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CLINICAL PRACTICE

2020 Update of the quality indicators for acute myocardial infarction: a position paper of the Association for Acute Cardiovascular Care: the study group for quality indicators from the ACVC and the NSTE-ACS guideline group

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Aims Quality indicators (QIs) are tools to improve the delivery of evidence-base medicine. In 2017, the European Society of Cardiology (ESC) Association for Acute Cardiovascular Care (ACVC) developed a set of QIs for acute myocardial infarction (AMI), which have been evaluated at national and international levels and across different populations. However, an update of these QIs is needed in light of the accumulated experience and the changes in the supporting evidence.

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Methods and results The ESC methodology for the QI development was used to update the 2017 ACVC QIs. We identified key domains of AMI care, conducted a literature review, developed a list of candidate QIs, and used a modified Delphi method to select the final set of indicators. The same seven domains of AMI care identified by the 2017 Study Group were retained for this update. For each domain, main and secondary QIs were developed reflecting the essential and complementary aspects of care, respectively. Overall, 26 QIs are proposed in this document, compared to 20 in the 2017 set. New QIs are proposed in this document (e.g. the centre use of high-sensitivity troponin), some were retained or modified (e.g. the in-hospital risk assessment), and others were retired in accordance with the changes in evidence [e.g. the proportion of patients with non-ST segment elevation myocardial infarction (NSTEMI) treated with fondaparinux] and the feasibility assessments (e.g. the proportion of patients with NSTEMI whom risk assessment is performed using the GRACE and CRUSADE risk scores).

Conclusion Updated QIs for the management of AMI were developed according to contemporary knowledge and accumulated experience. These QIs may be applied to evaluate and improve the quality of AMI care.

Keywords Quality indicators • Quality improvement • Myocardial infarction

Background

Assessing the quality of care has become mandatory in many healthcare systems and is an intrinsic component of quality improvement. In 2017, the European Society of Cardiology (ESC) Association for Acute Cardiovascular Care (ACVC) published a position paper defining quality indicators (QIs) for acute myocardial infarction (AMI)[1] with the aim of supporting quality improvement, and based on the assumption that rigorous measurement is fundamental. This was the first QI initiative undertaken within the ESC by one of its constituent associations, concordant with the mission statement of the ACVC to 'improve the quality of care of patients with acute cardiovascular disease'. The ACVC Study Group on QIs decided that QIs should not only reflect high-grade recommendations in ESC guidelines but also should consider the domains of care for which there is potential room for improvement, and where measurement can be performed using existing registries or databases. As a result, the ACVC QIs covered seven domains of care, including centre organization, reperfusion/invasive strategies, risk assessment, antithrombotic selection, secondary prevention, and patient experience. Lastly, two composite indicators and one outcome were defined.

Objectives

The 2017 ESC ACVC QIs were used to support quality assessment and improvement at national[2–7] and international levels,[8] and across different populations.[9] Various studies evaluating the ESC ACVC QIs using existing registries have shown that most QIs can be captured, and, thus can guide the development of future cardiovascular registries.[10] In addition, the ESC ACVC QIs identified gaps in care delivery within and between countries, highlighting missed opportunities to improve clinical outcomes.[2,3,5,9]

Three years after the publication of the initial set of QIs, the ACVC study group on QI considered that an update was timely, because the ESC has updated its Clinical Practice Guidelines for the management of patients with AMI (with and without ST-segment elevation), and published the methodology by which the ESC QIs should be developed.[11] Hence, the QI update was driven by the experience accumulated from assessment of previous QIs in existing registries (Supplementary material online, *Table S1*), the ESC methodology for QI development[11] as well as other methodologies,[12,13] and to ensure the validity of the measurements.[14]

Methods

The 2017 ESC ACVC QIs were updated using the RAND/University of California–Los Angeles (UCLA) appropriateness method,[15,16] which is recommended by the ESC methodology for QI development,[11] and combines best scientific evidence with the collective judgement of experts using the modified Delphi process.[17]

The 2020 ESC ACVC QIs for AMI

The seven domains of AMI care identified by the 2017 Study Group were retained. The list of the main and secondary QIs for each domain are presented in *Figure 1* and Supplementary material online, *Table S2*, with the definitions of numerators and denominators, and the corresponding ESC guidelines recommendations.

Domain 1: centre organization

Network organization

Clinical relevance

In the setting of acute coronary syndrome (ACS), a network organization has a beneficial impact through the availability of different capacities, such as the use of a single telephone emergency number, early identification of ACS, transportation with ambulances with basic or advanced life support capability, direct access to catheterization laboratory, and delivery of care following written protocols.[18] This organization facilitates the selection of the appropriate reperfusion strategy, and reduces times to reperfusion in ST-segment elevation myocardial infarction (STEMI) patients.[19–21] Furthermore, local, regional, or national written protocols can help to reduce delays, reduce variations in the quality of care,[22] and improve the quality of secondary prevention in post-discharge settings.[23]

Specific aspects for selection

Two QIs are related to participation in a regional network: the main QI (1) as a measure of network organization for the management of ACS, including written protocols; and the assessment of essential components of effective systems of STEMI care.[18] Similar QIs were already included in

Figure 1 Main and secondary Quality Indicators for each domain. Timely reperfusion is defined as time from ST-segment elevation myocardial infarction diagnosis to (i) infarct-related artery wire crossing: <60 min for patients presenting at a primary percutaneous coronary intervention hospital, or (ii) <90 min for patients diagnosed either in a non-percutaneous coronary intervention hospital or in the out-of-hospital setting, or (iii) injection of the bolus of fibrinolysis <10 min for patients reperfused with fibrinolysis.

the 2017 ACVC QI list, are supported by class IC recommendations and also feature in the list of QIs in the 2017 STEMI[24] and 2020 non-ST segment elevation ACS (NSTE-ACS) ESC guidelines.[25]

Availability of high-sensitivity troponin assay

Clinical relevance

Cardiac troponin (cTn) elevation is a key diagnostic and prognostic feature in NSTE-ACS. Only 'high-sensitivity' cardiac troponin (hs-cTn) assays have imprecision of <10% at the 99th percentile of the upper reference limit and have the ability to quantify cTn levels in >50% of apparently healthy individuals. Data have shown that more sensitive cardiac troponin assays, such as hs-troponin assay increase diagnostic accuracy with greater and more rapid ability to 'rule-in' or 'rule-out' myocardial infarction.[26]

Specific aspects for selection

Main QI (2) relates to the availability of hs-cTn assay measured at centre level. The use of hs-cTn over less sensitive assays is recommended by guidelines.[25] This QI is also included in the QIs list of the 2020 ESC Guidelines for NSTE-ACS.[25]

Pre-hospital interpretation of Electrocardiogram (ECG)

Clinical relevance

Timely diagnosis for patients with STEMI is determinant for clinical outcomes. The ESC guidelines for STEMI recommend acquiring and interpreting a 12-lead ECG as soon as possible following first medical contact (FMC) to facilitate early diagnosis and risk stratification.[23,24]

Specific aspects for selection

Main QI (3) captures the availability of systems of care in which STEMI diagnosis can be performed in the pre-hospital settings, with the initiation of appropriate treatment pathways.

Participation in a regular registry or quality assessment programme

Clinical relevance

Participation in a registry for quality assessment improves adherence to guidelines.[27] Major improvements in hospital performance and mortality rates have been reported over short periods of time, narrowing the gap between the quality of care delivered between hospitals[28,29] and the

association between the participation in a quality programme for timely reperfusion therapy and clinical improvement has been shown.[23] In addition, the assessment of reperfusion times for STEMI patients is an important and measurable component of STEMI care.

Specific aspects for selection

The two secondary QIs cover the quality improvement programme: participation in a regular registry, and regular monitoring of times to reperfusion. These QIs were already included in the 2017 ESC STEMI guidelines.[24]

Domain 2: invasive strategy

Reperfusion for ST segment elevation myocardial infarction patients

Clinical relevance

Reperfusion therapy should be administered to all eligible patients presenting with STEMI. Primary percutaneous coronary intervention (PCI) is the preferred option, provided it can be performed expeditiously. Based on considerable evidence, the ESC guidelines recommend time targets for reperfusion therapy based on the strategy used and the initial healthcare facility to which the STEMI patient was admitted. As such, time from STEMI diagnosis to wire crossing is recommended to be <60 min for patients presenting at a primary PCI hospital, whereas it should be <90 min for patients diagnosed either in a non-PCI hospital or in the out-of-hospital setting. For patients treated by fibrinolysis, the recommended time between STEMI diagnosis and initiation of fibrinolysis is <10 min.[24]

Specific aspects for selection

Both reperfusion and time to reperfusion have been used as key indicators of quality in patients with STEMI in most sets of QIs or performance measures (PMs).[1,30,31] Main QI (1) assesses the proportion of patients with STEMI admitted within 12 h of the onset of symptoms and treated with reperfusion (irrespective of the timing). Main QI (2) assesses 'timely' reperfusion, defined for reperfusion strategy, by primary PCI or fibrinolysis.[32] The time targets correspond to those recommended by the ESC Guidelines.[24] From a practical viewpoint, the measure of the proportion of patients with STEMI reperfused among those eligible has been measured in all publications reporting ESC-ACVC QIs assessment and ranged from 57% to 98%.

Early invasive strategy in non-ST segment elevation myocardial infarction patients

Clinical relevance

Patients with non-ST segment elevation myocardial infarction (NSTEMI) are on the spectrum of high-risk NSTE-ACS and, therefore, eligible for an invasive approach. The benefit of a routine over a selective invasive approach has been shown in high-risk patients and the timing of the strategy is split into immediate (for patients with very high-risk features such as persistent chest pain), early (<24 h after admission for patients with high-risk features, including those with diagnosis of NSTEMI) or <72 h.

Specific aspects for selection

Main QI (3) measures the use of an early invasive strategy and is therefore suitable for use in patients with NSTEMI. Compared with the previous QI list, the timing has been set at <24 h (instead of <72 h), in line with the ESC Guidelines.[25,33]

The use of radial access

Clinical relevance

The use of radial access is a new QI in this domain. It is justified by the reduction in bleeding and vascular complications achieved with the radial approach,[34,35] especially in ACS.[36]

Specific aspects for selection

This new QI is likely to be easy to assess and will be applicable in the majority of patients, both STEMI and NSTE-ACS. Supported by ESC Guidelines, the 'radial-first strategy' has been referred to as 'best practice' in a position paper from the American Heart Association (AHA).[37]

Domain 3: in-hospital risk assessment

Assessment of left ventricular ejection fraction

Clinical relevance

Left ventricular ejection fraction (LVEF) assessment is important for both prognostic and therapeutic reasons.

Specific aspects for selection

This QI was already in the previous ESC ACVC QIs set.

Assessment of LDL-cholesterol

Clinical relevance

LDL-cholesterol (LDL-c) is considered a causal factor for atherosclerosis.[38] Early and intense reduction of LDL-c as soon as possible after admission has been shown to be effective. The utility of LDL-c assessment is therefore not for the prescription of statins, but rather to have an initial reference value (called 'baseline', i.e. without the effect of LDL-C lowering therapy) and to estimate the potential likelihood of reaching the 2019 ESC guidelines target,[39] with a view to using additional therapies such as the combination with ezetimibe[40] or the early (within 4–6 weeks after discharge) introduction of a proprotein convertase subtilisin–kexin type 9 (PCSK9) inhibitor.[39]

Specific aspects for selection

This QI is new and applicable in all patients.

Risk assessment using a validated score

Clinical relevance

Patient stratification using validated scores is important, both for ischaemic and haemorrhagic risks. Thus, the use of a validated risk score is recommended by the ESC Guidelines (Class IA) for prognosis.

Specific aspects for selection

In the 2017 ESC ACVC QIs, two specific validated scores were included as independent QIs (i.e. the GRACE risk score for ischaemic risk, and the CRUSADE score for haemorrhagic risk). The Study Group decided to retire the specification of the tool used, but to keep the recommendation to perform risk assessment using a validated method.

Domain 4: antithrombotic treatment during hospitalization

Proportion of patients with 'adequate P2Y12 inhibition'

Clinical relevance

In patients with AMI, dual antiplatelet therapy (DAPT) is recommended as soon as possible when ACS is suspected. Among patients eligible for DAPT, the choice between clopidogrel, prasugrel, and ticagrelor is mainly

driven by the results of randomized studies comparing clopidogrel to prasugrel[41,42] and to ticagrelor,[43,44] and the bleeding risk. 'Adequate $P2Y_{12}$ inhibition' is defined as the appropriate selection of the $P2Y_{12}$ inhibitor in accordance with the 2020 ESC Guidelines:

- the use of ticagrelor in patients without a contraindication (e.g. previous haemorrhagic stroke, high bleeding risk, treatment with fibrinolysis, or concomitant use of oral anticoagulation).
- the use of prasugrel in PCI-treated AMI patients without previous haemorrhagic or ischaemic stroke, high bleeding risk (patients 75 years of age and/or with body weight < 60 kg), fibrinolysis or oral anticoagulation
- the use of clopidogrel when there is no indication for prasugrel or ticagrelor.

Specific aspects for selection

Given the importance of selecting the most appropriate $P2Y_{12}$ inhibitor in patients with coronary artery disease (i.e. tailored to the patient's ischaemic and bleeding risks), a Task Force of the ESC and European Association for Cardio-Thoracic Surgery published a focused update on DAPT,[45] in line with the STEMI and NSTE-ACS Guidelines, all supporting the concept of 'adequate $P2Y_{12}$ inhibition'. This QI already featured in the previous ACVC QIs set, and is included in the list of QIs of the 2020 ESC Guidelines for NSTE-ACS. Experience with the assessment of the ACVC QIs shows that this QI may be measured from many, but not all, existing registries, depending on the quality of the variables recorded (Supplementary material online, *Table S1*).

Parenteral anticoagulant at (or before) admission

Clinical relevance

Parenteral anticoagulation is recommended in AMI from the time of diagnosis up to PCI unless otherwise indicated. Different anticoagulant agents (unfractionated heparin, enoxaparin, fondaparinux, or bivalirudin) may be used in this setting. Parenteral anticoagulation is recommended for all patients, in addition to antiplatelet therapy, at the time of diagnosis.

Specific aspects for selection

This QI replaces the previous QI relating to fondaparinux because the ESC Guidelines no longer express a strong preference for any particular drug.

Patients discharged on dual antiplatelet therapy

Clinical relevance

The need for DAPT is a cornerstone of AMI management at the time of hospital admission and discharge, unless the patient is deemed to be at high bleeding risk.[45]

Specific aspects for selection

This QI is a complement to main QI (1), with the particular interest of being more straightforward, easier to assess, and including the prescription of aspirin. Contrary to 'adequate $P2Y_{12}$ inhibition', this QI is reported in all published assessments. Notably, patients treated with oral anticoagulation are excluded because several alternative strategies are available, including some without aspirin.

Mention the duration of dual antiplatelet therapy in the discharge letter

Clinical relevance

Although the standard duration of DAPT after AMI is 12 months, it must be determined according to the patient's risk and ischaemic profile, and may range from 1 to 48 months.[45] At discharge, a shortening or prolongation of the DAPT duration may be proposed according to specific tools, depending on the patient's characteristics, coronary anatomy, the extent of coronary artery disease, or PCI procedure.

Specific aspects for selection

Poor quality discharge letters represent a deficit in communication between hospital specialists and primary care physicians.[46] The post-AMI discharge document is a crucial element to ensuring transmission of medical information to the corresponding physician or the patient, including the ischaemic and haemorragic risk as perceived during the acute hospitalization. Standardization of the discharge document, including insights about the type and duration of the anti-thrombotic treatment has been highlighted by the recent ESC guidelines[25] and its routine application has been accepted by a national group in France.[47]

Domain 5: secondary prevention discharge treatments

After AMI, patients remain at very high-risk and secondary prevention treatment is crucial for reducing mortality and further cardiovascular events. The QIs in this domain cover the prescription of three therapeutic classes, in addition to the anti-thrombotic treatment.

High-intensity statins

Clinical relevance

Statins are fundamental to the treatment of atherosclerosis. In the setting of AMI, high intensity statins are safe and provide better prevention as compared to moderate intensity,[48] irrespective of admission LDL-c. Despite the body of evidence regarding the beneficial effects of lowering LDL-c[38] by statins (alone or in combination with ezetimibe or PCSK9 inhibitors), their use in current registries remains sub-optimal and the proportion of patients at LDL-c target is low: 32% in men and 23% in women in the EuroAspire V registry.[49]

Specific aspects for the selection

This QI was already in the 2017 ESC-ACVC list. Experience of assessment suggests that this QI cannot be assessed from some registries, because the type and dose of statins prescribed at discharge were not recorded. In addition, it is likely that intolerance to high-intensity statins was also not recorded. In registries reporting this QI, the rate of prescription of statins (any intensity) is high, but at high intensity in only about half of the patients.[49]

Patients with left ventricular ejection fraction 40% who are discharged from hospital on angiotensin-converting enzyme inhibitors (or angiotensin receptor antagonists if intolerant of ACEI)

Clinical relevance

Angiotensin-converting enzyme inhibitors (ACEIs) improve survival in patients with impaired LV systolic function, defined by an LVEF <40%. Initiation of ACEI [or angiotensin receptor antagonists (ARBs) in patients intolerant to ACEI] and prescription at the time of hospital discharge is beneficial among patients with an LVEF <40%.

Specific aspects for the selection

This QI was already in the 2017 ESC ACVC list, supported by a Class IIA recommendation. In practice, the proportion of patients with LVEF ≤40% is 15–20% in current registries; therefore, the QI applies only to a subset of high-risk patients.

Patients with left ventricular ejection fraction 40% who are discharged from hospital on beta-blockers

Clinical relevance

Beta-blockers remain a standard of care following AMI, however, the evidence was based on studies performed before the era of reperfusion.[50] In a recent large-scale observational study, a benefit with beta-blockade in post-AMI patients was shown, but only among patients with LV dysfunction.[51]

Specific aspects for the selection

This QI was already in the 2017 ESC-ACVC list. The exact type of beta-blocker indicated for patients with LV systolic dysfunction was not specified for the QI, given the complexity of the measure.

Domain 6: patient satisfaction

Feedback regarding the patient's experience and systematic assessment of health-related quality of life

Clinical relevance

The concept of 'patient-centred care' is based on focusing care on the patient rather than on the disease. In this approach, patients are actively involved in their own care, congruent with the principle of shared-decision making. Patient-reported outcomes (PRO, which can be seen as an assessment of the perceived level of impairment, disability, and quality of life) and patient-reported experience (PRE, which gather information on the care)[52] can be considered as QIs. To this end, PRO and PRE can be measured through patient satisfaction questionnaires.[53] In the setting of AMI, patient satisfaction PRO and PRE are associated with other indices of quality of care.[54,55]

Specific aspects for selection

This QI was already included in the 2017 ESC-ACVC QI list, but only partial assessment has been reported, except for 'referral to rehabilitation programmes' and 'pain control'. The use of a health-related quality of life questionnaire at discharge is reported in the long-tErm follow-up of antithrombotic management patterns In acute CORonary syndrome patients (EPICOR) and the Evaluation of the Methods and Management of Acute Coronary Events (EMMACE)-3 and -4 registries.[8] The Study Group has defined the main QI as a 4-item composite indicator including referral to a rehabilitation programme, patient information about the disease, treatment, and pain control. The secondary QI is the assessment of the health-related quality of life in all patients using a validated instrument.

Discharge letter sent to the patient

Clinical relevance

Copying the hospital discharge letter to the patient is an essential part of communication. The UK Academy of Medical Royal Colleges has published guidance on this topic, considering that excellent written communication is essential to good quality of care and that the letter would be better addressed to the patient and not to the corresponding physician ('Write to, not about').[56] This practice of writing to the patient, compared with writing to the clinician, increases patient satisfaction, improves both the doctor-patient relationship and trust, and reduces anxiety.[57]

Specific aspects for selection

To date, no similar QI or PM has been defined, but it appears to be feasible even if this currently remains undetermined.

Domain 7: outcome and composite quality indicator

Outcomes quality indicator

Thirty-day mortality rate adjusted for a validated risk score is unchanged.

Clinical relevance

All-cause mortality is a self-evident assessment of quality of care and the most easily interpretable, objective and unambiguous indicator. While the accuracy of mortality as a direct measure of quality of care is controversial,[58] the association between the ESC ACVC composite QI and the risk-adjusted outcomes is important.

Specific aspects for the selection

All-cause mortality is easy to assess and this measure provides essential information at broad-level (i.e. region-, country-, or continent-levels). At centre-level, the interpretation may be more challenging and less generalizable, depending on the size of the denominator.

Composite quality indicator

Composite quality indicators (CQIs) summarize information from different domains into a single measure. Thus, it is possible to expand the scope of the measure by including a broad range of individual indicators, to provide a single metric that enables temporal comparisons, classification of centres, and demonstration of the association between the CQI and outcomes, a way of reassuring clinicians about the validity of process instead of clinical outcome assessment.[13]

Clinical relevance

By reducing the information from all domains into a single CQI, the areas for specific improvement may be obscured. Among the different types of composites, the opportunity-based and the all-or-none are the most frequently recommended for the quality of care assessment.[59,60] Since the two methods, while associated,[61] provide different approaches, both types of CQI have been maintained in the updated version. The main CQI is an opportunity-based score, where all domains are represented and have the same weight (except in patients with LVEF ≤40% in whom two additional items are required, giving more weight to the secondary prevention domain). This design has the advantage of increasing the number of items, which may vary according to the patient characteristics and the database used. The secondary CQI has an all-or-none design with only three individual QIs, but all three are deemed clinically relevant: the timely reperfusion or invasive strategy, the prescription of the 'appropriate' $P2Y_{12}$ inhibition and high-intensity statins. With this CQI, only patients who received all three processes are considered as a success and therefore, this method best reflects the patient's interest and tracks excellence.

Specific aspects for the selection

In the previous experience of assessment of the 2017 ESC ACVC QIs, the opportunity-based CQI was reported in most cases and, after transformation into categories, was associated with mortality.[2,3,5,7,8] The Study Group decided that the opportunity-based CQI should contain one item per domain, namely the most adequate to capture quality, despite the challenges for assessment, and considering that this was more an issue related to the design of current registries than the definition of the CQI.

Comparison with previous quality metrics definitions and future developments

The comparison of QI selection between the ESC ACVC 2020 and ESC-ACCA 2017, the American College of Cardiology (ACC) and AHA

Table 1 Quality metrics selected by ESC-ACVC 2020, ESC ACCA 2017, ACC/AHA 2017, and CCS 2008

Domain	Indicators	ACVC 2020	ACCA 2017	ACC/AHA 2017	CCS 2008
Centre Organization	**Network**				
	Availability of hs-cTn				
	Pre-hospital interpretation of ECG				
	Quality registry programme				
	Systematic assessment of times to reperfusion				
Reperfusion—invasive coronary strategy	**STEMI with reperfusion**				
	Timely reperfusion by PCI				
	Time for fibrinolytic therapy				
	Door to needle time				
	Door in Door out time				
	Time to PCI transferred patient				
	Invasive strategy <24 h				
	Radial access				
	FMC to arterial access (STEMI)				
Risk assessment	**LVEF assessment**				
	LDL-c assessment				
	Risk assessment with a validated score				
Antithrombotics	**Adequate P2Y$_{12}$**				
	Aspirin admission				
	Parenteral anticoagulation				
	DAPT at discharge				
	Mention about DAPT duration				
Secondary Prevention	**High-intensity statins**				
	Aspirin discharge				
	ACEI/ARB if LVEF < 40%				
	Aldosterone antagonist at discharge				
	Beta-blockers if LVEF < 40%				
Patient satisfaction	**Feedback**				
	Cardiac rehabilitation				
	Smoking cessation advice				
	Quality of life				
	Discharge letter				
Cardiac arrest	Immediate angiography				
	Hypothermia				
Composite Indicator	**Opportunity-based**				
	All or none				
Outcomes	**Thirty-day risk-adjusted mortality**				

In bold, the Main QIs in 2020. Green indicates quality metric with comparable definition to ESC ACVC 2020; in orange, quality metric selected items with a different definition, in white, no corresponding quality metric. In red, withdrawn indicators.

2017[62] and Canadian Cardiovascular Society (CCS) 2008 is presented in *Table 1*.

- *Centre organization*: compared to the 2017 selection, the QI on availability of hs-cTn in the centre is new.
- *Reperfusion/invasive strategy*: the number of QIs has been reduced and the indicators related to the time for reperfusion have been aligned with the 2017 ESC GL and simplified as compared to the 2017 definition. As compared to the ACC/AHA measure set, the starting time is the initial diagnosis of STEMI (vs. first medical contact for ACC/AHA) and the thresholds are different: <60 min to wire crossing the lesion for patients presenting at a primary PCI hospital, or <90 min for patients diagnosed either in a non-PCI hospital or in the out-of-hospital setting who were then transferred to a PCI-capable centre, and <10 min in case of reperfusion with fibrinolysis. The radial access QI is new and has not been presented in other selections. The reduction of the time to invasive approach to 24 h in NSTEMI is in line with comparable PM from the ACC/AHA.
- *Risk assessment*: the main change is the simplification of the overall risk assessment, without specifying specific risk scores. The assessment of LDL-c has been added as a Main QI. The ESC Guidelines recommend this measure because available evidence supports the addition of ezetimibe and PCSK9 inhibitors on top of high-intensity statins in selected patients.

- *Antithrombotic treatment during hospitalization*: the prescription of 'adequate $P2Y_{12}$ inhibition', already in the 2017 list, has been confirmed, despite the complexity of the assessment. The selection of an 'adequate' $P2Y_{12}$ inhibitor is also in the ACC/AHA PM list with two different definitions, both focusing on the safety side, without considering the potential benefit of using a more potent $P2Y_{12}$ inhibitor in eligible patients. The use of fondaparinux (for NSTE-ACS in the ACVC 2017 selection) has been replaced by the use of a parenteral agent at admission. The mention of the duration of DAPT in the discharge letter is a new indicator, never seen in previous selections. As in 2017, aspirin at admission and at discharge are not included in the list of QIs, reflecting the fact that although this treatment is of paramount importance, the Study Group considers it to be widely applied, with limited room for improvement.[30]
- *Secondary prevention:* there has been no change to this section, compared to the 2017 selection. The prescription of high-intensity statins at discharge was also adopted by ACC/AHA, while aspirin at discharge (and at admission) is considered to be 'topped out' and not included in the ESC ACVC list.
- *Patient satisfaction:* with the exception of cardiac rehabilitation, no comparable indicators have been defined by the ACC/AHA or CCS. The Study Group consider these QI to be important, and there is a compelling need to include the necessary variables in future registries to render assessment possible.
- *Mortality:* risk-adjusted 30-day all-cause mortality has been maintained in the updated QI list, despite significant limitations for interpretation. In contrast, no outcome measure has been selected by ACC/AHA, because the outcomes are only partially dependent on the quality of care, risk adjustment is challenging and, used as PM and not a QI, inclusion of outcome measures could have potentially negative consequences.[12]

Perspectives

The first set of QIs was developed to improve quality through self-assessment. This has been possible in different countries, not carried out by health agencies or insurance companies, but by cardiologists themselves at low cost through existing registries. To facilitate such use of QIs, the Study Group considered the results of these assessments in revising the QIs. Thus, some QIs that were found to be challenging to report have been retired or modified. Conversely, despite not being measured in all registries, certain QIs have been maintained, considering that they capture important aspects of quality care. The next step will be the standardization of the main registries in Europe in order to include the specific variables needed for quality assessment according to the revised set of QIs. In most existing registries and surveys, this would correspond to the addition of a limited number of variables, which should be reliable and straightforward to assess.

Supplementary material

Supplementary material is available at *European Heart Journal: Acute Cardiovascular Care*.

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