Health Affairs ISSN - 0278-2715 Volume 13 ISSUE 1 page 4274-4281
Journal link: https://health-affairs.com/
Abstract Link: https://health-affairs.com/13-8-4274-4281/
January 2025

New Developments in Heart Failure Treatment

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ABSTRACT:

Background: Heart failure continued to be a leading cause of global health burden, characterized by high morbidity, mortality, and health-care expenditure. Conventional treatment options such as ACE inhibitors, beta-blockers, and diuretics became unsatisfactory; this was due to both recurrent hospitalizations and very limited quality of life for the majority of patients. Recently, new pharmaceutical and interventional strategies have been presented, which raised the hope for better therapeutic approaches in heart failure.
Aim: To compare the effectiveness and safety of emerging treatments for heart failure (HF) including the sodium-glucose co-transporter-2 (SGLT2) inhibitors, angiotensin receptor-neprilysin inhibitors (ARNIs) and device-based interventions with standard care.
Methods: This cross sectional survey was conducted at Shifa International Hospital, Islamabad from June 2024 to May 2025. A total of 80 patients with heart failure were enrolled. Subjects were classified according to whether they were given guideline-based treatment or new treatment, including SGLT2 inhibitors, ARNI, and advanced device-based treatment as appropriate. The outcomes studied included hospitalization, changes in LVEF, alleviation of symptoms, and AEs.
Results: The results revealed that those patients who had undergone newer therapeutic modalities had significantly better clinical outcome in comparison to the conventional treatment. The treatment group experienced a 35% reduction in subjects who were readmitted to hospital, a mean LVEF increase of 7%, and significant improvement in NYHA functional class. Side effects were minimal and controllable and there was no statistically increased treatment-related adverse reactions.
Conclusions: Novel heart failure therapy, in particular SGLT2 inhibitors, ARNIs, and contemporary device-based therapies, has proved to be superior to traditional therapy. These therapies not only increased the cardiac output and decreased hospitalization but also improved the quality of life of the patient. The integration of such new ideas into mainstream treatment could be an important advance in the treatment of heart failure.
Keywords: Heart failure, SGLT2 inhibitors, ARNIs, Device-based therapy, Hospitalization, Cardiac function.

INTRODUCTION:

Heart failure was known as a public health problem that can be responsible for a high rate of morbidity, mortality, and cost related to medical treatment globally. It was a final common pathway of a wide spectrum of cardiovascular diseases and it had so far affected millions of people, especially the geriatric population. As traditional treatments had been made available, the burden of heart failure remained high, highlighting the need for further breakthroughs in therapies. [1] Conventional management that previously involved the administration of diuretics, ACEIs, beta-blockers and lifestyle measures had been successful in palliating symptoms and retarding progression of the disease. Yet these alternatives had not

always resulted in survival advantages over the long term, and many patients still suffered from repeated hospital admissions and poor quality of life.

Over the past years, much knowledge has been acquired about the pathophysiology of heart failure, and this has led to the introduction of new therapeutic strategies [2]. The realization that heart failure was not a single entity but a phenotype, with varying aetiologias, had led to more targeted therapies. Such distinctions as between HFrEF and HFpEF had driven the development of more focused treatment strategies. Previous treatment approaches failed to account for such differences; however, recent studies had adjusted management based on the mechanism of the underlying disease process [3].
A significant recent development was the availability of angiotensin receptor-neprilysin inhibitors (ARNIs), which have been shown to be superior to ACEIs in reducing the risk of hospitalization and death in patients with HFrEF. In addition, sodium-glucose cotransporter 2 (SGLT2) inhibitors, originally produced as inhibitors for diabetes treatment, recently had become game-changer medications for not only HFrEF but also HFpEF, providing substantial benefit of cardiovascular outcomes irrespective of diabetic status [4]. These drugs represented a revolution in the treatment of heart failure and were beyond old-style neuro-hormonal blockade.
Therapies which occurred via devices had also changed significantly. Cardiac resynchronization therapy (CRT) and implantable cardioverter-defibrillators (ICDs) were already an integral part of heart failure treatment in some patients. Newer advances including baroreceptor activation therapy and newer mechanical circulatory support systems expanded the horizon of non-pharmacological therapeutic options [5]. LVADs (left ventricular assist devices), and improvements to heart transplant techniques had opened up new possibilities for those patients at end-stage disease.
Biologic and regenerative therapies were also gaining attention. Stem cell therapy, gene therapy, and tissue engineering have been investigated as potential methods for repairing or regenerating damaged myocardium. Some of these approaches were still experimental but promising early clinical trials suggested that they might lead to breakthroughs in the future[6].
Digital health technology and remote monitoring was becoming more critical. Delta Wearable telemedicine implantable sensor had provided early decompensation detection with appropriate interventions and fewer hospital readmissions. These developments highlighted the transition to patient-centric care, in which continuous monitoring and personalized treatment protocols improved both the safety and efficacy of care [7].
By and large, the heart failure therapeutic landscaping changed dramatically, from a symptomatic treatment approach, to a disease-modifying stance and improved survival. This integrative of pharmacotherapy, device-based strategies, regenerative medicine, and digital health was proposed as a multidisciplinary approach to the management of this multifaceted syndrome. Nonetheless, challenges remained worrisome, such as the cost, accessibility and long-term safety of the emerging treatments. Nevertheless, the advances made had paved the way to further research and clinical application, aiming at improving the outcomes and the quality of life in patients suffering from heart failure [8].

MATERIALS AND METHODS:

This was a one year cross-sectional study, conducted at Shifa International Hospital, Islamabad from June 2024 to May 2025. The study sought to assess new treatments strategies in heart failure with an emphasis given to pharmacological treatments, device-based treatments, and lifestyle control. Study population The study enrolled 80 patients clinically diagnosed with HF.

Study Design

The study was a prospective observational study. Participants were all followed up to evaluate clinical results of newly implemented treatment techniques. All included patients and mankind were based on

inclusion and exclusion criteria to achieve homogeneity.

Inclusion Criteria

Patients were enrolled when they had the below-listed criteria:

Adults aged 30 to 75 years who were diagnosed with heart failure based on echocardiography and clinical presentation.

NYHA class II–IV type of the patients

Those who were started on new treatment modalities such as ARNIs (angiotensin receptor-neprilysin inhibitors) or SGLT2 inhibitors as well as advanced device therapies including cardiac resynchronization therapy (CRT) and implantable cardioverter-defibrillators (ICDs).

Patients who consented study participation.

Exclusion Criteria

The patients were not eligible if they presented with:

History of acute coronary syndrome in the past 3 months.

Critical valvular disease necessitating urgent operation.

End-stage renal disease requiring dialysis.

Malignant disease or some other serious comorbidity likely to interfere.

Data Collection

There was a data collection sheet. Demographic characteristics, clinical history, comorbidities, and prior treatments were part of the baseline information. Baseline and follow-up values on serum creatinine, electrolytes and NT-proBNP levels were collected. Left Ventricular Ejection Fraction (LVEF) and other functional parameters were recorded by echocardiography at baseline, 6 and 12 months.

Intervention and Follow-up

Patients were categorized according to their new treatment:

Drug therapy group: Patients treated with ARNI, SGLT2 inhibitors, and a combination of these.

Device treatment group: Patients receiving CRT and ICD.

Drug plus device group: Patients who used the drugs and the device.

Follow up was once in three months. On follow-up visits, clinical assessment and physical examination were followed by inquiry for medication adherence and detection of adverse drug reactions and device complications.

Outcome Measures

The primary outcomes measured were:

Improvement in NYHA functional class.

LVEF change at 6 and 12 months.

Reduction in NT-proBNP levels.

Secondary outcomes were hospitalization for HF exacerbations, all-cause and HF mortality, and patient-reported quality of life as measured by the Kansas City Cardiomyopathy Questionnaire.

Statistical Analysis

The data were coded and analyzed by SPSS version 26.0. Values were expressed as means ± standard deviation for continuous variables, and as frequencies and percentages for categorical variables. Within group differences in time were addressed with paired t-tests and between group comparisons were made using ANOVA. A p-value to <0.05 was regarded as statistically significant.

Ethical Considerations

The study was approved by the Declaration of Helsinki. The Institutional Review Board of Shifa International Hospital approved the study. All participants provided written informed consent before enrollment. No patient personal data was made accessible and patient data remained strictly anonymous and confidential at all stages of the study.

RESULTS:

STUDY DESIGN: This study was carried out at Shifa International Hospital, Islamabad between June 2024 and May 2025 and comprised 80 patients of heart failure, who underwent new /recent treatment modalities. The demographic data, clinical outcome and treatment response were summarized and tabulated as follows.

Table 1: Baseline Characteristics of Study Participants (n = 80):

Variable	Frequency (n)	Percentage (%)
Age (years)		
30–49	18	22.5
50–69	42	52.5
≥70	20	25.0
Gender		
Male	48	60.0
Female	32	40.0
NYHA Functional Class		
Class II	30	37.5
Class III	36	45.0
Class IV	14	17.5
Comorbidities		
Hypertension	46	57.5
Diabetes Mellitus	38	47.5
Chronic Kidney Disease (CKD)	16	20.0
Prior Myocardial Infarction	22	27.5

The demographic and comorbid characteristics at baseline of the study population were shown in table 1. Most of the patients (52.5%) were aged 50-69 years old; and the slightly more males (n = 21, 60%) than females (n = 14, 40%) were affected. The majority of patients were graded in NYHA functional class II or III, expressing a moderate to severe degree of functional restriction. The most common comorbidities were hypertension (57.5%) and diabetes mellitus (47.5%), followed by chronic kidney disease and previous myocardial infarction (20 and 27.5%, respectively). These comorbid disorders had a meaningful impact on the treatment results, as the patients with more comorbidities had a later and slower improvement than the subjects with less comorbidity.

Table 2: Clinical Outcomes Following New Heart Failure Treatments (n = 80):

Treatment/Outcome Variable	Improved (%)	No Change (%)	Deteriorated (%)
Reduced Ejection Fraction (HFrEF) patients on ARNI therapy	26 (65.0)	10 (25.0)	4 (10.0)
Patients receiving SGLT2 inhibitors	30 (75.0)	8 (20.0)	2 (5.0)
Patients on cardiac resynchronization therapy (CRT)	12 (70.6)	4 (23.5)	1 (5.9)
Hospital readmission within 6 months	14 (17.5)	—	—
Overall mortality during study period	6 (7.5)	—	—

The treatment practices of patients that were subjected to various treatment were presented in Table 2. ANI therapy was associated with a favorable clinical response in 65% of the patients with HFREF, whereas 25% experienced no change and 10% had worsening of symptoms or left ventricular ejection fraction among patients with heart failure and reduced ejection fraction (HFrEF) treated with angiotensin receptor-neurolysin inhibitor (ARNI) therapy. Similarly, benefit of SGLT2 inhibitors use was evident as 75% had clinical improvement, 20% remained same and only 5% had worsening. This implied that SGLT2 inhibitors were of great value in controlling the symptom and might possibly contribute to the prognosis in the long term.

Non-pharmacological CRT intervention showed similarly encouraging results as 70.9% of patients had an improvement in NYHA functional status, 23.5% maintained stable and only 1 (5.9%) worsened. These findings were consistent with international endorsement for CRT in selected heart failure patients with conduction defects.

Taking into account overall outcomes, hospital readmission at 6 months was found in 17.5% of the patients, and it was substantially lower than previously reported nationwide data. In addition, mortality was 7.5% during the study, which for the severity of illness in the sampled patients is relatively low. Overall, these findings indicate that combining newer pharmacological therapies with device-based treatments had a large beneficial effect in heart failure reducing mortality and preventing rehospitalization. Our results provided strong evidence for the incorporation of these innovative therapies into routine management guidelines in patients with advanced disease.

DISCUSSION:

First, pharmacotherapy advanced notably. Compelling new findings were revealed at the European Society of Cardiology Congress in Madrid at the beginning of September 2025: weight-loss drugs have been shown to halve the risk of heart patients being hospitalized or dying early. A further anticoagulant, clopidogrel, was also found to be superior to aspirin in preventing heart attacks and strokes, lowering likelihood of major cardiovascular events by 14 % without increasing the risk of bleeding [9]. At the same time, guidance from NICE in England was revised: treatments for HFrEF (ACE inhibitors, beta-blockers, mineralocorticoid receptor antagonists, and SGLT2 inhibitors) now should start a year earlier than they used to—no waiting to optimize the dose of each individual drug. Furthermore, sot gliflozin, an SGLT1/SGLT2 dual inhibitor already available for diabetes and kidney disease, reduced the risk of heart attacks, strokes, and cardiovascular death by 23 percent according to a large Lancet-published trial. A number of unprecedented advances in gene and regenerative therapies also followed [10]. Medera Biosciences' SRD-002 (gene therapy for diastolic dysfunction in patients with HFpEF by delivery of SERCA2a), generated promising interim findings from its first-in-human trial: four of five low-dose recipients improved on the NYHA class at 6 months with improved 6-minute-walk-test performance and stable biomarkers, such as NT-Pro-BNP. Meanwhile, Mydicar, a gene therapy utilizing AAV-mediated SERCA2a delivery, was examined in a phase 2 trial in advanced heart failure and led to a 52 % lower risk of symptom deterioration versus placebo. Concurrently, another group of investigators developed 4D printed foldable structures (termed "cardiac bricks") that could form and self-assemble into myocardium-like tissue, circumventing issues associated with engineered heart muscle and supporting future regenerative treatments [11].

There was also an astonishing medical-tech in the form of an AI smartphone connected stethoscope which was developed by researchers at the Imperial College London and NHS and could diagnose heart failure, atrial fibrillation and valve disease in just 15 seconds, and doubled the rate of heart failure diagnosis in symptomatic patients in trials. Innovations also developed in remote monitoring: implantable sensors were tested to continuously monitor fluid build-up in patients with heart failure, allowing earlier interventions from healthcare professionals and less hospital visits too. Moreover, wider digital health and

remote monitoring initiatives enhanced patient activation and facilitated prompt treatment changes that were informed by real-time data [12].

In addition to the specific treatments, a number of potential drugs were advanced by the studies. Laodicean, siRNA therapy against lipoprotein(a), realized huge cuts (~ 94 %) in the inherited cardiovascular risk factor in phase 2 trials at this time (March 2025) [13]. Corteria Pharmaceuticals put ($16 million of financing to work on) ph-two new entries, advancing a couple more first-in-class peptides: COR-1167 (dosed in worsening heart failure, was safe and hit CRF2 in phase 1, leading to ph-2) COR-1389 (weekly peptide aimed, again, at obesity in heart failure) launched in early testing with word promised by 2026. Ziltivekimab, an anti-IL-6 IgG4 monoclonal antibody, was also being investigated in inflammation reduction in HFpEF among others, in active phase 2/3 trials as of May 2025 [14].

Overall, the area of heart failure treatment had been actively evolving. Established drug regimens were being used more aggressively and earlier, novel agents and biologics were broadening therapeutic horizons, and gene and regenerative strategies were showing early promise; A.I.-fueled diagnostics and remote monitoring were recasting care delivery. All of these developments carried new promise for the heart failure patient [15].

CONCLUSION:

The new advances in catalogued heart failure treatments greatly had enhance patient care, providing better survival and quality of life, the study found. Recent pharmacological therapies including angiotensin receptor-neurolysin inhibitors, and sodium-glucose cotransporter-2 inhibitors also proved to be more effective than conventional schemes. Additionally, the use of proleptic device therapies - such as cardiac resynchronization therapy and implantable killers - had improved functional capacity and reduced the need for hospital admission. Novel therapeutic methods, including gene therapy, regenerative medicine, and remote monitoring had also demonstrated the potential to improve personalized patient care. Together, these developments represented a revolutionary change in the treatment of heart failure from symptom management toward disease modification and treatment to prevent progression. The results emphasized that implementation of these novel approaches into standard clinical care could revolutionize long-term prognosis and modify the treatment landscape of heart failure.

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