

2023

Essential Messages from ESC Guidelines

**Clinical Practice
Guidelines Committee**

ACUTE CORONARY SYNDROMES

Guidelines for the management of
acute coronary syndromes

Essential Messages

2023 ESC Guidelines for the management of acute coronary syndromes

Developed by the task force on the management of acute coronary syndromes of the European Society of Cardiology (ESC).

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Patient Forum

ESSENTIAL MESSAGES FROM THE 2023 ESC GUIDELINES FOR THE MANAGEMENT OF ACUTE CORONARY SYNDROMES

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Key messages

1. Epidemiology of ACS:

ACS encompass a spectrum of conditions that include patients with a recent change in clinical symptoms or signs, with or without changes on 12-lead ECG and with or without acute elevations in cardiac troponin concentrations. ACS are commonly classified based on ECG at presentation and the presence or absence of troponin elevation into UA, NSTEMI, or STEMI. The incidence of STEMI is decreasing whereas the incidence of NSTEMI is increasing. While there are some sex differences in the epidemiology of ACS, women and men receive equal benefit from invasive and non-invasive management strategies and, in general, should be managed similarly.

2. Diagnostic tools (ECG, troponin, and non-invasive imaging):

Chest pain/discomfort is the most common symptom initiating the ACS diagnostic and therapeutic pathway. High-sensitivity troponin measurements and rapid 'rule-in' and 'rule-out' algorithms should be used in patients with suspected NSTEMI-ACS. MI is not the only condition resulting in cardiomyocyte injury and cardiac troponin elevation, and other conditions should also be considered in the differential diagnosis. Non-invasive imaging can be useful to increase diagnostic accuracy and optimize risk assessment.

3. STEMI management networks:

Co-ordination between EMS and hospitals with common written protocols is central to the management of STEMI. EMS should transfer patients immediately to 24/7 high-volume PCI centres regardless of the initial treatment strategy (PPCI or pre-hospital fibrinolysis). EMS should always alert the PCI centre immediately after selection of the reperfusion strategy, and patient transfer to the PCI centre should bypass the ED.

4. Invasive strategy and reperfusion therapy:

An invasive strategy is recommended for patients with ACS. Invasive strategies are time sensitive. For STEMI and very high-risk NSTEMI-ACS, an immediate invasive strategy is recommended. For patients with NSTEMI-ACS an inpatient invasive strategy is recommended; in NSTEMI-ACS patients with high-risk characteristics, an early invasive strategy (<24 h) should be considered. If timely (within 120 min from time of diagnosis) PPCI cannot be performed in patients with STEMI, fibrinolytic therapy is indicated within 12 h of symptom onset in patients without contraindications.

5. Antithrombotic therapy:

Antithrombotic therapy is indicated in all ACS patients, regardless of the management strategy. This consists of both antiplatelet and anticoagulant therapy. Aspirin is recommended for all ACS patients at an initial loading dose and a longer-term maintenance dose. In addition to aspirin, a P2Y₁₂ receptor inhibitor is recommended, and should be maintained over 12 months unless there are concerns regarding HBR. Regarding P2Y₁₂ receptor inhibitor choice, prasugrel and ticagrelor are recommended in preference to clopidogrel and prasugrel should be considered in preference to ticagrelor for ACS patients who undergo PCI. Pretreatment (i.e. treatment with a P2Y₁₂ receptor inhibitor prior to coronary angiography) in patients with NSTEMI-ACS is not recommended routinely but may be considered for patients with STEMI undergoing PPCI. Parenteral anticoagulation is recommended for all patients at the time of diagnosis. Discontinuation of parenteral anticoagulation should be considered immediately after the invasive procedure. Some patients with ACS will also have an indication for long-term OAC, most commonly AF. In these patients, TAT for up to 1 week, followed by DAT using a NOAC at the recommended dose for stroke prevention and a single oral antiplatelet agent (preferably clopidogrel), is recommended as the default strategy.

6. ACS with unstable presentation:

A PPCI strategy is recommended in patients with resuscitated cardiac arrest and an ECG with persistent ST elevation (or ST elevation equivalents), whereas routine immediate angiography is not recommended in patients with an ECG without persistent ST elevation (or equivalents). Temperature control (i.e. continuous monitoring of core temperature and active prevention of fever (i.e. >37.7°C)) is recommended in patients with OHCA who remain unresponsive after ROSC. In patients with CS complicating ACS, emergency coronary angiography is recommended, whereas the routine use of IABP in ACS patients with CS and no mechanical complications is not.

7. Early care:

Following reperfusion, it is recommended to admit high-risk ACS patients, including all STEMI patients, to a CCU/ICCU. ECG monitoring for arrhythmias and ST-segment changes is recommended for at least 24 h after symptom onset in all high-risk patients with ACS. It is recommended that all hospitals participating in the care of high-risk ACS patients have an ICCU/CCU equipped to provide all aspects of care for STEMI and NSTEMI-ACS patients, including treatment of ischaemia, severe HF, arrhythmias, and common co-morbidities. It is also recommended that the LVEF is determined before hospital discharge in all patients with ACS. Discharge of high-risk ACS patients within 48-72 h should be considered in selected patients if early rehabilitation and adequate follow-up are arranged.

8. Technical aspects during PPCI:

Routine radial access and use of DES are the standard of care during PCI for ACS. Intravascular imaging should be considered to guide PCI and may be considered in patients with ambiguous culprit lesions. Routine thrombus aspiration is not recommended. CABG should be considered in patients with an occluded IRA when PCI is not feasible or unsuccessful and there is a large area of myocardium in jeopardy. In patients presenting with SCAD, PCI is recommended only for patients with symptoms and signs of ongoing myocardial ischaemia, a large area of myocardium in jeopardy, and reduced antegrade flow.

9. Management of patients with MVD:

For patients with MVD, it is recommended to base the revascularization strategy (IRA PCI, multivessel PCI/CABG) on the patient's clinical status and co-morbidities, as well as their disease complexity, according to the principles of management of myocardial revascularization. For patients with MVD presenting with CS, IRA-only PCI during the index procedure is recommended. For patients with STEMI undergoing PPCI, complete revascularization is recommended either during the index PCI or within 45 days. In patients presenting with NSTEMI-ACS and MVD, complete revascularization should be considered, preferably during the index procedure. For patients with STEMI, it is recommended that decisions regarding PCI of non-IRA are based on angiographic severity, whereas for patients with NSTEMI-ACS, functional invasive evaluation of non-IRA severity during the index procedure may be considered.

10. MINOCA:

The term MINOCA refers to the situation where patients present with symptoms suggestive of ACS and demonstrate troponin elevation and non-obstructive coronary arteries at the time of coronary angiography, i.e. coronary artery stenosis <50% in any major epicardial vessel. MINOCA is best considered as a working diagnosis that encompasses a heterogeneous group of underlying causes (both cardiac and extra-cardiac) and is found in 1-14% of patients with ACS. In all patients with an initial working diagnosis of MINOCA, it is recommended to follow a diagnostic algorithm to determine the underlying cause. CMR imaging is a key diagnostic tool in patients with a working diagnosis of MINOCA.

11. Special patient subsets:

- a. CKD: Moderate to severe CKD is present in >30% of ACS patients. These patients receive less interventional and pharmacological treatment and have a worse prognosis in comparison to patients with normal kidney function. It is recommended to apply the same diagnostic and therapeutic strategies in patients with CKD (dose adjustment may be necessary) as for patients with normal kidney function.
- b. Older adults: In general, older adults should undergo the same diagnostic and treatment strategies, including invasive angiography and revascularization, as younger patients.
- c. Patients with cancer: Management of ACS in patients with cancer can be challenging for several reasons, including frailty, increased bleeding risk, thrombocytopenia, and increased thrombotic risk. An invasive strategy is recommended in cancer patients presenting with high-risk ACS with expected survival ≥ 6 months. A conservative non-invasive strategy should be considered in ACS patients with poor cancer prognosis (with expected survival < 6 months) and/or very high bleeding risk.

12. Long-term treatment:

Secondary prevention after ACS should be offered to every patient and should start as early as possible after the index event. This includes cardiac rehabilitation, lifestyle management and pharmacological treatment, and has been shown to both increase quality of life and decrease morbidity and mortality.

13. Patient perspectives:

Some of the key first steps in the timely diagnosis and treatment of ACS are reliant on a comprehensive assessment of symptoms. An incomplete history or poorly elicited symptoms can result in delay or misdiagnosis. Patient-centred care is recommended as a critical tenet of routine clinical management and involves consideration of a patient's physical, emotional, and psychological needs.

The provision of care that is respectful of, and responsive to, individual patient preferences, needs and values, is important in the management of patients with ACS. It is recommended, as much as possible, to include ACS patients in decision-making. Preparing for discharge begins on admission. Educating and informing the patient using the teach back method and educationally appropriate material should be integrated into the patient care pathway.

14. Quality indicators:

ACS QIs aim to audit practice and improve clinical outcomes in real-life patients by demonstrating the gap between optimal guideline-based treatment and actual care of ACS patients. Subsequent measures to improve QI attainment can be implemented based on the local, regional, and global assessment of QIs.

Gaps in evidence

Section	Gaps in evidence	Research recommendations to address these gaps
<p>Triage and diagnosis</p>	<ul style="list-style-type: none"> Observe zone: how can we improve the guidance for and management of patients assigned to the observe zone of the 0 h/1 h and 0 h/2 h ESC algorithms to improve their poor outcome? No testing rule: What is the added value of biomarkers other than hs-cTn for rapid rule-out of NSTEMI-ACS compared with usual care? There is insufficient evidence to set sex-specific thresholds for troponin levels. The role of non-invasive anatomy (e.g. CCTA) or functional imaging (e.g. stress testing strategies) for low-risk NSTEMI-ACS patients should be further evaluated. 	<ul style="list-style-type: none"> Observe zone: Prospectively evaluate changes in the 0 h/1 h and 0 h/2 h ESC algorithms to improve the outcomes of patients assigned to the observe zone. No testing rule: Randomization of patients to strategies with and without new biomarkers to evaluate whether their use improves clinical outcomes. Prospectively evaluate the impact of using sex-specific cut-offs on the diagnosis, treatment and outcomes of patients presenting to the ED with suspected ACS. Adequately powered RCTs testing whether non-invasive imaging improves clinical outcomes in patients presenting with NSTEMI-ACS.
<p>Initial measures for patients presenting with suspected STEMI Initial treatment</p>	<ul style="list-style-type: none"> The impact of early i.v. beta-blockers on clinical outcomes in patients with a working diagnosis of STEMI remains unclear. Infarct size and microvascular obstruction are the main determinants of long-term prognosis. Interventions which serve to limit infarct size are needed. 	<ul style="list-style-type: none"> Patients randomized to i.v. beta-blockers (ideally metoprolol) or placebo before PPCI, with hard endpoints evaluated. Translate cardioprotective therapies from experimental to clinical setting by executing adequately powered trials.
<p>Acute-phase management of patients with NSTEMI-ACS</p>	<ul style="list-style-type: none"> The comparison of routine or selective invasive assessment in low-risk NSTEMI-ACS has not been adequately evaluated. The optimal timing of invasive angiography in high-risk NSTEMI-ACS patients remains to be elucidated. 	<ul style="list-style-type: none"> Low-risk patients should be randomized to routine or selective invasive strategy. RCTs testing different time intervals to perform angiography within the 72 h window after the initial presentation.

Gaps in evidence

Section	Gaps in evidence	Research recommendations to address these gaps
<p>Antithrombotic therapy</p>	<ul style="list-style-type: none"> • Whether pretreatment with oral P2Y12 receptor inhibitors prior to ICA improves clinical outcomes in NSTEMI-ACS patients is uncertain. • Whether platelet function testing or genetic testing to guide de-escalate oral P2Y12 receptor inhibitors after the first month of therapy following PCI improves clinical management and outcomes remains unclear. • The optimal long-term antithrombotic regimen in NSTEMI-ACS patients who have undergone PCI is unknown. • After stopping DAPT, a head-to-head comparison based on superiority between aspirin monotherapy and clopidogrel monotherapy is required. 	<ul style="list-style-type: none"> • Randomize patients to pretreatment with oral P2Y12 receptor inhibitors or no pretreatment, prior to ICA. • Randomize ACS patients to prasugrel or ticagrelor, both without pretreatment. • A strategy based on platelet function testing or genetic testing should be prospectively tested in patients who may benefit from de-escalating antithrombotic therapy. • RCTs evaluating the benefit-risk balance for ischaemic bleeding events for different periods of antithrombotic duration. • A head-to-head randomized comparison testing for superiority is needed to compare aspirin versus clopidogrel monotherapy after DAPT.
<p>Acute coronary syndrome with unstable presentation</p>	<p>The role of percutaneous MCS devices in patients presenting with ACS and CS remains unclear.</p>	<p>Randomized comparisons between standard of care and percutaneous MCS devices in ACS with CS.</p>
<p>Management of acute coronary syndrome during hospitalization</p>	<p>Clinical improvement through the use of risk stratification based on risk prediction models.</p>	<p>Patients randomized to a particular intervention or to usual care based on validated risk prediction models.</p>

Gaps in evidence

Chapter	Gaps in evidence	Research recommendations to address these gaps
<p>Technical aspects of invasive strategies</p>	<ul style="list-style-type: none"> Does intravascular imaging-guided revascularization strategy improve clinical outcomes in patients with ACS? Does intracoronary physiology assessment of myocardial reperfusion after PPCI improve risk stratification and/or stratified medicine for limiting microvascular dysfunction and reperfusion injury/MVO post ACS? In ACS patients with an IRA that is unsuitable for stent implantation, does drug-coated balloon treatment of the IRA improve clinical outcomes? Microvascular obstruction associated with PPCI represents an unmet clinical need in patients with ACS. Development of therapies for the prevention and treatment of MVO is urgently needed. Does early implementation of MCS in the management of high-risk ACS patients improve clinical outcomes? Does intracoronary hypothermia reduce infarct size and improve clinical outcomes in STEMI patients undergoing PPCI? What is the optimal antiplatelet strategy in patients presenting with SCAD? Specific gaps in knowledge surround antithrombotic treatment in the acute and post-ACS periods, including the optimal combination and duration of treatment. 	<ul style="list-style-type: none"> RCTs evaluating the efficacy of an intravascular imaging-guided revascularization strategy to improve meaningful clinical outcomes in patients with ACS. Prospectively evaluate whether intracoronary physiology assessment of myocardial reperfusion better stratifies patient risk. Patients with an IRA unsuitable for stent implantation randomized to drug-coated balloon treatment or usual care to evaluate clinical outcomes. Pre-clinical and clinical research is needed to evaluate cardioprotective therapies aimed at reducing microvascular obstruction. RCTs evaluating the benefit of using MCS in high-risk patients. Randomized trials are needed to demonstrate both whether intracoronary hypothermia reduces myocardial infarct size, and if this translates into clinical improvement. RCTs evaluating several antiplatelet strategies in patients with SCAD with the aim of determining which results in the greatest clinical benefit.

Gaps in evidence

Chapter	Gaps in evidence	Research recommendations to address these gaps
<p>Management of patients with multivessel disease</p>	<ul style="list-style-type: none"> Does complete revascularization of NSTEMI-ACS with multivessel CAD improve clinical outcomes vs. culprit-only PCI? Does management of non-infarct-related CAD with intravascular imaging guidance to identify rupture-prone atherosclerotic plaque improve clinical outcomes? Does FFR-guided management improve clinical outcomes vs. standard angiography-guided management in NSTEMI-ACS? What is the optimal timing of coronary revascularization (immediate vs. index hospitalization vs. staged) of non-IRA revascularization in STEMI and NSTEMI-ACS? Does intensive medical therapy improve outcomes in patients with MVD compared with standard secondary prevention? The clinical utility of hybrid coronary revascularization in ACS patients with multivessel CAD is uncertain. 	<ul style="list-style-type: none"> Patients with NSTEMI-ACS and MVD randomized to complete vs. culprit-only PCI. RCTs testing whether the use of intravascular imaging to guide the management of non-infarct-related lesions would improve clinical outcomes. Patients randomized to FFR-guided management vs. standard angiography-guided management in NSTEMI-ACS. Three-arm study comparing the clinical benefits of immediate, in-hospital and staged coronary revascularization strategies. Patients with MVD randomized to intensive secondary prevention vs. usual care to evaluate whether the former strategy improves clinical outcomes. RCTs assessing the clinical benefit of hybrid revascularization

Gaps in evidence

Chapter	Gaps in evidence	Research recommendations to address these gaps
<p>• How to better differentiate Type 2 from Type 1 MI before invasive assessment.</p> <p>• The optimal management strategy in older adults with NSTEMI-ACS is not known.</p> <p>• The optimal management strategy in older frail, co-morbid adults with NSTEMI-ACS is not known.</p> <p>• The optimal management strategy in older frail, co-morbid adults with STEMI is not known.</p> <p>• Optimal antiplatelet therapy and its duration to manage ACS in pregnant patients are not known.</p> <p>• The optimal management strategy for pregnant women with NSTEMI-ACS is not known.</p> <p>• There is a need to further evaluate the contribution of social determinants of health</p> <p>Special situations</p>		<ul style="list-style-type: none"> • Prospective evaluation of diagnostic strategies aimed at better classifying patients according to their type of MI (Type 1 vs. Type 2). • Further studies recruiting older adults should be conducted to evaluate whether the current standard of care also benefits this subset of patients. • Older frail, co-morbid patients should not be systematically excluded from RCTs. • Prospective data are needed to better understand which antiplatelet therapy regimen is best for pregnant women. • Observational data are needed in patients with ACS to evaluate the real impact of social determinants of health on clinical outcomes. Randomized interventions aimed at reducing social inequalities are needed to evaluate how to reduce this gap.

Gaps in evidence

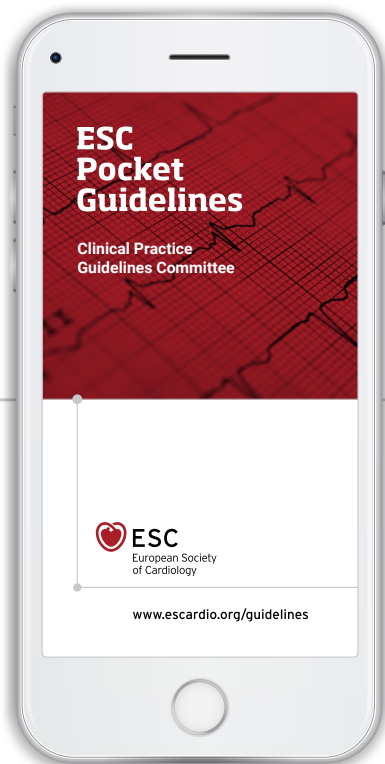
Chapter	Gaps in evidence	Research recommendations to address these gaps
<p>Long-term treatment</p>	<ul style="list-style-type: none"> To evaluate the uptake, safety, and outcomes for alternative forms of cardiac rehabilitation, with a focus on telemedicine and eHealth. How to improve referral for and uptake of CR, especially for groups with low participation, including women, older persons, and ethnic minorities. The role of personalized medicine in the short- and long-term treatment of ACS needs to be further studied. How to address additional risk from non-traditional risk factors, e.g. cardio-obstetrics, cardio-oncology, and inflammatory conditions, needs further attention. Inflammation as a treatment target in patients with atherosclerosis still needs unravelling, as well as the use of biomarkers of inflammation (high-sensitivity C reactive protein, interleukins 1 and 6) to guide treatment of residual risk. The role of lipoprotein (a) in guiding treatment and as an independent treatment target needs to be studied further. The added cardioprotective role of beta-blockers in post-ACS patients without reduced LVEF on otherwise optimal medical therapy needs to be clarified. The added cardioprotective role of ACE inhibitors/ARBs in post-ACS patients without reduced LVEF on otherwise optimal medical therapy needs to be clarified. The future role of new treatment options, using mRNA- and siRNA-based therapies targeting lipid metabolism and inflammation, needs to be explored. It has to be determined whether SGLT2 inhibitors—in the specific group of patients with ACS without heart failure or diabetes—improve clinical outcomes, regardless of diabetes status. 	<ul style="list-style-type: none"> Remote cardiac rehabilitation methods need randomized data to evaluate their true potential. Further monitoring is needed to increase the participation of historically under-represented patients in CR. Patients randomized to personalized strategies vs. usual care are needed to determine the role of precision medicine in ACS. Prospective cohorts are needed to evaluate non-traditional risk factors and residual risk. RCTs testing whether management based on the use of biomarkers of inflammation improves clinical outcomes. RCTs testing whether lipoprotein(a) measurement to guide medical management further improves clinical outcomes. Patients randomized to beta-blocker and no beta-blocker use to evaluate treatment efficacy in patients with ACS and LVEF >40%. RCTs evaluating the benefit of using ACE inhibitors/ARBs vs. placebo on top of standard care in ACS patients with LVEF >40%. Randomized data are needed to evaluate the role of mRNA- and siRNA-based therapies in the current context of lipid management and lipid targets. ACS patients without HF or diabetes should be randomized to SGLT2 inhibitors vs. standard of care.

Gaps in evidence

Chapter	Gaps in evidence	Research recommendations to address these gaps
<p>Patient perspectives</p>	<ul style="list-style-type: none"> The feasibility of performing short witnessed verbal consent followed by written consent after the acute phase needs further evaluation. There is a need to assess the contribution of social determinants of health on ACS incidence and prognosis. The use of validated patient-reported outcome and experience measures in evidence-based medicine should be increased. Quality of life is a relevant outcome not captured in most trials. Use of validated decision aids and audio-visual tools can be helpful to make informed choices that consider patients' values and preferences and promote patient involvement 	<ul style="list-style-type: none"> Studies comparing verbal vs. written consent to evaluate safety endpoints and any ethical concerns. The influence of social determinants of health on clinical outcomes should be evaluated, as well as those interventions aimed at reducing social inequalities. PROMs/PREMs should have a more prominent role in RCTs evaluating patients with ACS. Include quality of life as a prominent outcome in clinical trials. Testing the use of validated decision aids and audio-visual tools to improve decisions around informed choices.
<p>Quality indicators</p>	<p>There is a lack of implementation studies evaluating whether prospectively monitoring and reporting ESC QIs for ACS improve clinical outcomes.</p>	<p>Implementation studies evaluating a quality of care programme based on the evaluation of ESC QIs for ACS.</p>
<p>General</p>	<p>Patients included in clinical trials represent a relatively small proportion of real-life patients.</p>	<p>Conduct clinical trials closer that enrol more representative patient populations (e.g. pragmatic clinical trials).</p>

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Post-publication corrections and updates are available at: www.escardio.org/guidelines

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