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Review Article

Establishing a National Quality of Care Framework for Heart Failure in Korea: Keep Standards for Heart Failure (KSHF) Initiative

Mi-Hyang Jung, MD, PhD[1], Soo Yong Lee, MD, PhD[2], Yang Hyun Cho, MD, PhD[3], Dae-Hwan Bae, MD[4], Sunki Lee, MD[5], Chan Joo Lee, MD, PhD[6], Jung-Woo Son, MD[7], Jae Yeong Cho, MD, PhD[8], and Eung Ju Kim, MD, PhD[5]

[1]Division of Cardiology, Department of Internal Medicine, Seoul St. Mary's Hospital, Catholic Research Institute for Intractable Cardiovascular Disease, College of Medicine, The Catholic University of Korea, Seoul, Korea
[2]Division of Cardiology, Department of Internal Medicine and Research Institute for Convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Pusan National University School of Medicine, Yangsan, Korea
[3]Department of Thoracic and Cardiovascular Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea
[4]Division of Cardiology, Department of Medicine, Sejong General Hospital, Bucheon, Korea
[5]Division of Cardiology, Department of Internal Medicine, Korea University Guro Hospital, Korea University, Seoul, Korea
[6]Division of Cardiology, Department of Internal Medicine, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea
[7]Division of Cardiology, Department of Internal Medicine, Yonsei University Wonju College of Medicine, Wonju, Korea
[8]Department of Cardiovascular Medicine, Chonnam National University Medical School, Gwangju, Korea

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Correspondence to
Eung Ju Kim, MD, PhD
Division of Cardiology, Department of Internal Medicine, Korea University Guro Hospital, Korea University, 148 Gurodong-ro, Guro-gu, Seoul 08308, Korea.
Email: withnoel@korea.ac.kr

ABSTRACT

Heart failure (HF) continues to pose a significant public health burden in Korea, marked by increasing prevalence, hospitalizations, and healthcare costs. Although advances in guideline-directed medical therapy (GDMT) have improved patient prognosis, a persistent gap between evidence-based guidelines and real-world practice hinders optimal patient outcomes. To address this challenge, the Korean Society of Heart Failure launched the Keep Standards for Heart Failure (KSHF) initiative to enhance the quality of care (QoC) for individuals with HF. This initiative combines registry-based and non-registry approaches, including the development of structured educational programs, a standardized discharge checklist, and the implementation of the KSHF-QoC registry. The registry is designed to systematically evaluate HF management across diverse healthcare settings by analyzing prescription trends, treatment adherence, and patient-centered outcomes. Unlike earlier registries that focused primarily on acute HF in tertiary care centers managed by HF specialists, the KSHF-QoC registry broadens its scope to include general cardiologists, thereby offering a more comprehensive and representative assessment of routine care. Through continuous monitoring of QoC indicators, benchmarking across institutions, and structured performance feedback, the KSHF initiative aims to improve GDMT adherence, optimize HF care delivery, and reduce readmission rates. These efforts represent a critical advancement toward standardizing HF management and improving long-term outcomes for patients in Korea.

Keywords: Quality of health care; Heart failure; Registries; Program development

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KEEP STANDARDS FOR HEART FAILURE (KSHF): A CAMPAIGN TO ENHANCE QUALITY OF CARE (QoC) IN INDIVIDUALS WITH HEART FAILURE (HF)

Position statement for QoC in HF

Introduction to the KSHF movement

HF represents the terminal stage of various cardiovascular diseases and is associated with high mortality, impaired quality of life (QoL), and significant healthcare costs. The global burden of HF is increasing, currently affecting more than 64 million people worldwide and resulting in substantial economic consequences.[1] In Korea, the prevalence of HF increased from 0.77% in 2002 to 2.58% in 2020, accompanied by increasing hospitalization and mortality rates.[2] During this period, HF-related healthcare expenditures surged 16-fold, reaching approximately $2.4 billion in 2020.[2]

Despite advances in pharmacological therapies, including renin-angiotensin-aldosterone system blockers/angiotensin receptor-neprilysin inhibitor (ARNI), beta-blockers, mineralocorticoid receptor antagonists (MRAs), and sodium-glucose cotransporter-2 inhibitors (SGLT2i), HF outcomes remain suboptimal in real-world practice.[3] This can be largely attributed to persistent gaps between guideline-based recommendations and real-world prescribing practices. Contributing factors include limited awareness of updated clinical guidelines, clinical inertia, and therapeutic nihilism, particularly among older adults and those with multiple comorbidities. Systematic efforts are essential to ensure the effective implementation of evidence-based therapies. These efforts should emphasize optimizing and standardizing HF care across all clinical settings—not only HF-specialized centers—through structured quality improvement initiatives.

The KSHF movement was established to enhance the QoC for individuals with HF in Korea. Acknowledging that real-world clinical practices often deviate from evidence-based guideline recommendations, resulting in suboptimal outcomes, the KSHF initiative aims to bridge these care gaps through systematic, evidence-based interventions. The initiative incorporates both non-registry and registry-based efforts under the leadership of the Korean Society of Heart Failure, with the QoC Committee overseeing both components. Non-registry activities include the development of educational programs and practical clinical tools, such as a standardized discharge checklist and an accompanying implementation manual. These resources are designed to promote consistent practical implementation, aiming to enhance HF care. Additionally, the QoC Committee established the KSHF-QoC registry to systematically assess real-world HF management practices, provide structured feedback, and ultimately enhance HF QoC through data-driven evaluation and continuous quality improvement.

This paper outlines the objectives, key performance indicators (KPIs), and strategic initiatives of the KSHF campaign to optimize HF management. By leveraging the KSHF-QoC registry as a platform for continuous monitoring and structured feedback, the initiative aims to drive measurable improvements in QoC and patient outcomes.

Gaps between guidelines and real-world practice

Despite the availability of well-established HF treatment guidelines from leading academic societies, their real-world implementation remains inconsistent. Adherence to guideline-directed medical therapy (GDMT) is particularly low for newer agents such as the ARNI and SGLT2i.[3] Several barriers contribute to this gap (**Figure 1**).

A multicenter analysis in Korea revealed substantial variations in GDMT implementation, with some hospitals reporting adherence rates below 50%.[2,4] While QoC frameworks in Europe and the United States have successfully improved GDMT adherence, Korea currently lacks a robust national system. Optimizing GDMT improves outcomes. Meta-analyses have shown that ARNI, beta-blockers, MRA, and SGLT2i significantly reduce cardiovascular mortality and the risk of first HF hospitalization.[5] However, real-world adherence to these therapies remains low, negatively

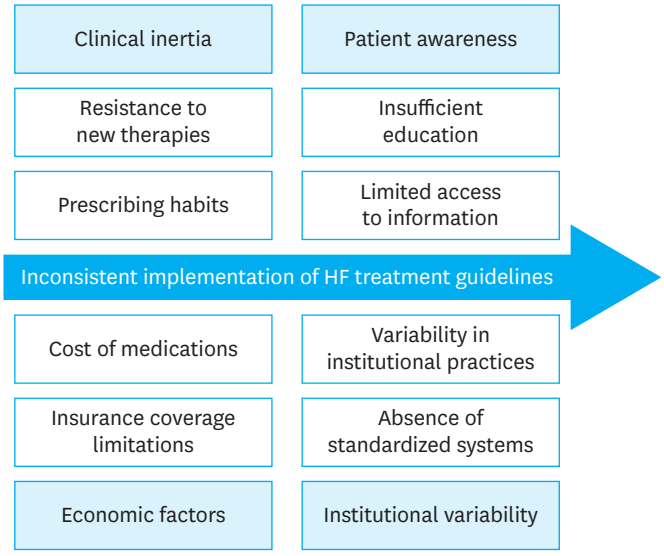

Figure 1. Barriers to implementation of guideline-directed medical therapy for HF.
HF = heart failure.

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impacting patient prognosis. Even after the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure study, a landmark real-world quality improvement registry study, GDMT adherence improved minimally, with just 54% of patients remaining on GDMT 1 year postdischarge.[6] Despite being recommended as first-line therapies, ARNI and SGLT2i prescription rates remain as low as 10% at discharge in Japan, Sweden, and the United States.[7]

Dose up-titration to target levels is another critical aspect of GDMT, yet many patients fail to achieve recommended doses. Evidence suggests that patients receiving high-dose angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs) experience significantly lower mortality and hospitalization rates compared to those on low-dose therapy. Nevertheless, low-dose prescriptions remain prevalent.[8,9] The Safety, Tolerability, and Efficacy of Rapid Optimization, Helped by NT-proBNP Testing, of Heart Failure Therapies (STRONG-HF) trial further underscores the importance of rapid up-titration.[10] This trial demonstrated that early, intensive up-titration of GDMT within weeks after hospital discharge substantially reduced 180-day all-cause mortality and HF readmissions. These findings emphasize the need for structured titration protocols to ensure that patients reach optimal therapeutic doses as early as possible.

Suboptimal GDMT implementation results in missed opportunities to improve outcomes. In contrast, appropriate GDMT has been associated with a 30–40% reduction in 1-year mortality, a 20–50% reduction in HF rehospitalizations, and significant improvements in QoL, including exercise tolerance and overall well-being.[10-14]

Early initiation of GDMT during hospitalization or immediately after discharge significantly reduces mortality and readmission rates.[15] Furthermore, inadequate or delayed therapy has been associated with worse clinical outcomes and QoL.[16] Additionally, rapid titration of GDMT in outpatient ambulatory settings is also critical, as emphasized in recent trials such as STRONG-HF,[10] which demonstrated significant mortality benefit with early up-titration after discharge.

A structured, nationwide QoC assessment framework is imperative for Korea. Leveraging insights from Improving Care through Accreditation and Recognition in HF (ICARe-HF) in Europe and Get With The Guidelines-HF (GWTG-HF) in the United States, Korea should implement a standardized national framework to enhance adherence, improve patient outcomes, and bridge the existing care gaps. Additionally, widespread implementation of the Korean Discharge Checklist can improve postdischarge management, ensure continuity of treatment, and help reduce readmission rates.

KPIs and domains of QoC

Delivering high-quality HF care requires the establishment of standardized performance metrics that assess both adherence to clinical guidelines and patient-centered outcomes. Multiple international organizations, including the European Society of Cardiology (ESC) and the American Heart Association (AHA)/American College of Cardiology, have developed quality indicators aimed at evaluating and enhancing HF care.[16,17] These indicators serve as benchmarks for assessing clinical practice, optimizing therapeutic strategies, and bridging gaps between guideline recommendations and real-world practice.[18] **Figure 2** highlights the core domains of HF quality indicators, ranging from structural components to patient-centered outcomes, along with key performance metrics that facilitate the objective assessment of care quality, such as timely diagnosis, implementation of GDMT, and early post-discharge follow-up.

Enhancing QoC through non-registry initiatives

Development and dissemination of educational materials for healthcare professionals and individuals living with HF

The management of HF has become increasingly complex. In individuals with HF with reduced ejection fraction (HFrEF), GDMT remains the cornerstone of care, traditionally comprising four foundational pharmacological classes with well-established survival benefits.[3] Additionally, emerging therapeutic options have further improved outcomes in specific clinical scenarios.[19,20] For instance, vericiguat has been shown to reduce the risk of cardiovascular death or HF hospitalization for individuals experiencing worsening HF despite optimal pharmacological therapy.[21] Similarly, ivabradine is recommended for individuals in sinus rhythm who continue to exhibit an elevated heart rate despite receiving the maximally tolerated dose of beta-blockers.[22] Device-based therapies, including implantable cardioverter defibrillators (ICDs) for individuals at high risk of sudden cardiac death and cardiac resynchronization therapy for patients with ventricular dyssynchrony, also represent essential components of comprehensive HF management.[23,24] Collectively, the expanding therapeutic landscape has markedly increased the complexity of HF management.

Although therapeutic advances have improved survival and contributed to a greater prevalence of individuals with HF with improved ejection fraction, they have also introduced significant challenges for healthcare professionals and individuals living with HF. From a clinician's perspective, the proliferation of pharmacological and device-based therapies necessitates careful patient selection, vigilant monitoring for therapeutic efficacy and adverse

Domains of HF quality indicators	Key performance indicators for HF care
Structural quality indicators: Evaluate infrastructure, including multidisciplinary HF teams, dedicated HF specialists, and specialized care units	**Timely diagnosis and assessment:** HF patients should have documented EF measurement and classification
Patient assessment: Include echocardiography, natriuretic peptide measurement, and risk stratification based on HF phenotypes	**GDMT implementation:** Eligible heart failure with reduced ejection fraction patients should receive ARNI, beta-blockers, MRA, and SGLT2i at discharge
Initial treatment: Assesses the implementation of GDMT, including the prescription of beta-blockers, ARNI, MRA, and SGLT2i at discharge	**Therapeutic optimization:** HF patients should achieve at least 50% of the target dose within 6 months, provided no contraindications exist
Therapy optimization: Monitors treatment escalation, dose titration, and advanced interventions, such as CRT and ICD in eligible patients	**Post-discharge follow-up:** HF patients should have an outpatient follow-up visit within 7 days of discharge
Patient-centered outcomes: Evaluates post-discharge follow-up, cardiac rehabilitation referral, and health-related QoL improvements	**Cardiac rehabilitation enrollment:** Eligible HF patients should be referred to cardiac rehabilitation either during hospitalization or within 30 days of discharge

Figure 2. Key domains and metrics for evaluating quality of HF care.
HF = heart failure; EF = ejection fraction; GDMT = guideline-directed medical therapy; ARNI = angiotensin receptor-neprilysin inhibitor; MRA = mineralocorticoid receptor antagonist; SGLT2i = sodium-glucose cotransporter-2 inhibitors; CRT = cardiac resynchronization therapy; ICD = implantable cardioverter defibrillator; QoL = quality of life.

effects, and timely identification of candidates for additional interventions. This multidimensional management approach inevitably increases the clinical burden associated with HF management. From the patient's perspective, polypharmacy elevates the risk of adverse drug interactions and challenges medication adherence. Furthermore, the frequent coexistence of comorbidities further compounds therapeutic complexity.

Not all individuals living with HF receive care from specialized multidisciplinary teams. For example, individuals with ischemic cardiomyopathy secondary to coronary artery disease or tachycardia-induced cardiomyopathy secondary to arrhythmias are often managed by general cardiologists, while others may receive care exclusively from non-cardiology specialists. Recent studies have highlighted significant differences in both prescribing patterns and medication titration practices between HF specialists and non-specialists.[25] Given that these studies were conducted prior to the 2020s, the disparity may have widened further as pharmacological management continues to evolve.

Among the strategies proposed to address these disparities, targeted education for healthcare professionals remains one of the most critical. To be effective, such initiatives must be supported by the development and dissemination of comprehensive, high-quality educational materials designed to enhance competency in contemporary HF management.

Patient education is equally essential in optimizing HF management. During routine clinical encounters, it is often challenging to fully explain the rationale for every prescribed medication, the potential spectrum of adverse effects and their management, and the indications for device-based interventions. Therefore, the development and widespread distribution of structured educational materials that clearly communicate these aspects is necessary. Notably, studies have shown that structured education provided to individuals hospitalized with acute decompensated HF is associated with improved survival compared with those who do not receive such education.[26,27] Beyond prescribing medications, implementing educational programs to enhance adherence is critical.

In summary, the systematic development and dissemination of educational materials for both healthcare professionals and individuals living with HF are essential. Such initiatives can help ensure adherence to treatment guidelines, facilitate adverse event monitoring in both clinical and home settings, improve medication adherence, and support the appropriate use of device-based therapies. Ultimately, these efforts can play a significant role in enhancing the overall quality of HF care.

Discharge checklist development and updates

Since 2019, the Korean Society of Heart Failure has developed and implemented a comprehensive HF discharge checklist to ensure

that all essential therapeutic interventions are appropriately administered before hospital discharge. This checklist serves as a practical tool for healthcare professionals, enabling systematic verification of adherence to GDMT and optimizing pharmacological management for individuals living with HF. By utilizing this checklist, clinicians can monitor adherence to standard care protocols and assess the appropriate use of evidence-based therapies.[28] The primary objectives of the HF discharge checklist, as originally conceived, were to (A) improve adherence to GDMT, (B) enhance the QoC, (C) improve patient outcomes, and (D) facilitate the ongoing education and training of residents and practicing physicians. To facilitate its integration into routine clinical practice, the checklist was designed as a single-page document to ensure ease of use. Additionally, both a detailed version (**Supplementary File 1**) and a summarized version (**Supplementary File 2**) were made available, allowing institutions to adopt the version best suited to their operational needs.

The management of HF continues to evolve, necessitating periodic updates to clinical guidelines and tools to reflect emerging evidence and best practices. The Korean Society of Heart Failure first developed the HF discharge checklist in 2020, and it has since undergone three revisions, with the most recent fourth version introduced in February 2025. These modifications reflect advancements in pharmacological therapies, risk stratification methodologies, and patient education strategies, ultimately aiming to optimize postdischarge care and improve clinical outcomes.

The most significant updates to the discharge checklist were introduced during its second revision in 2023. Notably, ARNI therapy was prioritized over ACE inhibitor or ARB therapy as the first-line treatment for patients with HFrEF, reflecting the superior clinical benefits of ARNI. Furthermore, SGLT2i and intravenous (IV) iron therapy were newly incorporated into the checklist, representing a substantial shift in treatment recommendations.

In the original 2020 checklist version, iron status was not explicitly addressed, despite growing evidence of its prognostic significance in HF. The 2023 revision rectifies this omission by recommending iron repletion therapy for patients with a serum ferritin level below 100 ng/mL or a transferrin saturation of less than 20% when ferritin levels are between 100 and 299 ng/mL.

This change aligns with contemporary guidelines[29,30] that underscore the role of IV iron therapy, particularly ferric carboxymaltose, in alleviating symptoms, improving exercise capacity, and reducing HF-related hospitalizations in patients with HFrEF.[30] Additionally, the 2025 update reflects recent changes in insurance coverage policies in Korea, which now allow reimbursement for IV iron therapy in patients who are intolerant to or unresponsive to oral iron. Although reimbursement remains restricted in patients eligible for oral therapy, this policy adjustment has nonetheless improved access to IV iron for a subset of patients with HF.

The updated checklist also incorporates new pharmacological agents, most notably vericiguat. While the 2020 checklist emphasized the initiation and titration of GDMT with ACE inhibitors, ARBs, ARNI, beta-blockers, MRAs, and SGLT2i, it did not include vericiguat. The 2024 version acknowledges vericiguat's role in reducing morbidity and mortality among patients with chronic HF who experience worsening symptoms despite optimized GDMT. This addition reflects the growing recognition of vericiguat's benefits, as demonstrated in recent clinical trials.[21,31]

The 2025 updates account for changes in insurance coverage that impact the prescription of SGLT2i. In the 2020 checklist, limited insurance coverage was cited as a barrier to prescribing SGLT2i. However, with the recent expansion of reimbursement to include all individuals with HF across the full spectrum of left ventricular ejection fraction, the omission of SGLT2i due to insurance constraints is no longer justified. The revised checklist incorporates these policy changes to ensure that reimbursement limitations no longer obstruct evidence-based therapeutic decisions.

Finally, the latest checklist places more emphasis on patient education and cardiac rehabilitation. While the 2020 version offered general guidance on dietary management, daily weight monitoring, and physical activity, the revised checklist explicitly mandates counseling on participation in cardiac rehabilitation and the provision of structured educational materials. This change reflects the expanding body of evidence indicating that patient education significantly enhances therapy adherence and reduces HF-related hospitalizations. Additionally, to support the practical implementation of the discharge checklist, a companion manual titled “Practical Guidance on Pharmacological and Device Therapy for Heart Failure Patients” was developed, with the initial edition published in 2020 and an updated version released in 2025 (**Supplementary File 3**).

In summary, the implementation and continuous refinement of the HF discharge checklist by the Korean Society of Heart Failure exemplifies a structured, guideline-informed approach to HF care. By ensuring the timely and appropriate initiation of evidence-based therapies, this tool enhances adherence to best practices and contributes to improved clinical outcomes for individuals with HF. The latest version, which incorporates new pharmacological options, expanded HF classifications, refined decompensation triggers, enhanced patient education, and recent expansions in insurance coverage for IV iron and SGLT2i, ensures

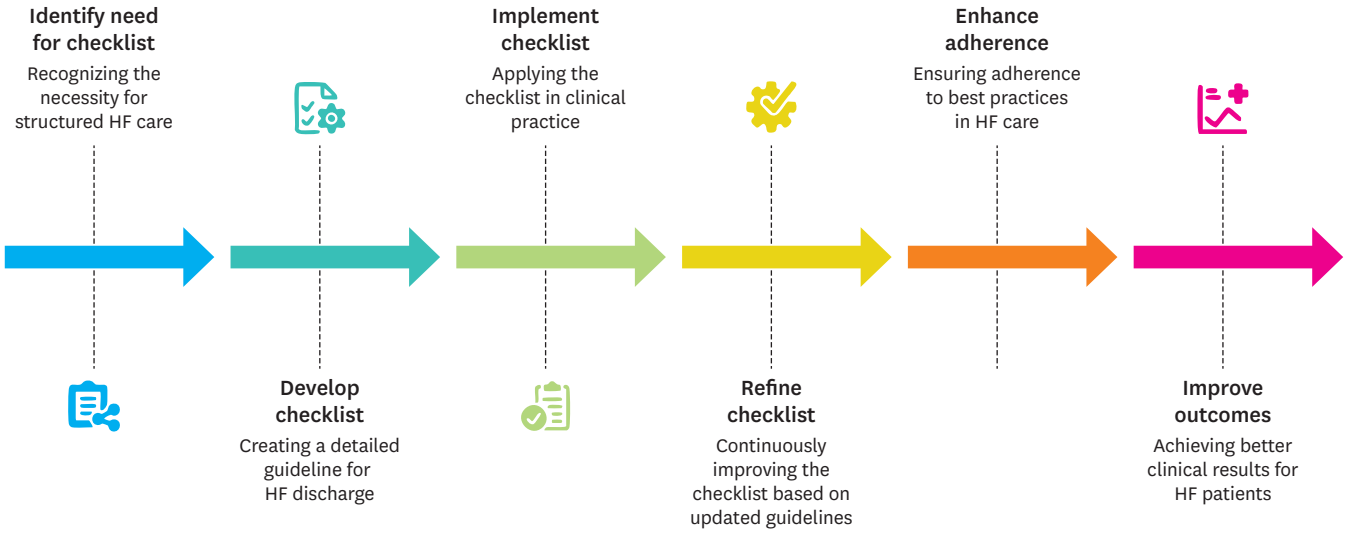

Figure 3. Implementation of HF discharge checklist.
HF = heart failure.

that the checklist remains a vital tool in optimizing HF management and reducing hospital readmissions (**Figure 3**).

Other non-registry activities

In addition to these pharmacological advancements in HF, the need for an improved risk stratification model has gained increasing attention. One of the primary objectives of the QoC Committee is the development of a Korean-specific HF risk score, similar to the GWTG-HF Risk Score used in the United States. Although global risk models such as GWTG-HF, Seattle Heart Failure Model, and Meta-Analysis Global Group in Chronic Heart Failure Score have been widely used,[32-34] these models were developed using data from Western cohorts and may not fully reflect the distinct clinical characteristics of Korean individuals with HF.

A Korean-specific HF risk score is essential for several reasons. First, significant differences exist in patient demographics and HF etiology, which necessitate a tailored approach. Korean individuals with HF tend to have a lower body mass index (BMI), a lower prevalence of ischemic cardiomyopathy, and distinct clinical characteristics compared to Western populations.[35,36] These demographic and clinical distinctions directly affect the predictive accuracy and clinical utility of widely used international models, limiting their applicability in Korean clinical settings. Additionally, the prevalence of HF is increasing in Korea,[2] underscoring the importance of risk stratification for both patients with HFrEF and HFpEF. Another critical factor is the regional variation in clinical practice and healthcare infrastructure. The existing GWTG-HF score was developed using US registry data, which reflects healthcare delivery systems and resource availability that differ substantially from those in Korea. A Korean HF risk score, derived from national registries such as the Korean Acute Heart Failure (KorAHF), the Korean Heart Failure (KorHF) registry, and the KSHF-QoC registry, would leverage local, representative datasets uniquely suited for developing a tailored risk prediction tool. This would enable clinicians to more accurately identify high-risk patients, personalize therapeutic interventions, and implement timely GDMT titration and advanced HF treatments.

The implementation of a Korean-specific HF risk model would also significantly impact clinical practice and national healthcare policies. Early identification of high-risk individuals would allow healthcare providers to better prioritize follow-up strategies, enhance medication adherence, and reduce hospital readmissions. It would facilitate more efficient resource allocation, improve overall patient outcomes, and guide reimbursement strategies. Moreover, a validated risk model tailored to the Korean population could promote equitable access to high-quality HF management across various healthcare settings. As the landscape of HF management continues to evolve, the integration of a validated risk prediction model into routine clinical practice will be a critical step forward. The KSHF's initiative to develop a Korean-specific HF risk score underscores the need for regionally adapted clinical tools capable of enhancing clinical precision, reducing hospital readmissions, and ultimately improving survival among individuals with HF. Furthermore, future research should explicitly focus on external validation of the Korean-specific HF risk model using independent datasets, as well as prospective multicenter studies designed to evaluate its long-term clinical effectiveness, robustness, and generalizability across Korea's diverse clinical environments.

To facilitate broad dissemination and implementation of non-registry initiatives, the KSHF-QoC Committee has established a multi-tiered dissemination strategy. This includes centralized distribution of materials to institutions, and educational workshops and webinars. In addition, digital channels such as the official Korean Society of Heart Failure YouTube channel, the society's homepage, and the HF Times newsletter are actively utilized to promote new tools and updates. Future plans also include the integration of clinical decision support (CDS) prompts into electronic health record (EHR) systems to encourage point-of-care application and adherence to evidence-based practices.

KSHF-QoC REGISTRY: A STRATEGIC INITIATIVE FOR QoC IN HF

Rationale and design of the KSHF-QoC registry

Objectives of the KSHF-QoC registry and its distinctive features compared to pre-existing HF registries

From 2005 to 2009, the Korean Society of Cardiology (KSC) developed the Korean KorHF registry as part of its 50th-anniversary initiative, enrolling 3,200 patients.[35] At a time when comprehensive epidemiological data on HF in Korea were limited, this registry offered critical insights into mortality and rehospitalization rates among individuals with HF. Building upon these foundational findings, the KorAHF registry was launched in 2010, funded by the Korea National Institute of Health and led by the Heart Failure Research Committee of the KSC. KorAHF enrolled 5,625 patients across 10 university hospitals and aimed to identify prognostic factors influencing HF survival and to inform the development of effective disease management strategies.[37]

The third registry, initiated by the Korean Society of Heart Failure in March 2018, has enrolled individuals with HF hospitalized across 47 tertiary hospitals. As of December 2022, more than 7,000 patients have been enrolled, and follow-up is currently ongoing.[38] Together, KorHF, KorAHF, and the ongoing KorHF III serve as Korea's representative acute HF registries. These datasets have significantly advanced the understanding of risk factors, treatment patterns, and prognosis in HF, and have played a pivotal role in shaping Korea's national HF treatment guidelines.

While these registries have provided crucial epidemiological and clinical insights, they were primarily designed for academic research rather than for evaluating the real-world QoC in HF. A key limitation is the absence of systematic QoC assessment, as the focus of prior registries has been on clinical characteristics, treatment patterns, in-hospital outcomes, and long-term prognostic factors without evaluating adherence to evidence-based treatment standards in routine practice. Selection bias is another important concern. Previous registries predominantly enrolled individuals with HF managed by HF specialists in high-volume tertiary centers, which may not accurately represent HF management by general cardiologists or in community hospitals. Furthermore, because these registries employed prospective enrollment, selection bias could stem from both researcher-driven inclusion criteria and patient willingness to participate, thereby limiting objective assessment of QoC across diverse healthcare settings. Another challenge is that, having been initiated several years ago, these registries do not fully capture adherence to the most recent GDMT recommendations, thereby reducing their applicability to contemporary HF care.

To address these limitations, the KSHF-QoC registry is designed to provide a comprehensive and objective assessment of HF care across diverse clinical settings. Unlike its predecessors, this new registry will retrospectively evaluate prescription patterns and clinical outcomes of all individuals with HF treated within a defined period at a hospital, including those managed by general cardiologists, not just HF specialists. By shifting the focus from specialist-led, research-driven registries to a broader, practice-based evaluation of HF care, the KSHF-QoC registry will play a pivotal role in identifying gaps in guideline adherence, informing targeted improvement strategies, and ultimately enhancing HF care quality across Korea.

Review of other QoC registries in Europe and the USA

How should a QoC registry be optimally established within the domestic healthcare system? To inform this process, it is essential to review successful HF QoC programs implemented internationally. In the United States and Europe, three prominent initiatives—GWTG-HF ICARe-HF, and Global Registries and Surveys Programme-HF (GRASP-HF)—serve as representative models. While these programs share the overarching goals of improving HF care, they differ in methodology, scope, and implementation strategies (**Table 1**).

Launched in 2005, the GWTG-HF registry involves participation from hundreds of hospitals across the United States. The registry has amassed a substantial volume of patient data, which has been utilized in numerous studies related to HF treatment strategies, prognosis across patient subgroups, and quality improvement initiatives. The program offers hospitals a web-based platform for data collection, CDS, and real-time benchmarking, thereby facilitating performance improvement initiatives. Participation in GWTG-HF has been associated with increased adherence to clinical guidelines and improved patient outcomes. According to a 2019 AHA report, 116 peer-reviewed articles were published

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Table 1. Comparison of major international QoC registries for heart failure

Feature	GWTG-HF	ICARe-HF	GRASP-HF (closed)	Let's KSHF
Supporting organization	AHA	HFA of ESC	ESC	KSHF
Launching year	1999, Consensus meeting 2005, Launching	2018, Consensus meeting 2023, Set-up	Parallels with ICARe-HF	2023, Consensus meeting 2024, Launching
Target patient group	Hospitalized heart failure patients	Hospitalized heart failure patients	Outpatients and hospitalized heart failure patients	Hospitalized heart failure patients
Focus area	Heart failure	Acute heart failure care quality improvement	Heart failure management and improving adherence to guidelines	Heart failure management and improving adherence to guidelines
Primary objective	Improve patient outcomes through guideline adherence	Optimize treatment for patients with acute heart failure	Enhance adherence to heart failure guidelines and reduce hospital readmissions	Increase guideline adherence by at least 10%
Geographic scope	United States (nationwide)	International (e.g., Europe and beyond)	Primarily Europe, under the ESC	South Korea
Data collection (registry)	Yes	Yes	Yes	Yes (retrospective)
Accreditation	Yes	Yes	No	No
Key metrics	Mortality, readmission, medication use, adherence to guidelines	In-hospital mortality, treatment patterns, post-discharge outcomes	Epidemiology, management practices, guideline adherence	Epidemiology, management practices, guideline adherence
Participation	Voluntary participation by hospitals	Voluntary participation by healthcare institutions and heart failure centers	Voluntary participation by hospitals and clinical sites across Europe and affiliated countries	Voluntary participation by hospitals
Implementation strategy	Data collection, feedback provision, support for quality improvement processes	Pilot management improvement strategies in long-term care facilities	Monitoring guideline adherence and providing educational materials	Campaign to improve heart failure care through a discharge checklist, structured education program
Outcome improvements	Reduced mortality, improved adherence to evidence-based therapy	Enhanced clinical outcomes, better discharge planning	Improved guideline compliance, better understanding of real-world practices	Improved adherence to GDMT and reduced mortality

QoC = quality of care; GWTG-HF = Get with The Guidelines-Heart Failure; ICARe-HF = Improving Care of Acute Heart Failure; GRASP-HF, Global Registries And Surveys Programme – Heart Failure; KSHF = Korean Society of Heart Failure; AHA = American Heart Association; ESC = European Society of Cardiology; GDMT = guideline-directed medical therapy.

using data from the GWTG-HF registry between 2006 and June 2019.[39] Research using this registry continues to appear in high-impact journals to this day.[40]

The GWTG-HF initiative plays a crucial role in enhancing the QoC delivered to individuals with HF and improving their clinical outcomes. It establishes KPIs and defines specific domains of QoC to systematically measure and assess the quality of HF management. Several KPIs are employed to assess the QoC delivered to patients with HF. These include the prescription rate of GDMT at discharge, such as ACE inhibitors, beta-blockers, and MRA, as well as the evaluation of left ventricular systolic function prior to discharge. Additional KPIs assess the implementation rate of patient education at discharge, including instructions on medication adherence, dietary restrictions, and physical activity, and the rate of postdischarge follow-up within seven days via outpatient visits or telephone contact. Additionally, GWTG-HF defines key domains of QoC to facilitate a comprehensive evaluation of HF management. These include the following: (a) diagnosis, evaluated through adherence to diagnostic criteria and the use of echocardiography; (b) pharmacological therapy, assessed by the appropriateness of prescribed medications and monitoring for adverse drug effects; (c) non-pharmacological therapy, measured by the provision of cardiac rehabilitation and ICD therapy; (d) patient education, focused on the delivery and content of discharge instructions; and (e) discharge planning and follow-up, assessed by the timeliness and effectiveness of postdischarge care and complication monitoring. These KPIs and domains serve as benchmarks to ensure high-quality, evidence-based care for patients with HF.

In contrast to the 20-year history of GWTG-HF, a similar yet distinct QoC initiative has been launched more recently in Europe. The ICARe-HF program is a long-term initiative led by the Heart Failure Association (HFA) of the ESC. Acknowledging the growing burden of HF and the proven benefits of multidisciplinary care, the QoC initiative aims to provide structured, evidence-based HF care through a network of accredited centers.[41] These centers are categorized into the following three levels—community, specialized, and advanced, depending on the complexity of services provided. Community QoCs focus on the initial evaluation and ongoing management of chronic HF. Specialized QoCs offer intermediate-level diagnostics and interventions, while advanced QoCs provide comprehensive care, including mechanical circulatory support and heart transplantation. Accreditation is granted by the HFA/ESC based on rigorous criteria that include infrastructure, clinical protocols, staffing, and quality metrics, with periodic re-evaluation every 4–6 years. The program is implemented in

collaboration with national HF societies and is tailored to each country's healthcare system. Through this framework, the QoC program aims to reduce disparities in HF care, promote education and research, and strengthen the strategic goals of the HFA/ESC.

GRASP-HF is a short-term (6 months) registry that ran in parallel with ICARe-HF. Data were collected through the GRASP-HF snapshot registry until 31 October 2024, at which point the registry was closed.[42] The primary aim of GRASP-HF was to improve understanding of HF epidemiology and patient outcomes, while also assessing adherence to the latest ESC HF guidelines in both chronic and acute settings. The insights gained from GRASP-HF contribute significantly to the development of future guidelines and improvements in patient care.

In summary, although all three programs share the overarching goal of improving HF care, they diverge in their strategies and implementation. GWTG-HF emphasizes data-driven quality improvement within hospitals in the United States, ICARe-HF focuses on accrediting centers that adhere to high standards of care internationally, and GRASP-HF aims to collect and analyze clinical data to inform the development of future HF guidelines and enhance HF management practices across Europe.

Design of KSHF-QoC registry

The KSHF-QoC registry adopts a descriptive retrospective study design with emphasis on feasibility and data comprehensiveness. Following its official launch at the 2024 Heart Failure Seoul conference, the registry will retrospectively collect data, using this event as the reference point for data inclusion. Data collection and review will occur annually, with plans for long-term continuation over at least 10 years.

Several key considerations led our committee to adopt a retrospective data collection method after thorough deliberation. First, this retrospective approach enables the inclusion of a more diverse population of individuals with HF. For example, the KorHF III registry, a prospective cohort study conducted between 2018 and 2022, enrolled 7,352 individuals with HF across 47 hospitals and primarily involved HF specialists.[38] Consequently, patients admitted under interventional cardiology or electrophysiology departments were often excluded, introducing potential selection bias. In contrast, the retrospective design enables the inclusion of individuals with HF admitted across various subspecialties within cardiology, allowing for a more comprehensive dataset. Second, the retrospective approach also alleviates logistical challenges associated with obtaining informed consent. Prospective studies require explicit consent from all enrolled participants, which is a time-consuming and resource-intensive process. In contrast, the KSHF-QoC registry primarily evaluates performance indicators related to GDMT prescription rates, which can be accurately assessed through retrospective review of prescription data.

In addition to these logistical and practical advantages, a retrospective design offers several methodological strengths in evaluating the quality of care for HF. By relying on real-world clinical data, this approach captures actual treatment patterns and decision-making processes, thereby minimizing the influence of observer or enrollment bias that may occur in prospective studies. This retrospective analysis can provide regular feedback to each institution and medical staff, based on unbiased facts related to areas of non-compliance with treatment guidelines, and it is easy to implement quality improvement activities focused on a specific area. Moreover, the use of existing EHR and claims data enables the inclusion of large, unselected populations, allowing for a more accurate reflection of real-world clinical practice across diverse hospital settings. This retrospective approach can minimize financial and logistical burdens while ensuring efficient data collection.

Despite its advantages, the retrospective study design presents certain limitations. As part of a long-term plan involving annual data collection and review over at least 10 years, the study population for each cycle will be identified using consistent inclusion criteria. For the first cycle (December 1, 2024, to November 30, 2025), individuals with HF will be identified based on specific principal diagnosis codes—I50, I42, I11.0, I13.0, I13.2, I22.5, and their subcodes, while excluding secondary diagnoses. These codes align with those used in the KorHF factsheet.[2] This standardized approach will be uniformly applied across all subsequent data collection cycles. However, the use of EHR diagnosis codes introduces a risk of misclassification, potentially resulting in the underrepresentation of true HF cases due to coding errors or the inclusion of patients without confirmed HF. To reduce this risk, expert clinical review and additional verification steps will be incorporated into the data refinement process.

Furthermore, to manage the large volume of eligible cases, approximately 50% of identified patients will be included in the registry using a pragmatic, calendar-based sampling method. Given the substantial number of annual HF admissions, the inclusion of all eligible patients would pose significant logistical and financial challenges. Therefore, we adopted a pragmatic, calendar-based sampling method to ensure feasibility while maintaining representativeness. Specifically, all participating institutions will enroll patients admitted on odd-numbered days in odd-numbered months and even-numbered days in even-numbered months during the one-year study period. This approach is designed to be arbitrary and independent of clinical or institutional factors,

thereby minimizing investigator-driven selection bias. The sampling framework was inspired by the design of the International REgistry to assess medical Practice with lOngitudinal obseRvation for Treatment of Heart Failure registry, in which participating sites were permitted to choose among several predefined calendar-based enrollment strategies (e.g., alternate days or weeks) to ensure feasibility while preserving representativeness.[43] In our study, a single calendar-based method was uniformly applied across institutions to maintain consistency.

The primary objective of the KSHF-QoC registry is to improve adherence to GDMT by at least 10% relative to previous levels, with the KorHF III registry serving as the benchmark for evaluating improvement.[38] Since KorHF III was a prospective study conducted exclusively among HF specialists, achieving a 10% increase in GDMT adherence using a retrospective design presents a considerable challenge. Nevertheless, by initiating the "Let's KSHF" campaign ahead of the data collection phase, participating institutions are expected to engage actively in addressing these challenges and contributing to the targeted improvement in GDMT adherence.

Strategies for using QoC metrics to enhance care

The role of the KSHF-QoC registry in enhancing QoC

The KSHF-QoC registry plays a pivotal role in improving HF patient care by standardizing treatment, monitoring adherence, and providing performance feedback. This system enhances QoC through three key mechanisms:

1) Standardizing clinical practice and tracking patient outcomes

The KSHF-QoC registry facilitates evidence-based HF management by standardizing clinical workflows and ensuring optimal implementation of GDMT. Through systematic data collection and comprehensive analysis, the registry aids in developing and refining treatment strategies, thereby allowing healthcare professionals to assess the effectiveness of both pharmacological and non-pharmacological interventions (e.g., device implantation, lifestyle modifications). By leveraging longitudinal patient data, the system enables continuous evaluation of treatment effectiveness and supports adaptive management approaches. Similar to international experiences,[44] this data-driven strategy can lead to reduced hospitalization rates, fewer complications, and improved survival outcomes for individuals with HF. Technological sustainability is further supported through formal maintenance agreements with technology providers, ensuring ongoing system updates and user support, while the registry interface is continuously improved based on user feedback to enhance usability. To ensure long-term sustainability of this standardization effort, the registry may also incorporate emerging artificial intelligence technologies to provide personalized education, automate data quality monitoring, and deliver real-time decision support.

2) Monitoring GDMT adherence and providing targeted feedback

Adherence to GDMT is a core QoC metric, and the KSHF-QoC system plays a critical role in its evaluation and optimization. The registry evaluates GDMT adherence rates across institutions, enabling comparative benchmarking of hospital-specific QoC indicators. For institutions with low adherence rates, the system provides targeted feedback and tailored educational resources, assisting healthcare providers in consistently implementing guideline-recommended therapies. This strategy helps minimize disparities between hospitals and improves nationwide QoC. Furthermore, the registry tracks patient-level adherence, supporting personalized treatment strategies aimed at further optimizing patient outcomes.[44] Supporting sustained adherence monitoring requires continuous capacity building through regular workshops and standardized online modules for clinicians and data managers. Each participating hospital designates "quality champions" who lead local training initiatives and serve as points of contact for ongoing quality improvement efforts, ensuring consistent implementation of registry protocols and maintaining clinical competency in HF management.

3) Providing performance benchmarks and driving continuous improvement

To enhance HF care nationwide, the KSHF-QoC registry provides hospital-specific QoC performance reports, allowing institutions to identify strengths, address gaps, and refine clinical practices. By comparing performance metrics across hospitals, institutions can benchmark their results, adopt best practices, and align treatment approaches with both national and international standards.[45] The system also facilitates continuous monitoring, supporting the development of predictive models for early intervention. Healthcare providers can utilize timely insights to track patient health trends, implement appropriate interventions, and refine treatment protocols based on the latest clinical evidence. Regular performance reviews raise provider awareness, foster a culture of ongoing QoC enhancement, and drive sustained improvements in HF management. Maintaining continuous improvement over the long-term necessitates sustainable funding through continued support from the KSHF, government healthcare quality improvement programs, and cost-sharing arrangements with participating hospitals. To promote sustained hospital participation, the registry delivers periodic hospital-specific performance reports, recognition programs, and national workshops that incentivize participation and facilitate best practice sharing among institutions.

Integration of EHR, CDS, and digital heath tools in registry systems

KSHF aims to leverage existing hospital-based EHR systems to facilitate real-time data capture and automated transfer to a centralized quality registry. This integration is modeled after successful international examples such as the AHA's GWTG-HF and the Swedish Heart Failure Registry, both of which have demonstrated the effectiveness of EHR-linked data collection in enhancing completeness and reducing reporting burden.[46,47] Additionally, we plan to incorporate CDS tools into the KSHF dashboard, including evidence-based reminders for GDMT and alerts for quality gaps (e.g., missing discharge instructions, unprescribed ACE inhibitors/ARNIs for eligible patients). These interventions are aligned with best practices used in programs like the UK's National Heart Failure Audit, which have shown improvement in prescription rates and patient outcomes through point-of-care prompts.[48] As digital health tools are recognized as important in chronic disease management, the KSHF framework plans to incorporate home-based telemonitoring and patient-facing apps in later phases, once the program is more mature and stable. These tools can facilitate symptom tracking, medication adherence, and early detection of decompensation. International programs such as Germany's Telemedicine for the Heart (Telemedizinisches Zentrum) and Canada's Medly Program have demonstrated the feasibility and effectiveness of such approaches in reducing hospitalizations and improving self-care.[45,49]

In summary, the KSHF-QoC registry is an essential tool for advancing HF QoC in Korea, improving patient outcomes, and optimizing healthcare system efficiency. By leveraging data-driven approaches, the registry enhances medical service quality and maximizes treatment effectiveness. Through integrated sustainability strategies across funding, training, technology support, and hospital engagement, the registry ensures its long-term impact on HF care quality. Ultimately, it promotes the implementation of evidence-based care, ensuring that individuals with HF receive the highest standard of treatment.

LIMITATIONS AND FUTURE DIRECTIONS

This study has several limitations. First, although the KSHF-QoC registry was designed to evaluate real-world quality of care, its retrospective nature and reliance on EHR data introduce the risk of diagnostic misclassification and incomplete clinical information. To reduce this risk, expert review and data validation processes are being considered during the data refinement phase. Second, due to the high volume of HF admissions, approximately 50% of eligible patients will be included using a calendar-based sampling strategy. While this approach is based on non-clinical criteria and was previously utilized in large-scale registries,[43] it may still introduce selection bias. Third, systemic barriers in the Korean healthcare system, such as the lack of reimbursement for patient education, may limit the implementation of improvement strategies. Addressing these structural issues through policy engagement and collaborative initiatives will be an important role for the Korean Society of Heart Failure. In the future, if resources and infrastructure improve, the registry may be expanded toward a prospective and all-case inclusion model to enable more comprehensive quality assessments and interventions.

CONCLUSION

The KSHF initiative represents a comprehensive and strategic effort to improve the QoC for patients with HF in Korea. Through systematic interventions, including educational programs, the implementation of a structured discharge checklist, and the establishment of the KSHF-QoC registry, this initiative aims to standardize HF management, monitor adherence to GDMT, and provide continuous feedback for quality improvement. The KSHF-QoC registry plays a pivotal role in this initiative, addressing the limitations of previous registries by capturing real-world prescribing patterns and clinical outcomes across various healthcare settings, including those involving general cardiologists. By enabling performance benchmarking and delivering targeted feedback, the registry is expected to drive improvements in GDMT adherence, treatment optimization, and institutional QoC. Importantly, the KSHF initiative was deliberately designed to reflect Korea's unique healthcare environment, characterized by a single-payer system, limited reimbursement for non-pharmacological interventions (e.g., patient education, cardiac rehabilitation), and substantial HF care delivered by general cardiologists rather than HF specialists. It also acknowledges population-specific features—such as lower BMI, lower blood pressure, and distinct HF etiologies—and includes plans for a Korean-specific risk prediction model. By integrating registry-based monitoring with pragmatic, low-cost tools such as a national discharge checklist and structured education programs, KSHF presents a scalable, locally tailored approach that distinguishes it meaningfully from international programs like GWTG-HF and ICARe-HF. Looking ahead, the success of the KSHF initiative will depend on active collaboration among healthcare providers, policymakers, and institutions to integrate QoC metrics into routine clinical practice. By leveraging data-driven insights and aligning with global best practices, the initiative can enhance HF care nationwide, reduce readmissions, and improve long-term outcomes.

ORCID iDs
Mi-Hyang Jung
https://orcid.org/0000-0003-0224-5178
Soo Yong Lee
https://orcid.org/0000-0003-2616-1294
Yang Hyun Cho
https://orcid.org/0000-0003-1685-3641
Dae-Hwan Bae
https://orcid.org/0000-0002-4464-8613
Sunki Lee
https://orcid.org/0000-0002-5247-7981
Chan Joo Lee
https://orcid.org/0000-0002-8756-409X
Jung-Woo Son
https://orcid.org/0000-0002-1790-3228
Jae Yeong Cho
https://orcid.org/0000-0002-9393-2821
Eung Ju Kim
https://orcid.org/0000-0003-2322-6267

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Author Contributions
Conceptualization: Jung MH, Son JW, Kim EJ; Formal analysis: Cho JY; Investigation: Jung MH, Lee SY, Cho YH, Bae DH, Lee S, Lee CJ, Son JW, Kim EJ; Supervision: Lee SY, Cho YH, Bae DH, Lee S, Lee CJ, Son JW, Cho JY, Kim EJ; Validation: Kim EJ; Visualization: Jung MH, Cho YH, Lee S, Kim EJ; Writing - original draft: Jung MH; Writing - review & editing: Lee SY, Cho YH, Bae DH, Lee S, Lee CJ, Son JW, Cho JY, Kim EJ.

SUPPLEMENTARY MATERIALS

Supplementary File 1
Detailed version of discharge checklist.

Supplementary File 2
Summarized version of discharge checklist.

Supplementary File 3
Practical guidance on pharmacological and device therapy for patients with heart failure.

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