasonable alternative in regions where these potent P2Y₁₂ inhibitors are not available or affordable. Patient and family education is needed to emphasize the importance of compliance with the prescribed anti-platelet therapy regimen. More widespread availability of lower-cost generic versions of ticagrelor and prasugrel may improve the ability of LMICs to follow the guideline recommendations.

PRIORITY 6. Complete revascularization.

Complete revascularization (i.e. revascularization of non-culprit lesions, including those in non-infarct related arteries, as well as the culprit lesion) is recommended for most patients with STEMI, and this can be performed safely during the index procedure if issues are anticipated with scheduling of follow-on staged PCI.

Relevant recommendations	Class	Level
It is recommended to base the revascularization strategy [infarct related artery (IRA)] percutaneous coronary intervention (PCI), multivessel PCI/coronary artery bypass grafting) on the patient's clinical status and comorbidities, as well as their disease complexity, according to the principles of management of myocardial revascularization.	I	B
Multivessel disease in ACS patients presenting in cardiogenic shock:		
IRA-only PCI during the index procedure is recommended.	I	B
Multivessel disease in haemodynamically stable STEMI patients undergoing PPCI:		
Complete revascularization is recommended either during the index PCI procedure or within 45 days.	I	A
It is recommended that PCI of the non-IRA is based on angiographic severity.	I	B

Key strategy for implementation of this priority in low-resource settings

Patients undergoing angiography with multivessel disease should undergo complete revascularization at the time that is logistically most convenient, although within 45 days of the ACS event. This can be during the index procedure in all STEMI patients apart from those presenting in cardiogenic shock, for whom a culprit lesion only strategy at the time of index PCI is recommended.

PRIORITY 7. Long-term interventions after ACS.

Lifelong high dose, high potency (atorvastatin or rosuvastatin) statin therapy should be prescribed for all patients. If available, additional lipid lowering drugs can be used in conjunction with statins if required in order to achieve the LDL cholesterol goal. Lifestyle advice should be provided, focusing on stopping all smoking and all use of tobacco, adapting a healthy diet, and encouraging regular physical activity and exercise (Figure 1). If available, patients should be referred to cardiac rehabilitation, keeping the options of remote or home-based cardiac rehabilitation in mind if a centre-based option is not available. It is recommended that the left ventricular ejection fraction is determined before hospital discharge in all patients with ACS. For patients with reduced ejection fraction (≤40%), angiotensin converting enzyme inhibitors, mineralocorticoid receptor antagonists and beta blockers are recommended.

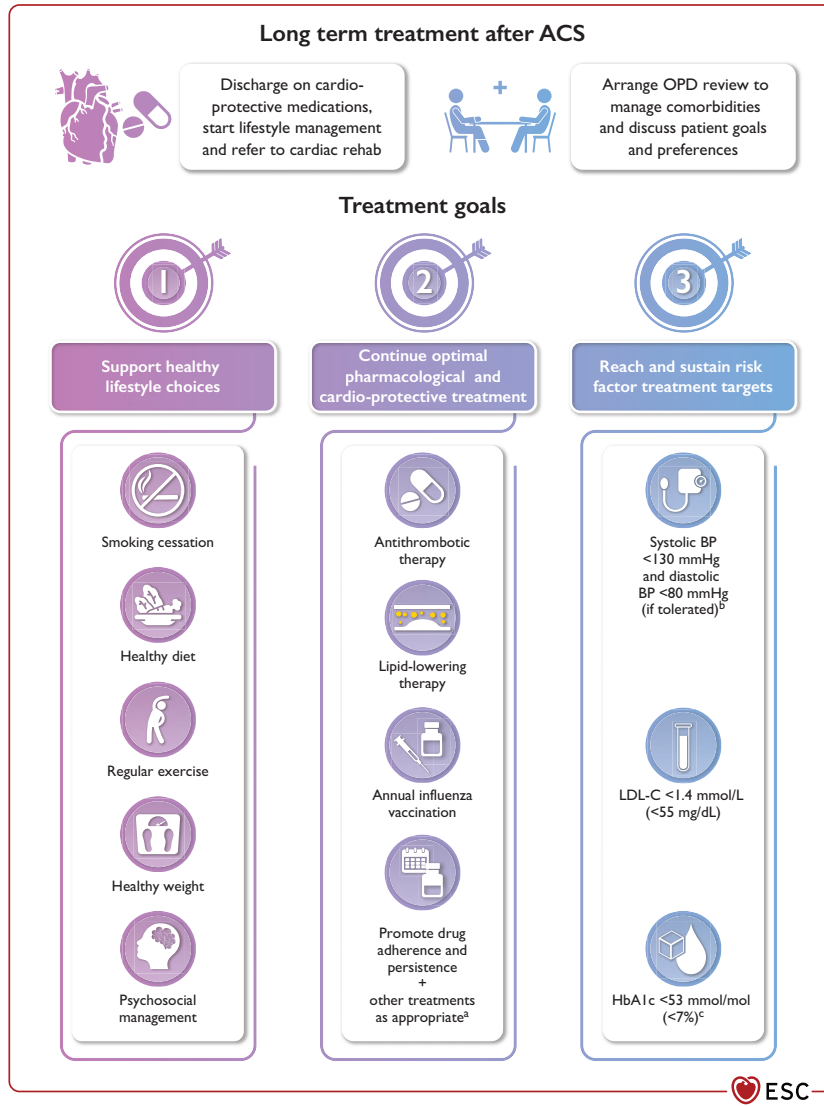
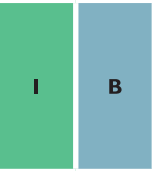


Figure 1 Long term treatment after ACS. ACS, acute coronary syndrome; HbA1c, glycosylated haemoglobin; LDL-C, low density lipoprotein cholesterol; and OPD, outpatient department. ^aSee Guideline for details on other pharmacological treatments after ACS. ^bFor patients ≥70 years of age the systolic target should be <140 mmHg and down to 130 mmHg if tolerated. ^cFor patients with diabetes mellitus. Byrne, R.A. et al. 22023 ESC Guidelines for the management of acute coronary syndromes, *Eur Heart J*, Volume 44, Issue 38, Pages 3720–3826, by permission of the European Society of Cardiology.

Relevant recommendations	Class	Level
It is recommended that high-dose statin therapy is initiated or continued as early as possible, regardless of initial low density lipoprotein C (LDL-C) values.	I	A
It is recommended to aim to achieve an LDL-C level of < 1.4 mmol/L (< 55 mg/dL) and to reduce LDL-C by ≥50% from baseline.	I	A
It is recommended that all ACS patients participate in a medically supervised, structured, comprehensive, multidisciplinary exercise-based cardiac rehabilitation and prevention programme.	I	A
Angiotensin-converting enzyme (ACE) inhibitors are recommended in ACS patients with HF symptoms, LVEF ≤40%, diabetes, hypertension, and/or CKD.	I	A
Beta-blockers are recommended in ACS patients with LVEF ≤40% regardless of HF symptoms.	I	A
Mineralocorticoid receptor antagonists are recommended in ACS patients with an LVEF ≤40% and HF or diabetes.	I	A

It is recommended that ACS patients adopt a healthy lifestyle, including:

- Stopping all smoking of tobacco
- Healthy diet (Mediterranean style)
- Alcohol restriction
- Regular aerobic physical activity and resistance exercise
- Reduced sedentary time



Key strategies for implementation of this priority in low-resource settings

Further research is needed to determine if a polypill strategy (combination of aspirin, statin, and an antihypertensive medication) could improve adherence and persistence with guideline recommended medical therapies and clinical outcomes after ACS in low-resource settings. Increasing the awareness of secondary prevention recommendations amongst local physicians and healthcare workers should be a priority. Development of systems to ensure regular medication access is also important. Patient discharge information should ideally be provided in both written and verbal formats prior to discharge. Adequate preparation and education for patient discharge is recommended. This can involve using the teach back technique and/or motivational interviewing, giving information in chunks, and checking for understanding.

Some of the most important messages from the guideline with respect to long term treatment after ACS are summarized in *Figure 1*, and seven key priorities to improve the implementation of the guideline in low-resource settings are summarized in *Figure 2*. It is hoped that implementation of these guidelines will lead to improvements in cardiovascular outcomes globally.

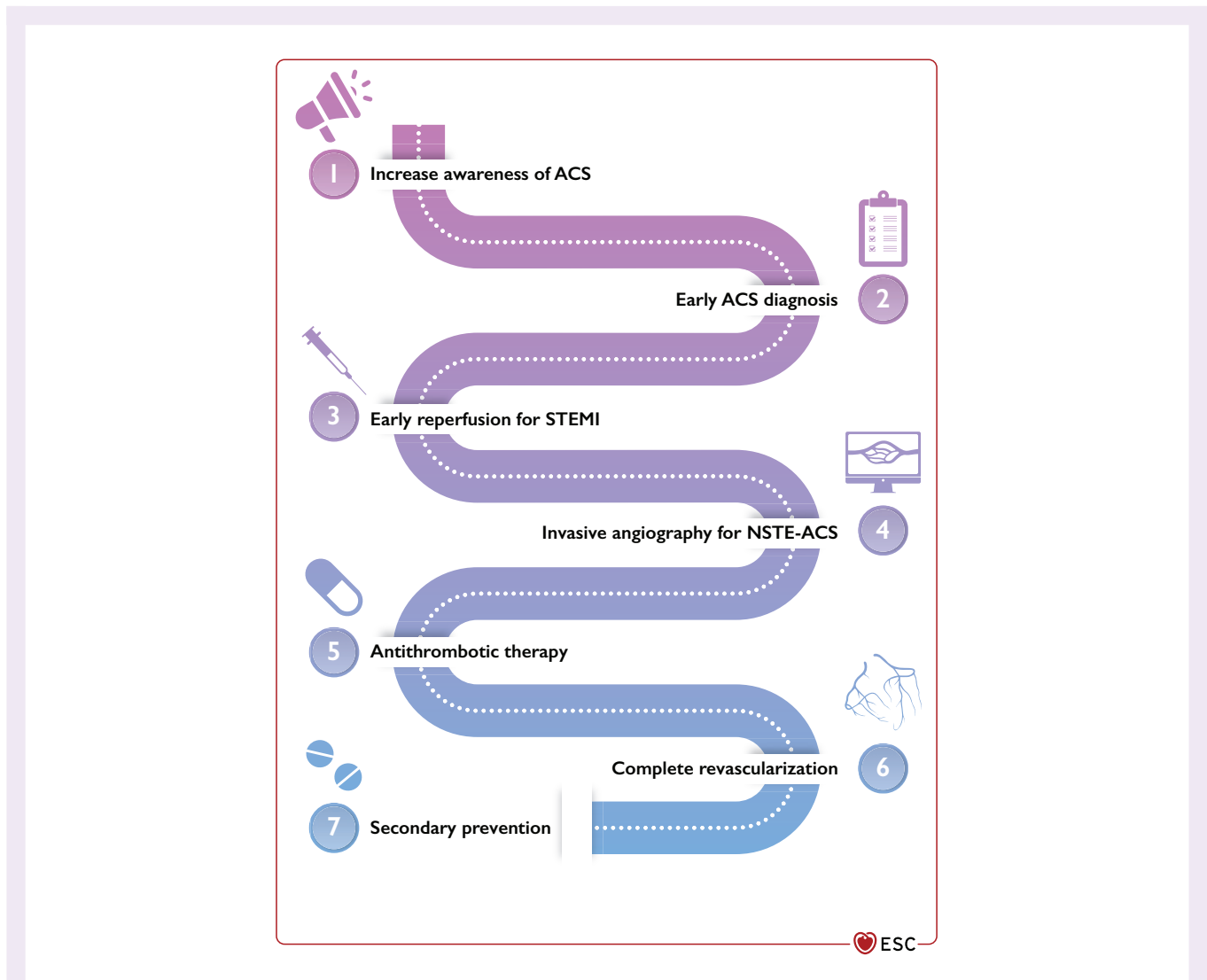


Figure 2 The seven key priorities for the implementation of the 2023 ESC ACS Guidelines in low-resource settings. ACS, acute coronary syndrome; NSTEMI-ACS, non ST elevation acute coronary syndrome; and STEMI, ST elevation myocardial infarction.

Acknowledgements

Members of the Task Force for the 2023 ESC Guidelines for the management of acute coronary syndromes: Emanuele Barbato, Colin Berry, Alaide Chieffo, Marc J. Claeys, Gheorghe-Andrei Dan, Marc R. Dweck, Mary Galbraith, Martine Gilard, Lynne Hinterbuchner, Ewa A. Jankowska, Peter Jüni, Vijay Kunadian, Margret Leosdottir, Roberto Lorusso, Roberto F.E. Pedretti, Angelos G. Rigopoulos, Maria Rubini Gimenez, Holger Thiele, Pascal Vranckx, Sven Wassmann, and Nanette Kass Wenger.

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