ESC European Society of Cardiology

European Journal of Heart Failure (2024)
doi:10.1002/ejhf.3376

POSITION PAPER

European Society of Cardiology quality indicators update for the care and outcomes of adults with heart failure. The Heart Failure Association of the ESC

Amr Abdin[1]*, Chris Wilkinson[2,3], Suleman Aktaa[4,5,6], Michael Böhm[1], Marija Polovina[7], Giuseppe Rosano[8,9], Mitja Lainscak[10,11], Lars H. Lund[12], Theresa McDonagh[13,14], Marco Metra[15], Marianna Adamo[15], Richard Mindham[16], Massimo Piepoli[17,18], Magdy Abdelhamid[19], Stefan Störk[20], Maria P. Tokmakova[21], Petar Seferović[7], Andrew J.S. Coats[22], and Chris P. Gale[4,5,6]

[1]Internal Medicine Clinic III, Cardiology, Angiology and Intensive Care Medicine, Saarland University Hospital, Homburg, Germany; [2]Hull York Medical School, University of York, York, UK; [3]Academic Cardiovascular Unit, South Tees NHS Foundation Trust, James Cook University Hospital, Middlesbrough, UK; [4]Leeds Institute for Cardiovascular and Metabolic Medicine, University of Leeds, Leeds, UK; [5]Leeds Institute for Data Analytics and Leeds Institute of Cardiovascular and Metabolic Medicine, University of Leeds, Leeds, UK; [6]Department of Cardiology, Leeds Teaching Hospitals NHS Trust, Leeds, UK; [7]Serbian Academy of Sciences and Arts, University of Belgrade Faculty of Medicine and Heart Failure Center, Belgrade University Medical Center, Belgrade, Serbia; [8]Department of Cardiology, St George's University and St George's University Hospitals, London, UK; [9]Department of Cardiology, San Raffaele Cassino Hospital, Cassino, Italy; [10]Department of Internal Medicine, and Department of Research and Education, General Hospital Murska Sobota, Murska Sobota, Slovenia; [11]Faculty of Medicine, University of Ljubljana, Ljubljana, Slovenia; [12]Department of Medicine Karolinska Institute, and Department of Cardiology, Karolinska University Hospital, Stockholm, Sweden; [13]King's College Hospital, London, UK; [14]School of Cardiovascular Medicine & Sciences, King's College London, London, UK; [15]Cardiology, ASST Spedali Civili of Brescia, Department of Medical and Surgical Specialties, Radiological Sciences, and Public Health, University of Brescia, Brescia, Italy; [16]ESC Patient Forum, Sophia Antipolis, France; [17]Clinical Cardiology, IRCCS Policlinico San Donato, Milan, Italy; [18]Department of Biomedical Sciences for Health, University of Milan, Milan, Italy; [19]Faculty of Medicine, Kasr Al Ainy, Cardiology Department, Cairo University, Giza, Egypt; [20]Department of Clinical Research & Epidemiology, Comprehensive Heart Failure Centre and Department of Internal Medicine I, University Hospital Würzburg, Würzburg, Germany; [21]Department of Cardiology, Medical University of Plovdiv, Plovdiv, Bulgaria; and [22]Heart Research Institute, Sydney, Australia

Received 27 March 2024; revised 2 May 2024; accepted 25 June 2024

Aims To update the European Society of Cardiology (ESC) quality indicators (QIs) for the evaluation of the care and outcomes of adults with heart failure.

Methods and results The Working Group comprised experts in heart failure including members of the ESC Clinical Practice Guidelines Task Force for heart failure, members of the Heart Failure Association, and a patient representative. We followed the ESC methodology for QI development. The 2023 focused guideline update was reviewed to assess the suitability of the recommendations with strongest association with benefit and harm against the ESC criteria for QIs. All the new proposed QIs were individually graded by each panellist via online questionnaires for both validity and feasibility. The existing heart failure QIs also underwent voting to 'keep', 'remove' or 'modify'. Five domains of care for the management of heart failure were identified: (1) structural QIs, (2) patient assessment, (3) initial treatment, (4) therapy optimization, and (5) patient health-related quality of life. In total, 14 'main' and 3 'secondary' QIs were selected across the five domains.

*Corresponding author. Internal Medicine Clinic III, Cardiology, Angiology and Intensive Care Medicine, Saarland University Hospital, Kirrberger Strasse 100, 66421 Homburg, Germany. Tel: +49 6841 1615029, Fax: +49 6841 1615032, Email: amr.abdin@uks.eu

Conclusion This document provides an update of the previously published ESC QIs for heart failure to ensure that these measures are aligned with contemporary evidence. The QIs may be used to quantify adherence to clinical practice as recommended in guidelines to improve the care and outcomes of patients with heart failure.

Keywords Heart failure • Quality indicators • Clinical practice guidelines • Outcomes

Introduction

Following the release of the 2021 European Society of Cardiology (ESC) guidelines on the diagnosis and treatment of acute and chronic heart failure (HF),[1] there have been a number of randomized clinical trials[2–6] which have provided novel findings concerning the management of HF. In 2023, a focused update for HF was issued to provide new recommendations for the management of HF based on the latest evidence.[7]

It is advised to optimize medical therapy for HF according to established guidelines during each patient visit to enhance outcomes.[1,6,7] Yet, in daily clinical practice it is not infrequent that patients with HF do not receive all of the recommended pharmacotherapies and/or devices – either non-receipt, delayed use or being prescribed doses lower than those reported in clinical trials and recommended in guidelines.[8–12] Additionally, the challenge of polypharmacy in patients with HF, combined with the logistical, financial and safety considerations associated with initiating and/or adjusting guideline-directed medical therapy (GDMT), underscores the need for mechanisms that differentiate between situations where clinical decisions and non-use of interventions are appropriate.[8,9]

In 2022, the ESC quality indicators (QIs) of HF, in collaboration with the Heart Failure Association (HFA) of the ESC, were established to develop a set of indicators for the management of adults with HF.[13] This work was undertaken in parallel with the writing of the 2021 ESC guidelines for the diagnosis and treatment of acute and chronic HF, and in collaboration with the Task Force members of the guidelines. A summary form of these indicators has been embedded within the guideline document.[1] These published QIs[13] have been used as means to measure adherence to and outcomes associated with HF medical therapy. Moreover, the QIs defined a discrete process of care, and thus allow the interpretation of real-world evidence data.[14]

Following the publication of the 2023 ESC focused guideline update for HF,[7] it is appropriate that the HF QIs are re-appraised and new ones developed as necessary. This document focuses on the recommendations of the guideline update, and reviews the existing QIs.

Methods

The methodology by which the ESC develops its QIs for the quantification of cardiovascular care and outcomes is published separately.[15] In brief, the methodology involves (i) the identification of the key domains of care for the management of HF by constructing a conceptual framework of HF care, (ii) the development of candidate QIs by conducting a systematic review of the literature, (iii) the selection of the final set of QIs using a modified-Delphi method, and (iv) the evaluation of the feasibility of the developed QIs.

The ESC uses the term QI to describe a specific clinical situation and the process of care that is recommended (or not recommended) to be performed. The ESC QIs include 'main' and 'secondary' indicators, which may be divided into structural, process, and outcome QIs depending on the aspect of care being measured.[16]

The 2023 focused guideline update was reviewed to assess the suitability of the recommendations with strongest association with benefit and harm (class I and III, respectively) against the ESC criteria for QIs.

Members of the Working Group

The Working Group comprised of members of the Task Force of the 2023 focused update of the ESC guidelines for HF, members of the HFA, experts in the management of patients with HF, QI development experts, and a patient representative.

The identification of the key domains of care was established in the 2022 QI paper by constructing a conceptual illustration of the multi-faceted journey for patients with HF,[13,15] and formed the framework that encompasses the QIs. The Working Group defined the 'target population' for whom the set of QIs is developed as patients with an established diagnosis of HF. The exclusion of patients with suspected HF was sought to allow the identification of the cohort of patients eligible for the aspects of care being measured.[13] In addition, the Working Group defined, for each new developed QI, a numerator (patients who received the aspect of care being measured), a denominator (patients eligible for the aspect of care being measured), the measurement period (the timepoint at which the assessment is performed), and the measurement duration (the time frame needed for enough cases to be collected). For the structural QIs, however, only numerator definitions were provided. This is because these are binary measurements (yes, no).[13] The Working Group also voted to keep, remove or modify the previously published QIs.

Data synthesis

Modified Delphi process

The 'candidate' QIs which were derived from the aforementioned process were evaluated using the modified Delphi method.[17,18] The ESC criteria for QI development[15] were shared with the Working Group members prior to voting in order to standardize the selection process. All the new proposed QIs were individually graded by each panellist via online questionnaires using a 9-point ordinal scale for both validity and feasibility.[15,19] The existing HF QIs also underwent voting to 'keep', 'remove' or 'modify'. Two of the previously published HF QIs were modified and therefore evaluated as new QIs based on the new published evidence.

Analysing voting results

The 9-point ordinal scale used for voting implied that ratings of 1 to 3 meant that the QI is not valid/feasible (as a QI); ratings of 4 to 6 meant that the QI is of an uncertain validity/feasibility; and ratings of 7 to 9 meant that the QI is valid/feasible. For each 'candidate' QI, the median and the mean deviation from the median were calculated to evaluate the central tendency the dispersion of the votes. 'Candidate' QIs, with median scores ≥7 for validity, ≥4 for feasibility, and with minimal inter-rater variation (defined as mean deviation from median ≤1.5) were included in the final set of QIs.[13,15] The QIs included following the first voting round were defined as 'main' QIs, while those included after a second round of voting were defined as 'secondary' QIs. The old QIs with a group voting score of >70% to keep were retained in the new set of QIs.

Results

Domains of heart failure care

Five domains of care for the management of HF were identified by the Working Group during the early phases of the development process. These domains included: (1) structural QIs, which evaluate the characteristics of the facilities caring for patients with HF, (2) patient assessment, which evaluates the investigations needed at the time of diagnosis, (3) initial treatment, which evaluates the first-line GDMT for patients with HF, (4) therapy optimization, which evaluates the subsequent treatment options, and (5) patients' health-related quality of life (*Table 1*).

Voting results

Based on the new recommendations in the guideline update, four new QIs were employed as 'new candidate' QIs, and were in the first round of voting. Of these, 3 (75%) QIs were included as 'main indicators' and 1 (25%) was excluded. According to the voting results, from the old set of QIs 11 main and 3 secondary QIs remained unchanged (online supplementary *Table S1*).

Quality indicators

Domain 1: Structural quality indicators

As in 2022,[13] the existing two main QIs remain unchanged. There were (1) the availability of a dedicated multidisciplinary team for the management of patients with HF; and (2) the availability of dedicated healthcare professional(s) who may be able to deliver HF specific education to facilitate patient self-care. These are key aspects of HF care and have been found to be associated with improved outcomes.[1,20–22]

Domain 2: Patient assessment

In this domain, five QIs remained unchanged, and one QI was modified based on new evidence and proposed as the new main QI. The remaining QIs were: (1) the proportion of patients with HF who have a documentation of their HF clinical type (HF with reduced [HFrEF], mildly reduced [HFmrEF], and preserved ejection fraction [HFpEF]); (2) the proportion of patients with HF who have a documentation of their electrocardiographic findings; (3) the proportion of patients with HF who have their natriuretic peptides measured; (4) the proportion of patients with HF who have their blood tests documented such as liver function tests and iron profile as they provide prognostic information and help guide therapeutic strategy[7,23,24]; and (5) the proportion of patients hospitalized with HF who have been referred for a cardiac rehabilitation programme.

The new modified QI in this domain was the proportion of patients hospitalized with HF who had a follow-up visit from a healthcare professional within 6 weeks of their hospital discharge. This QI was selected as a main QI. This is because post-discharge interventions such as early follow-up and cardiac rehabilitation have been associated with improved patient outcomes, most notably in the STRONG-HF trial.[1,6–8]

Domain 3: Initial treatment

In this domain, four QIs remained as main QIs: the proportion of patients with HFrEF who are prescribed (1) beta-blockers; (2) angiotensin-converting enzyme (ACE) inhibitor, angiotensin receptor blockers (ARB) or angiotensin receptor–neprilysin inhibitor (ARNI); (3) mineralocorticoid receptor antagonists (MRA); and (4) the proportion of HF patients who are prescribed loop diuretic therapy if they have evidence of fluid retention.

Sodium–glucose cotransporter 2 (SGLT2) inhibitors have been shown to improve outcomes in HF patients across the range of left ventricular ejection fraction (LVEF).[7] Therefore, a new QI was selected that measures the proportion of patients with HF, independent of LVEF, who are prescribed an SGLT2 inhibitor in the absence of contraindications. This QI was selected as the main QI.

Domain 4: Therapy optimization

Here, two secondary QIs from the previous set[13] were retained. There were: (1) the proportion of symptomatic patients with HFrEF in sinus rhythm with a QRS duration ≥150 ms and left bundle branch block QRS morphology and with LVEF ≤35% despite ≥3 months of optimal medical therapy who are offered cardiac resynchronization therapy; and (2) the proportion of symptomatic patients with HF, LVEF ≤35% despite ≥3 months of optimal medical therapy, and ischaemic heart disease who are offered a primary prevention implantable cardiac defibrillator.

In addition, a new QI has been proposed in this domain that relates to the proportion of patients with HFrEF and HFmrEF who are prescribed intravenous iron therapy when they have evidence of iron deficiency. This is because of new evidence showing that treatment of iron deficiency improves HF symptoms, physical performance and quality of life.[7,25]

Domain 5: Health-related quality of life

As in the previous QI set,[11] the use of a validated tool for assessing patient health-related quality of life, without specifying the characteristics or type of this tool, was selected as a secondary QI.

Table 1 Updated European Society of Cardiology indicators for the quality of care of patients with heart failure

Domain 1: Structural framework
Main (1.1)[a]: Centres should have a dedicated multidisciplinary team to manage patients with HF
Numerator: Availability of a dedicated multidisciplinary team to manage patients with HF.
Main (1.2)[a]: Centres should have dedicated trained healthcare professionals to deliver HF specific education to facilitate patient self-care
Numerator: Availability of dedicated trained healthcare professionals to deliver HF specific education to facilitate patient self-care.
Domain 2: Patient assessment
Main (2.1)[b]: Proportion of patients with HF who have a documentation of their HF clinical type (HFrEF, HFmrEF, HFpEF)
Numerator: Number of patients with HF who have a documentation of their HF clinical type (HFrEF, HFmrEF, HFpEF).
Denominator: Number of patients with HF.
Main (2.2)[b]: Proportion of patients with HF who have a documentation of their ECG findings
Numerator: Number of patients with HF who have a documentation of their ECG findings[c].
Denominator: Number of patients with HF.
Main (2.3)[d]: Proportion of patients with HF who have their NPs measured
Numerator: Number of patients with HF who have a documentation of their NP levels[d].
Denominator: Number of patients with HF.
Main (2.4)[d]: Proportion of patients with HF who have their blood tests documented
Numerator: Number of patients with HF who have a documentation of their creatinine, U&Es, FBC, glucose, HbA1c, TSH, LFTs, lipids, and iron profile results[d].
Denominator: Number of patients with HF.
Main (2.5)[b]: Proportion of patients hospitalized with HF who have been referred for a cardiac rehabilitation programme
Numerator: Number of patients with HF who have been referred for a cardiac rehabilitation programme following HF hospitalization.
Denominator: Number of patients hospitalized with HF.
Main (2.6)[b]: Proportion of patients hospitalized with HF who have a follow-up review by a healthcare professional within 6 weeks after their hospital discharge for rapid up-titration of evidence-based treatment
Numerator: Number of patients with HF who have a follow-up review by a healthcare professional within 6 weeks following HF hospitalization for rapid up-titration of evidence-based treatment.
Denominator: Number of patients hospitalized with HF.
Domain 3: Initial treatment
Main (3.1)[b]: Proportion of patients with HFrEF who are prescribed the beta-blocker bisoprolol, carvedilol, sustained-release metoprolol succinate, or nebivolol in the absence of any contraindications
Numerator: Number of patients with HFrEF who are prescribed the beta-blocker bisoprolol, carvedilol, sustained-release metoprolol succinate, or nebivolol.
Denominator: Number of patients with HFrEF without any contraindications for the beta-blocker bisoprolol, carvedilol, sustained-release metoprolol succinate, and nebivolol.
Main (3.2)[b]: Proportion of patients with HFrEF who are prescribed an ACE inhibitor, ARB or ARNI in the absence of any contraindications
Numerator: Number of patients with HFrEF who are prescribed an ACE inhibitor, ARB or ARNI.
Denominator: Number of patients with HFrEF without any contraindications for ACE inhibitors, ARBs and ARNI.
Main (3.3)[b]: Proportion of patients with HFrEF who are prescribed an MRA in the absence of any contraindications
Numerator: Number of patients with HFrEF who are prescribed an MRA.
Denominator: Number of patients with HFrEF without any contraindications for MRA.
Main (3.4)[b]: Proportion of patients with HF regardless of LVEF who are prescribed a SGLT2 inhibitor in the absence of any contraindications
Numerator: Number of patients with HF who are prescribed a SGLT2 inhibitor.
Denominator: Number of patients with HF without any contraindications for SGLT2 inhibitor.
Main (3.5)[b]: Proportion of patients with HF who are prescribed loop diuretic therapy if they have evidence of fluid retention
Numerator: Number of patients with HF, with evidence of fluid retention who are prescribed loop diuretic therapy.
Denominator: Number of patients with HF who have evidence of fluid retention and no contraindications for loop diuretic therapy.

Table 1 (Continued)

Domain 4: Therapy optimization
Main (4.1)[b]: Proportion of patients with HFrEF and HFmrEF who are prescribed intravenous iron therapy if they have evidence of iron deficiency
Numerator: Number of patients with HFrEF and HFmrEF, with evidence of iron deficiency who are prescribed intravenous iron therapy.
Denominator: Number of patients with HFrEF and HFmrEF who have evidence of iron deficiency and no contraindications for intravenous iron therapy.
Secondary (4.2)[b]: Proportion of symptomatic patients with HFrEF in sinus rhythm with a QRS duration ≥150 ms and LBBB QRS morphology and with LVEF ≤35% despite ≥3 months of OMT who are offered CRT
Numerator: Number of symptomatic (NYHA class II–III) patients with HFrEF in sinus rhythm with a QRS duration ≥150 ms and LBBB QRS morphology and with LVEF ≤35% despite ≥3 months of OMT who are offered CRT.
Denominator: Number of symptomatic (NYHA class II–III) patients with HF in sinus rhythm with a QRS duration ≥150 ms and LBBB QRS morphology and with LVEF ≤35% despite ≥3 months of OMT.
Secondary (4.3)[b]: Proportion of symptomatic patients with HF, LVEF ≤35% despite ≥3 months of OMT, and IHD who are offered primary prevention ICD[e]
Numerator: Number of symptomatic (NYHA class II–III) patients with HF, LVEF ≤35% despite ≥3 months of OMT, and IHD who are offered primary prevention ICD.
Denominator: Number of symptomatic (NYHA class II–III) patients with HF, LVEF ≤35% despite ≥3 months of OMT, and IHD who are expected to survive substantially longer than 1 year with good functional status.
Domain 5: Assessment of patient HRQoL
Secondary (5.1)[b]: Proportion of patients with HF who have an assessment of their HRQoL using a validated tool[e]
Numerator: Number of patients with HF who have an assessment of their HRQoL using a validated tool.
Denominator: Number of patients with HF.

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor–neprilysin inhibitor; CRT, cardiac resynchronization therapy; ECG, electrocardiogram; ESC, European Society of Cardiology; FBC, full blood count; HbA1c, glycated haemoglobin; HF, heart failure; HFA, Heart Failure Association; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; HRQoL, health-related quality of life; ICD, implantable cardioverter-defibrillator; IHD, ischaemic heart disease; LBBB, left bundle branch block; LFT, liver function test; LVEF, left ventricular ejection fraction; MRA, mineralocorticoid receptor antagonist; NP, natriuretic peptide; NYHA, New York Heart Association; OMT, optimal medical therapy; QI, quality indicator; SGLT2, sodium–glucose cotransporter 2; TSH, thyroid-stimulating hormone; U&E, urea and electrolyte.

[a]Measurement period = the time of enrolment in a registry or quality improvement programme, and annually thereafter.

[b]Measurement period = the time of outpatient visit or hospital discharge; measurement duration = 12 months, exclusion criteria = patients with advanced HF who are not considered for heart transplant and/or mechanical circulatory support.

[c]ECG findings must include rhythm, rate, and QRS complexes that are recorded within a 12-month period after the time of outpatient visit or hospital discharge.

[d]Within a 3-month period after the time of HF diagnosis (measurement period).

[e]The quality indicators in the domain 'Therapy optimization' were developed as secondary indicators given the concerns about their feasibility in different healthcare systems.

Composite quality indicators

The composite QI is a combination of two or more indicators into a single score, and serves to condense a number of individual QIs into a comprehensive assessment of care quality.[13,15] *Table 2* shows the individual QIs for within both the opportunity-based and the all-or-none composite QIs in the 2022 ESC HFA QIs for HF and the current update.

Discussion

This document provides an update of the ESC HF QIs. The indicators are based on evidence, endorsed by expert consensus, and serve as tools for enhancing the quality of care through improvement initiatives. This update of the HF QIs concurrently with the 2023 ESC clinical practice guidelines focused update enables the conversion of specific guideline recommendations into clear and measurable indicators (*Figure 1*).

Although optimization of HF therapies has been shown to reduce early death and hospitalization, there is a need for interventions to support the effective implementation of these treatments.[8–10] Clinical practice guidelines serve as an important tool for healthcare professionals – guiding the management of patients according to clinically assimilated and reviewed contemporary evidence.[1,7] Yet observational studies describe a second translational gap, and geographic variation in the application of evidence-based care.[10,14,26] This translates into missed opportunities for the reduction in morbidity, mortality and unscheduled healthcare utilization associated with HF.

The 2022 ESC HF QIs were the first ESC suite of QIs for the evaluation of HF care.[13] They were designed to be applicable to European clinical practice. Indicators of care quality are becoming more prevalent as measurable instruments for assessing adherence to guideline recommendations, detecting variation in clinical practice, and promoting quality improvement. The integration of data from routine clinical registries proves valuable in quantifying HF processes and treatment outcomes, especially when combined with QIs.[14] Therefore, assessing the validity of these ESC QIs in the clinical registry is an important and necessary step to measure adherence to these QIs.

Table 2 Composite quality indicators

Composite main: Opportunity-based
Calculated on 6 individual QIs in patients with LVEF >40%:
1. Proportion of patients with HF who have a documentation of their HF clinical type (HFrEF, HFmrEF, HFpEF).
2. Proportion of patients with HF who have a documentation of their ECG findings.
3. Proportion of patients with HF who have their NPs measured (within a 3-month period after the time of HF diagnosis).
4. Proportion of patients with HF who have their blood tests checked.
5. Proportion of patients with HFmrHF and HFpEF who are prescribed a SGLT2 inhibitor in the absence of any contraindications.
6. Proportion of patients hospitalized with HF who have been referred for a cardiac rehabilitation programme.
7. Proportion of patients hospitalized with HF who have a follow-up review by a healthcare professional within 6 weeks after their hospital discharge.
Calculated on 13 individual QIs in patients with LVEF ≤40%:
1. Proportion of patients with HF who have a documentation of their HF clinical type (HFrEF, HFmrEF, HFpEF).
2. Proportion of patients with HF who have a documentation of their ECG findings.
3. Proportion of patients with HF who have their NPs measured (within a 3-month period after the time of HF diagnosis).
4. Proportion of patients with HF who have their blood tests checked.
5. Proportion of patients hospitalized with HF who have been referred for a cardiac rehabilitation programme.
6. Proportion of patients hospitalized with HF who have a follow-up review by a healthcare professional within 4 weeks after their hospital discharge.
7. Proportion of patients with HFrEF who are prescribed the beta-blocker bisoprolol, carvedilol, sustained-release metoprolol succinate, or nebivolol in the absence of any contraindications.
8. Proportion of patients with HFrEF who are prescribed an ACE inhibitor, ARB or ARNI in the absence of any contraindications.
9. Proportion of patients with HFrEF who are prescribed an MRA in the absence of any contraindications.
10. Proportion of patients with HFrEF who are prescribed a SGLT2 inhibitor in the absence of any contraindications.
11. Proportion of patients with HFrEF who are prescribed intravenous iron therapy if they have evidence of iron deficiency
12. Proportion of symptomatic patients with HFrEF in sinus rhythm with a QRS duration ≥150 ms and LBBB QRS morphology and with LVEF ≤35% despite OMT who are offered CRT.
13. Proportion of symptomatic patients with HF, LVEF ≤35% despite ≥3 months of OMT, and IHD who are offered primary prevention ICD.
Numerator: Number of times each of the above individual QIs were accomplished correctly[a].
Denominator: Number of chances existed to deliver individual QIs based on the inclusion criteria of each QI (*Table 1*).
Composite secondary: All-or-none
1. Proportion of patients with HFrEF who are prescribed the beta-blocker bisoprolol, carvedilol, sustained-release metoprolol succinate, or nebivolol in the absence of any contraindications.
2. Proportion of patients with HFrEF who are prescribed an ACE inhibitor, ARB or ARNI in the absence of any contraindications.
3. Proportion of patients with HFrEF who are prescribed an MRA in the absence of any contraindications.
4. Proportion of patients with HF who are prescribed a SGLT2 inhibitor in the absence of any contraindications.
Numerator: Number of patients who are eligible for and have accomplished all the above individual QIs.
Denominator: Number of patients who are eligible for all the above individual QIs based on the inclusion criteria of each QI (*Table 1*).

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor–neprilysin inhibitor; CRT, cardiac resynchronization therapy; ECG, electrocardiogram; HF, heart failure; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; ICD, implantable cardioverter-defibrillator; IHD, ischaemic heart disease; LVEF, left ventricular ejection fraction; MRA, mineralocorticoid receptor antagonist; NP, natriuretic peptide; OMT, optimal medical therapy; QI, quality indicator; SGLT2, sodium–glucose cotransporter 2.

[a]Weighting for the individual component QIs within the composite is not provided here as this needs to be determined according to the volume of opportunities for these QIs for a particular hospital (e.g. a hospital that frequently has patients eligible for pharmacotherapies for HF but rarely performs ICD implantation would be scored in a manner that weights pharmacotherapy QIs more heavily).

In this HF QI update, we have primarily concentrated on the recommendations described in the 2023 ESC clinical practice guideline update. However, we also conducted voting on the existing QIs to determine whether any changes or removals were warranted. In this new set of QIs, and for the first time, there is a QI for the use of SGLT2 inhibitors in all patients with HF, regardless of LVEF. This represents a key quality measure given that SGLT2 inhibitors have demonstrated beneficial effects across the range of LVEF.[7] Furthermore, one secondary QI was promoted to be a main QI and concerned the current ESC recommendation for follow-up care after hospitalization with HF within 6 weeks compared with the recommendation of 4 weeks until follow-up in the 2021 ESC clinical practice guideline. This change in the recommendation and the level of evidence was based on the STRONG-HF trial, which demonstrated that high-intensity care including follow-up in the first 6 weeks after discharge for acute HF hospitalization reduced readmissions or death from any cause. Yet, a substantial proportion of patients do not receive all classes of drugs that could improve their prognosis.[8–10] Since the majority of the benefit of foundational HF treatments became apparent within the first 30 days after randomization,[8] the strategy of early follow-up to optimize HF therapy is an important QI to improve patient outcomes.

Although a standardized methodology was used in the development of this QI update to facilitate monitoring and reporting on the quality of HF care, which is a mandatory component of accountable

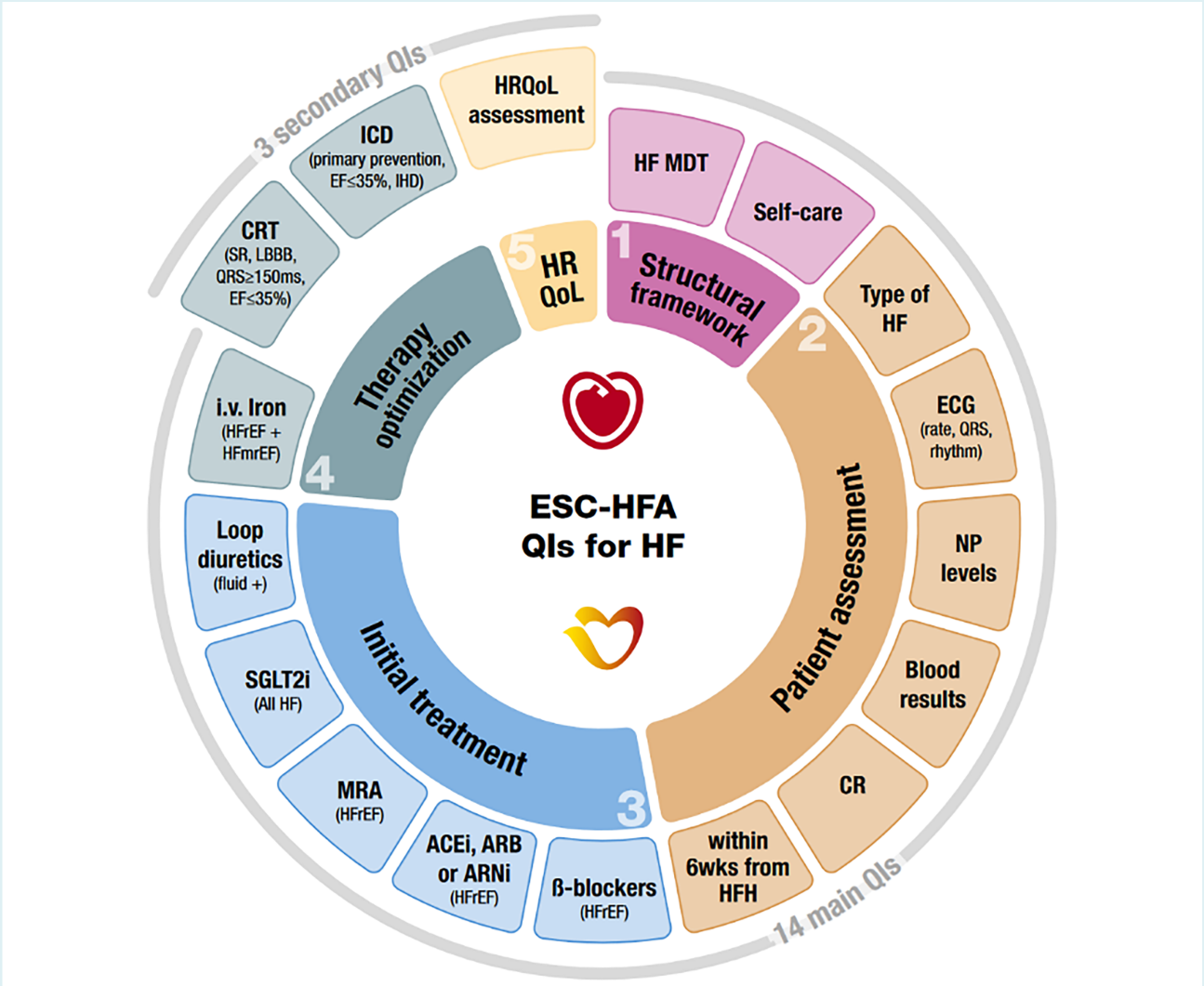

Figure 1 European Society of Cardiology (ESC) quality indicators (QIs) for the management of patients with heart failure (HF). ACEi, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor–neprilysin inhibitor; CR, chest X-ray; CRT, cardiac resynchronization therapy; ECG, electrocardiogram; EF, ejection fraction; HFA, Heart Failure Association; HFH, heart failure hospitalization; HFmrEF, heart failure with mildly reduced ejection fraction; HFrEF, heart failure with reduced ejection fraction; HRQoL, health-related quality of life; ICD, implantable cardioverter-defibrillator; IHD, ischaemic heart disease; LBBB, left bundle branch block; MDT, multidisciplinary team; MRA, mineralocorticoid receptor antagonist; NP, natriuretic peptide; SGLT2i, sodium–glucose cotransporter 2 inhibitor, SR, sinus rhythm. Blood results: urea, creatinine, estimated glomerular filtration rate, electrolytes, full blood count, glucose, glycated haemoglobin, thyroid-stimulating hormone, liver function test, lipids, and iron profile. Beta-blockers: bisoprolol, carvedilol, sustained-release metoprolol succinate, or nebivolol.

healthcare systems, there are limitations in our approach. First, relying exclusively on experts in QI selection introduces subjectivity. By employing the modified Delphi method and adhering to the ESC criteria, the process was consistent. Second, the QIs described in this article are a product of both the results of the literature review, the clinical practice guideline recommendations, and the consensus reached by the development group. Although the importance of other aspects in the treatment of HF is recognized, certain elements have not been selected due to the complexity of such decisions, making their practical implementation less feasible.

Conclusion

This document provides an update of the previously published ESC QIs for HF to ensure that these measures are aligned with contemporary evidence. Within these domains, it offers a total of 14 primary and 3 secondary QIs for the management of HF. The main novel QIs relate to follow-up within 6 weeks after a HF event, use of SGLT2 inhibitors across the LVEF spectrum, and use of intravenous iron in patients with HFrEF or HFmrEF and concomitant iron deficiency. Comprehensive specifications

for each QI are provided to enhance their practical application. The proposed set of QIs is designed to support the integration and evaluation of adherence to clinical practice guidelines. It also enables institutions to monitor, compare, and enhance the quality of care provided to patients with HF.

Supplementary Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Acknowledgement

We are grateful to Armin Schweitzer for his technical and artwork help.

Conflict of interest: A.A. reports speaker's honoraria from Boston Scientific and Bayer. M.B. reports personal fees from Abbott, Amgen, AstraZeneca, Bayer, Boehringer Ingelheim, Cytokinetics, Medtronic, Novartis, Servier, and Vifor, and is supported by the Deutsche Forschungsgemeinschaft (German Research Foundation; TTR 219, project number 322900939). G.R. reports speaker's honoraria from AstraZeneca, Boehringer Ingelheim, Bayer AG and Vifor. M.L. reports personal fees from Boehringer Ingelheim, and is supported by the Slovenian Research and Innovation Agency (grant J3-3076). L.H.L. is supported by Karolinska Institutet, the Swedish Research Council (grant 523-2014-2336), the Swedish Heart Lung Foundation (grants 20150557, 20190310), and the Stockholm County Council (grants 20170112, 20190525), and reports unrelated to the present work grants, consulting, honoraria from Abbott, Alleviant, AstraZeneca, Bayer, Biopeutics, Boehringer Ingelheim, Edwards, Merck/MSD, Novartis, Novo Nordisk, OrionPharma, Owkin, Pharmacosmos, Vifor Pharma; Stock ownership: AnaCardio. M.Ad. reports speaker honoraria from Abbott Vascular and Edwards Lifesciences. M.P. reports consultancy, speaker's fees from AstraZeneca, Boehringer Ingelheim, Novo Nordisk and payment for writing or reviewing the manuscript from Menarini, Servier. M.Ab. reports speaker's honoraria from Novartis, AstraZeneca, Bayer and Boehringer Ingelheim. P.S. reports consultancy agreement from Behringer Ingelheim, Novartis; honoraria for the lectures from AstraZeneca, Berlin Chemie-Menarini. A.J.S.C. reports having received honoraria and/or lecture fees from Astra Zeneca, Bayer, Boehringer Ingelheim, Edwards, Eli Lilly, GSK, Menarini, Novartis, Novo Nordisk, Servier, Vifor, Abbott, Actimed, Cardiac Dimensions, Corvia, CVRx, Enopace, ESN Cleer, Faraday, Impulse Dynamics, Respicardia, Viatris, all unrelated to this work. All other authors have nothing to disclose. Open Access funding enabled and organized by Projekt DEAL.

References

1. McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, Böhm M, *et al.* 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: Developed by the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). With the special contribution of the Heart Failure Association (HFA) of the ESC. *Eur J Heart Fail* 2022;**24**:4–131. https://doi.org/10.1002/ejhf.2333
2. Anker SD, Butler J, Filippatos G, Ferreira JP, Bocchi E, Böhm M, *et al.*; EMPEROR-Preserved Trial Investigators. Empagliflozin in heart failure with a preserved ejection fraction. *N Engl J Med* 2021;**385**:1451–1461. https://doi.org/10.1056/NEJMoa2107038
3. Solomon SD, McMurray JJV, Claggett B, de Boer RA, DeMets D, Hernandez AF, *et al.*; DELIVER Trial Committees and Investigators. Dapagliflozin in heart failure with mildly reduced or preserved ejection fraction. *N Engl J Med* 2022;**387**:1089–1098. https://doi.org/10.1056/NEJMoa2206286
4. Vaduganathan M, Docherty KF, Claggett BL, Jhund PS, de Boer RA, Hernandez AF, *et al.* SGLT-2 inhibitors in patients with heart failure: A comprehensive meta-analysis of five randomised controlled trials. *Lancet* 2022;**400**:757–767. https://doi.org/10.1016/S0140-6736(22)01429-5
5. Kalra PR, Cleland JGF, Petrie MC, Thomson EA, Kalra PA, Squire IB, *et al.*; IRON-MAN Study Group. Intravenous ferric derisomaltose in patients with heart failure and iron deficiency in the UK (IRONMAN): An investigator-initiated, prospective, randomised, open-label, blinded-endpoint trial. *Lancet* 2022;**400**:2199–2209. https://doi.org/10.1016/S0140-6736(22)02083-9
6. Mebazaa A, Davison B, Chioncel O, Cohen-Solal A, Diaz R, Filippatos G, *et al.* Safety, tolerability and efficacy of up-titration of guideline-directed medical therapies for acute heart failure (STRONG-HF): A multinational, open-label, randomised, trial. *Lancet* 2022;**400**:1938–1952. https://doi.org/10.1016/S0140-6736(22)02076-1
7. McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, Böhm M, *et al.* 2023 Focused Update of the 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: Developed by the task force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) With the special contribution of the Heart Failure Association (HFA) of the ESC. *Eur J Heart Fail* 2024;**26**:5–17. https://doi.org/10.1002/ejhf.3024
8. Abdin A, Bauersachs J, Soltani S, Eden M, Frey N, Böhm M. A practical approach to the guideline-directed pharmacological treatment of heart failure with reduced ejection fraction. *ESC Heart Fail* 2023;**10**:24–31. https://doi.org/10.1002/ehf2.14197
9. Abdin A, Anker SD, Butler J, Coats AJS, Kindermann I, Lainscak M, *et al.* 'Time is prognosis' in heart failure: Time-to-treatment initiation as a modifiable risk factor. *ESC Heart Fail* 2021;**8**:4444–4453. https://doi.org/10.1002/ehf2.13646
10. Abdin A, Anker SD, Cowie MR, Filippatos GS, Ponikowski P, Tavazzi L, *et al.* Associations between baseline heart rate and blood pressure and time to events in heart failure with reduced ejection fraction patients: Data from the QUALIFY international registry. *Eur J Heart Fail* 2023;**25**:1985–1993. https://doi.org/10.1002/ejhf.3023
11. Savarese G, Kishi T, Vardeny O, Adamsson Eryd S, Bodegård J, Lund LH, *et al.* Heart failure drug treatment-inertia, titration, and discontinuation: A multinational observational study (EVOLUTION HF). *JACC Heart Fail* 2023;**11**:1–14. https://doi.org/10.1016/j.jchf.2022.08.009
12. Stolfo D, Lund LH, Benson L, Lindberg F, Ferrannini G, Dahlström U, *et al.* Real-world use of sodium-glucose cotransporter 2 inhibitors in patients with heart failure and reduced ejection fraction: Data from the Swedish Heart Failure Registry. *Eur J Heart Fail* 2023;**25**:1648–1658. https://doi.org/10.1002/ejhf.2971
13. Aktaa S, Polovina M, Rosano G, Abdin A, Anguita M, Lainscak M, *et al.* European Society of Cardiology quality indicators for the care and outcomes of adults with heart failure. Developed by the Working Group for Heart Failure Quality Indicators in collaboration with the Heart Failure Association of the European Society of Cardiology. *Eur J Heart Fail* 2022;**24**:132–142. https://doi.org/10.1002/ejhf.2371
14. Batra G, Aktaa S, Benson L, Dahlström U, Hage C, Savarese G, *et al.* Association between heart failure quality of care and mortality: A population-based cohort study using nationwide registries. *Eur J Heart Fail* 2022;**24**:2066–2077. https://doi.org/10.1002/ejhf.2725
15. Aktaa S, Batra G, Wallentin L, Baigent C, Erlinge D, James S, *et al.* European Society of Cardiology methodology for the development of quality indicators for the quantification of cardiovascular care and outcomes. *Eur Heart J Qual Care Clin Outcomes* 2022;**8**:4–13. https://doi.org/10.1093/ehjqcco/qcaa069
16. Donabedian A. Evaluating the quality of medical care. *Milbank Mem Fund Q* 1966;**44**:166–206. PMID: 5338568.
17. Brook RH, McGlynn EA, Cleary PD. Quality of heath care. Part 2: Measuring quality of care. *N Engl J Med* 1996;**335**:966–970. https://doi.org/10.1056/NEJM199609263351311
18. McCormick KA, Fleming B. Clinical practice guidelines. The Agency for Health Care Policy and Research fosters the development of evidence-based guidelines. *Health Prog* 1992;**73**:30–34. PMID: 10122521.
19. Gurvitz M, Marelli A, Mangione-Smith R, Jenkins K. Building quality indicators to improve care for adults with congenital heart disease. *J Am Coll Cardiol* 2013;**62**:2244–2253. https://doi.org/10.1016/j.jacc.2013.07.099
20. Lund LH, Carrero JJ, Farahmand B, Henriksson KM, Jonsson Å, Jernberg T, *et al.* Association between enrolment in a heart failure quality registry and subsequent mortality – A nationwide cohort study. *Eur J Heart Fail* 2017;**19**:1107–1116. https://doi.org/10.1002/ejhf.762
21. McAlister FA, Youngson E, van Diepen S, Ezekowitz JA, Kaul P. Influence ofhospital volume on outcomes for patients with heart failure: Evidence from a Canadian national cohort study. *Am Heart J* 2018;**202**:148–150. https://doi.org/10.1016/j.ahj.2018.05.014

22. Seferovic PM, Piepoli MF, Lopatin Y, Jankowska E, Polovina M, Anguita-Sanchez M, *et al.* Heart failure Association of the European Society of Cardiology quality of care centres programme: Design and accreditation document. *Eur J Heart Fail* 2020;**22**:763–774. https://doi.org/10.1002/ejhf.1784
23. Ambrosy AP, Fonarow GC, Butler J, Chioncel O, Greene SJ, Vaduganathan M, *et al.* The global health and economic burden of hospitalizations for heart failure: Lessons learned from hospitalized heart failure registries. *J Am Coll Cardiol* 2014;**63**:1123–1133. https://doi.org/10.1016/j.jacc.2013.11.053
24. van Veldhuisen DJ, Ponikowski P, van der Meer P, Metra M, Böhm M, Doletsky A, *et al.*; EFFECT-HF Investigators. Effect of ferric carboxymaltose on exercise capacity in patients with chronic heart failure and iron deficiency. *Circulation* 2017;**136**:1374–1383. https://doi.org/10.1161/CIRCULATIONAHA.117.027497
25. Vukadinović D, Abdin A, Emrich I, Schulze PC, von Haehling S, Böhm M. Efficacy and safety of intravenous iron repletion in patients with heart failure: A systematic review and meta-analysis. *Clin Res Cardiol* 2023;**112**:954–966. https://doi.org/10.1007/s00392-023-02207-2
26. Seferović PM, Vardas P, Jankowska EA, Maggioni AP, Timmis A, Milinković I, *et al.* The Heart Failure Association Atlas: Heart Failure Epidemiology and Management Statistics 2019. *Eur J Heart Fail* 2021;**23**:906–914. https://doi.org/10.1002/ejhf.2143