Expert opinion of the Heart Failure Association of the Polish Cardiac Society, College of Family Physicians in Poland, and Polish Society of Family Medicine on the peri-discharge management of heart failure patients

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INTRODUCTION

Despite advances in the treatment of heart failure (HF), the rate of hospitalization for exacerbations of the disease remains high. One of the underlying reasons is that the recommended guidelines for HF management are still too rarely followed in daily practice. Disease exacerbation requiring inpatient treatment is always a factor that signals disease progression and thus worsens prognosis. This is also a key moment when therapy for HF exacerbation should be modified or initiated in the case of a newly diagnosed disease. Inpatient treatment and the peri-discharge period is the time when the etiology and mechanism of HF decompensation should be established. Therapy should be individualized based on etiology, HF phenotype, and comorbidities; it should take into account the possibilities of modern treatment. According to the recommendations of the European Society of Cardiology (ESC), HF patients should receive multidisciplinary management. Cooperation between various members of the multidisciplinary team taking care of HF patients improves the efficiency and quality of treatment. This expert opinion expands and details the information on the peri-discharge HF management recommended in the 2021 ESC guidelines and the 2022 American Heart Association (AHA)/ /American College of Cardiology (ACC)/Heart Failure Society of America (HFSA) guidelines.

HOSPITALISATION FOR HEART FAILURE — A MEDICAL, EPIDEMIOLOGICAL, AND PROGNOSTIC PROBLEM

Heart failure is a progressive condition with periods of exacerbations, which periodically also requires intravenous treatment and modification of medical management [1]. Hospitalization resulting from HF exacerbations significantly worsens patient prognosis. In Poland, current data on hospitalization for HF were obtained from an analysis conducted by the Ministry of Health (MoH), covering the entire adult population of Poland (41 532 268 people) from 2013 to 2018, focusing on people with a diagnosis of HF (1 686 861 people). In this group, almost half of the patients (817 432 people; 48.5%) were hospitalized. It was shown that between 2013 and 2018, the number of hospital admissions increased by as many as 33% (2013 — 198 881; 2018 — 264 808). Since 2008, the rate of hospitalization for HF in Poland has been the highest among Organization for Economic Cooperation and Development countries. The cost of hospitalization of HF patients increased by 125% between 2015 and 2020 in Poland. Expenditures of the National Health Fund (NHF) related to HF in Poland were estimated at 6.2 billion PLN in 2018, accounting for as much as 0.3% of GDP [2, 3]. The higher incidence of readmissions was seen primarily in women over 65 years of age, with comorbidities [4, 5].

Inpatient stay should be a key time for optimizing therapy and changing existing treatment. However, in daily practice, in most cases, medications prescribed on discharge are based on a pharmacotherapy regimen similar to that before hospitalization, which is a regimen that has proven ineffective in preventing cardiovascular destabilization [6]. Moreover, early initiation and intensification of pharmacotherapy do not occur in the peri-discharge period although numerous studies have shown that this is a safe procedure associated with improved patient prognosis [7–10]. Long-term observations have demonstrated that the post-discharge period, especially the first 30 days, is the time when cardiovascular events, exacerbation of HF, and the need for readmission are most common [11]. Hemodynamic destabilization and readmissions are factors that particularly worsen the prognosis of HF patients [1, 6, 11]. This is also indicated by the MoH data, according to which the chance of surviving 720 days from hospital discharge decreases significantly as the number of subsequent hospital admissions increases. With one hospitalization, the survival rate is 66.4%, and with four or more, it is only 43.9%.

BASELINE PHENOTYPE AND RESPONSE TO HOSPITAL TREATMENT AS DETERMINANTS OF POST-DISCHARGE MANAGEMENT

Clinical knowledge shows that in patients with acute heart failure (AHF), the quality of treatment in the period immediately after hospital discharge fundamentally affects short- and long-term morbidity and mortality [12]. Factors to be considered include individualized escalation of therapy, monitoring of its effectiveness and possible side effects of drugs, as well as rehabilitation carried out early after hospitalization. In practice, the implementation of HF treatment recommendations is not sufficient. The reasons for this may depend on both the patient and the healthcare system and may also be conditioned by the social environment and psychological profile of the patient. The sum of these factors is called the patient's clinical phenotype; its identification during hospitalization significantly modifies the possibilities of implementing, escalating, and sustainably continuing the recommended treatment [13].

According to an individual HF natural history, the patient's phenotypic features can be grouped according to the chronology of treatment, from the first clinical presentation and contact with the healthcare system to the patient's discharge from the hospital. For each hospitalization, the cycle of events is similar, and several groups of factors can be mentioned:

- the patient's historical data known at the time of admission;
- the clinical presentation of HF, including its etiology and the cause of decompensation;
- inpatient response to treatment and adverse events;
- individual determinants of patient cooperation after discharge.

The medical records and taking a thorough history from the patient and his/her family are irreplaceable sources of information. An effort should be made to gather as much data as possible, not only on cardiovascular risk factors and comorbidities but also on the chronology of events. Non-medical data, including social, psychological, and other issues, are also useful in planning patient care. The information obtained makes it possible to identify barriers to implementation, escalation, and maintenance of recommended therapy after discharge. Among the most significant factors are [14]:

- HF etiology, if already established;
- age of the patient, considering differences between chronological and biological age;
- number of previous hospital stays for cardiovascular decompensation;
- duration and complications observed during previous hospital stays;
- time from onset of the first concerning symptoms to the patient's contact with a physician and initiation of treatment (for previous and current hospital admissions);
- presence of comorbidities, especially atrial fibrillation (AF), type 2 diabetes mellitus (T2DM), chronic obstructive pulmonary disease (COPD), cancer, chronic kidney disease (CKD), liver failure, anemia, and neurological conditions, including progressive dementia;
- changes in "edema-free" body weight during HF (losses and gains after hospital stays), with determination of weight-loss percentage compared to the pre-HF period;
- frailty syndrome;

- presence of right ventricular dysfunction in previous hospital stays;
- left ventricular ejection fraction (LVEF) during previous hospital stays.
- treatment used to date, in particular, the type and doses of drugs recommended in the guidelines and the doses of diuretics;
- problems with patient adherence known from previous hospital stays (non-compliance, abandonment of medications, lack of conscious control of fluid supply, diuresis, body weight, etc.);
- mood disorders, depression, and other mental illnesses.

A still underestimated factor that determines subsequent patient outcomes is a delay between the appearance of the first HF symptoms and exacerbation and medical intervention [15]. Investigations conducted in the first hours of hospitalization should provide answers to further relevant questions. In addition to the etiology of HF (if already established), the specific circumstances and factors that may be responsible for the current cardiovascular decompensation are crucial. It is essential to elucidate the non-etiological causes of disease exacerbation besides analyzing acute causes of HF according to the CHAMPIT algorithm (acute Coronary syndrome/Hypertension emergency/Arrhythmia/acute Mechanical cause/Pulmonary embolism/Infections/Tamponade) [13]. Determining the etiology, in the case of *de novo* HF presentation, and searching for the causes of decompensation of previously stable HF can reveal the clinical circumstances – a specific patient phenotype – that determine further management. Undertaking treatment appropriate to the identified problem can modify HF management after discharge [13].

Among the most important etiological factors are:

- acute coronary syndromes (ACS) with the need for invasive treatment (revascularization);
- valve diseases for which invasive treatment can be used;
- infections, especially those requiring surgical management and long-term antimicrobial treatment (infective endocarditis or lead-related endocarditis, infected bedsores, and others);
- dysfunctions of implanted cardiac devices;
- thromboembolism;
- central nervous system ischemic events:
- arrhythmia;
- discontinuation or inappropriate use of pharmacotherapy, side effects of drugs (especially nephrotoxic or leading to thyroid dysfunction), alcohol, and illegal drugs;
- clinically significant bleeding;
- malignant neoplasms and their treatment.

In parallel and independently of etiologic diagnosis and causes of cardiovascular decompensation, the clinical presentation of HF itself can also influence post-discharge treatment. Current guidelines distinguish four main AHF phenotypes: acute pulmonary edema, decompensated chronic heart failure (CHF), isolated right ventricular HF, and cardiogenic shock. However, it is important to note that overlap between these phenotypes is possible in individual patients. The most important phenotypic features identified at the time of admission that may impose serious limitations on recommended therapies after discharge are summarized below [11]:

- class IV according to New York Heart Association (NYHA);
- "cold/wet" and "cold/dry" hemodynamic profiles of AHF;
- low blood pressure (BP);
- high natriuretic peptide levels, elevated troponin levels, hyponatremia, high urea levels, and high urea/creatinine ratio;
- impaired glomerular filtration, especially in those with a documented high percentage loss of "edema-free" body weight;
- low (<50–70 mEq/l) urinary sodium level 3 hours after intravenous loop diuretic administration;
- increased multiorgan congestion, especially with the presence of exudative fluid in body cavities;
- no prior treatment with renin-angiotensin-aldosterone system (RAAS) blockers and beta-blockers.

In addition to etiological intervention and treatment of the cause of cardiovascular decompensation, elimination of congestion and/or organ hypoperfusion usually requires diuretics, in some phenotypes, vasodilators, and, in others, drugs that increase myocardial contractility and peripheral vascular resistance. Determining the target condition, which is complete resolution of congestion and/or hypoperfusion and initiation or escalation of therapy recommended in the guidelines, and tracking the clinical response to this treatment (based on daily examination and laboratory test results) allows defining four basic clinical courses:

- steady clinical improvement toward a defined goal;
- initial clinical improvement followed by stabilization without reaching the target;
- steady clinical improvement but with worsening clinical parameters and additional test results (hypotonia, bradycardia, hyponatremia, greater than expected deterioration of renal function, hyperkalemia, metabolic alkalosis), individually or in combination;
- clinical worsening.

Except for the first course, all of the above scenarios require management modifications and may affect post-discharge management. Of paramount importance is the effectiveness of eliminating congestion, especially using the current recommendations for diuretic treatment (this factor is critical in maintaining clinical stability) and adequate treatment of comorbidities [16, 17]. Post-discharge treatment tactics and strategies can also be influenced by clinical adverse events observed during therapy. The same factors that contribute to the initial HF exacerbation can also complicate treatment.

Individual determinants of patient cooperation after discharge are among the least appreciated factors determining the success of HF therapy. Measures to improve

this cooperation are not implemented often enough. The factors that have the greatest impact on the effectiveness of cooperation include:

- the patient's level of education and his/her occupation;
- place of residence with special attention to the possibility of effective contact with various levels of the healthcare system (primary healthcare, cardiac outpatient center, hospital emergency department/emergency room, hospital ward), laboratory, pharmacy;
- opportunities for the patient and his/her family to use telemedical technologies during treatment;
- economic status;
- family and neighborhood environment.

METHODS OF ASSESSING PROGNOSIS IN HEART FAILURE RISK STRATIFICATION FOR READMISSIONS AND DEATH AFTER DISCHARGE AND THEIR UTILITY IN PRACTICE

There are many factors that are associated with particularly poor prognosis in HF patients [18]. These include disease progression expressed as consecutive stages A to D, NYHA classes I to IV, and, in the group with severe HF, the INTERMACS scale of 7 to 1. The risk is particularly high in patients after multiple hospital admissions for cardiovascular decompensation and in patients with CKD and other comorbidities [19, 20]. The prognosis is worse with decreasing LVEF, in patients with spherical left ventricular (LV) geometry (sphericity index >0.7) and with concomitant, hemodynamically significant valve diseases (especially mitral and/or tricuspid regurgitation) [21]. There is also an increased risk of decompensation or death in patients with a restrictive LV filling profile and significantly reduced LV longitudinal fiber function (reduced mitral annular velocities and longitudinal strain) [22]. A higher risk is observed in patients with right ventricular enlargement and dysfunction and pulmonary hypertension (tricuspid regurgitation velocity >2.8 m/s, mean pulmonary artery pressure >30 mm Hg) [23]. Patients >65 years of age, males, non-compliant patients, patients with depression, low body weight (cachexia) and nutritional deficiencies (including iron), ongoing infections, and high natriuretic peptide levels also have a worse prognosis [24].

Prognosis in HF is unfavorable in terms of both life expectancy and risk of hospitalization. According to data from the ESC Heart Failure Long-Term Registry, the prognosis is significantly worse in patients who were hospitalized than in outpatients. The annual overall mortality rate in the first group was 23%, while in the second group, it was 6.4%; the composite endpoint (overall mortality or HF hospitalization) in the first group was 35% and in the second 23% [25]. A huge problem is the need for frequent readmissions, especially in the first 30 days after discharge. According to Spanish data from 2003–2011, the rate of readmissions increased by 1.36% per year, from 17.6% to 22.1% [26]. The majority of hospital readmissions had a cardiovascular cause (60%), with HF in the first place. However, in recent years, attention has been drawn to the fact that conditions other than HF are responsible for a large proportion of hospital readmissions [20]. These data indicate the need for appropriate treatment of comorbidities in patients with HF. It is noteworthy that 1 in 6 patients discharged after cardiovascular decompensation is readmitted urgently to the hospital within 30 days of discharge [27]. The association of repeated hospital stays due to HF exacerbation with long-term prognosis has also been pointed out in other works. In one of them, the 30-day mortality rate was determined to be 7.4%, and the one-year mortality rate was 27.3% after hospitalization [28]. Each subsequent hospitalization was associated with shorter survival. Average survival after the first hospital stay for HF was 2.6 years, 1.8 years after the second, 1.5 years after the third, and only 1.3 years after the fourth hospitalization. However, the authors point out that this does not show that reducing readmission frequency would reduce mortality [28]. Further studies are needed to better understand the impact of readmissions on HF progression.

There is no single ideal prognostic indicator in HF. Such assessment is always multifactorial, depending, in addition to the above-mentioned determinants, also on the etiology of HF and the assessment of the reversibility of its cause (e.g., successful revascularization of the coronary arteries in patients with ischemic cardiomyopathy, successful treatment of a valve disease). Only a holistic view of these factors allows an experienced clinician to estimate the risk of serious complications and select patients for whom special care should be provided. Such analysis is not entirely accurate — despite a small number of risk factors, early disease progression does not mean that a given patient's prognosis is good [24]. In recent years, the MAGGIC scale, constructed from an analysis of data from 39 372 HF patients with preserved (HFpEF) and reduced ejection fraction (HFrEF) from 30 clinical trials, has been increasingly used; the scale includes 13 prognostic parameters [29]. These easily available scored indices include age, male sex, LVEF, NYHA class, creatinine level, not using beta-blockers, not using angiotensin-converting enzyme inhibitors (ACEIs)/angiotensin receptor blockers (ARBs), systolic blood pressure (SBP), body weight, time from HF diagnosis, smoking, presence of T2DM and COPD. In the MAGGIC study, the median score was 23. Low risk, defined as <17 points, was associated with 3-year risk of death of 10%. In contrast, very high risk (>33 points) was associated with 3-year risk of death of 70%. A calculator to determine the 1-year and 3-year risk of death in HF can be found at www.heartfailurerisk.org. Analysis of data from the above-mentioned ESC Heart Failure Long-Term Registry showed that fewer than 1% of practicing physicians assessed the prognosis of their HF patients using the available scales [30]. Such patient assessment is not simple but very useful. The finding of a worse prognosis based on the calculation of a composite index, such as the MAGGIC score, is an indication for more intensive treatment, more

Table 1. Recommended non-pharmacological interventions in patients with heart failure (HF) [24]

Recommendations	Class	Level
It is recommended that HF patients are enrolled in multidisciplinary HF management programmes to reduce the risk of HF hospitalization and mortality	I	A
Self-management strategies are recommended to reduce the risk of HF hospitalization and mortality. Outpatient or inpatient care programmes are recommended to reduce the risk of HF hospitalisation and mortality	I	A
Influenza and pneumococcal vaccinations should be considered to prevent HF and hospitalization	II	A

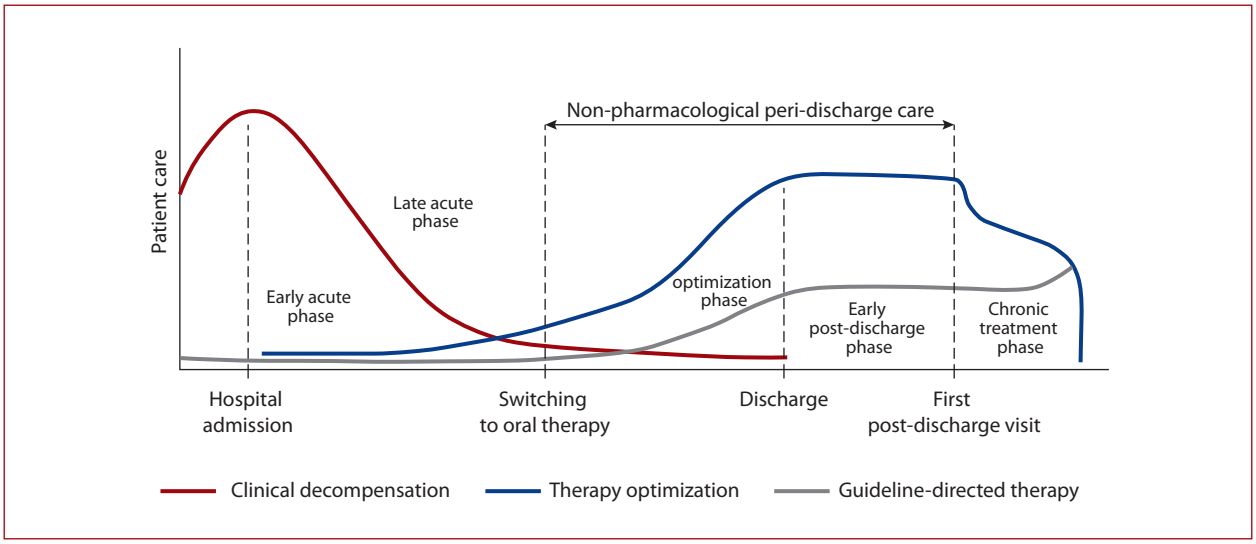

Figure 1. The clinical course of heart failure and the place of non-pharmacological management in the peri-discharge period [14]

frequent monitoring of HF course, and possibly referral to a transplantation center or palliative care.

NON-PHARMACOLOGICAL MANAGEMENT IN THE PERI-DISCHARGE PERIOD

Non-pharmacological management is a very important aspect of therapy. The current guidelines devote considerable attention to non-pharmacological interventions that should be implemented during hospitalization (Table 1) [24].

With regard to peridischarge treatment tasks and goals, non-pharmacological management involves three phases: the pre-discharge optimization phase, discharge, and early post-discharge phase (Figure 1) [14].

The essential tasks of the team coordinating HF treatment include [31]:

- HF diagnosis and monitoring disease progression;
- prescribing treatment, optimizing and monitoring HF therapy;
- patient and caregiver education about the disease and treatment;
- lifestyle education and recommendations (regarding diet, physical activity, and stimulants, among others);
- assessing the need for psychological and social support;
- coordination of comorbidity care;
- counseling and end-of-life palliative care.

The ESC guidelines support multidisciplinary-team care for HF patients. In the pre-discharge phase, the team should provide clinical assessment, therapy optimization, patient education, and a post-discharge care plan. Clinical evaluation of the patient, in the hospital, should include daily measurements of the following parameters: BP, heart rate (HR) and respiratory rate, body weight, and fluid retention levels. Periodically, it is also advisable to measure levels of biomarkers of myocardial overload and damage (B-type natriuretic peptide [BNP]/N-terminal pro-B-type natriuretic peptide [NT-proBNP], troponin) and assess renal function (creatinine/estimated glomerular filtration rate [eGFR], urea, electrolytes) [13].

In the peri-discharge period, patient education is a very important aspect affecting therapy effectiveness. This period should be used to comprehensively discuss with the patient issues such as their general knowledge of HF and prognosis, monitoring of vital signs, symptoms of fluid overload, and fluid intake. Implementing education and teaching patients to self-manage their symptoms reduces the risk of both HF and all-cause hospitalization (by 34% and 27%, respectively) [32]. Nurse-led face-to-face education is the most commonly chosen strategy in educating HF patients.

Education should include the following topics discussed in a comprehensible manner with the patient:

- basic information about the definition, cause, and course of HF (including prognosis);
- basic knowledge of pharmacotherapy (drugs, dosage, side effects, contraindicated drugs);
- essential information on implantable devices and percutaneous or surgical intervention;
- information on diet and use of stimulants (alcohol, cigarettes, use of psychoactive substances);

Table 2. Follow-up visits in patients with chronic heart failure

Clinical condition	Follow-up visits	Parameters evaluated	Specialist
Stable patient	Every 6 months	Signs of cardiovascular decompensation in patient history and on physical examination, other symptoms, BP, HR, complete blood count, electrolytes (sodium and potassium), creatinine, other[a]	Cardiologist/PCP
Patients discharged from hospital	Preferably 1–2 weeks after discharge, then as needed	Signs of cardiovascular decompensation in patient history and on physical examination, other symptoms, BP, HR, complete blood count, electrolytes (sodium and potassium), creatinine, other[a]	Cardiologist/PCP
Patients in the course of therapy escalation	As needed (to optimize therapy)	Signs of cardiovascular decompensation in patient history and on physical examination, other symptoms, BP, HR, complete blood count, electrolytes (sodium and potassium), creatinine, other[a]	Cardiologist/PCP

[a]Other — ECG once a year to assess the duration and morphology of the QRS complex and identify conduction and rhythm abnormalities (especially atrial fibrillation); echocardiography in case of clinical deterioration and 3–6 months after optimization of standard therapy for HFrEF to determine indications for possible modification of pharmacotherapy and/or implantation of devices (ICD, CRT)

Abbreviations: BP, blood pressure; CRT, cardiac resynchronization therapy; ECG, electrocardiogram; HFrEF, heart failure with reduced ejection fraction; HR, heart rate; ICD, implantable cardioverter-defibrillator; PCP, primary care physician

- knowledge about engaging in sexual activity;
- information on prophylactic vaccination;
- information on safe traveling.

Observations have shown that the rate of readmission within 30 days of the last hospital stay was significantly lower in the group of HF patients educated by a nurse (20.4%) compared to the group without education (50.0%) [33, 34]. It is also important to remember the need to educate family members and relatives of HF patients. Education and family support contribute to better adherence to pharmacological and dietary recommendations, and patients show better motivation and self-confidence [35, 36]. Special attention should be given to diuretic treatment with practical education on both diuretic dosage and fluid intake, as well as monitoring for symptoms of fluid overload. Symptom monitoring is an important aspect of patient-physician collaboration and should include assessment of breath shortness, fatigue, BP, HR, and body weight. These observations should be kept in the form of a diary/passport. It is important to teach the patient which symptoms are cause for concern (e.g. increased shortness of breath and/or edema or rapid weight gain of more than 2 kg in 3 days) and how to contact medical staff if there is an increase in symptoms that may indicate incipient cardiovascular decompensation. Cooperating patients can be taught to modify diuretic treatment and potassium supplementation depending on the severity of their symptoms, to control their renal function (creatinine/eGFR) and electrolyte levels. Patient involvement in self-management of symptoms and modification of diuretic treatment reduces the risk of HF hospitalization and mortality [13]. The Polish Cardiac Society has launched an educational portal for HF patients (www.slabeserce.pl) where they can improve their knowledge of the disease through accessible and understandable content. This portal can also be used to help educate patients. The Heart Failure Patient Passport can be downloaded from: https://niewydolnosc-serca.pl/sprawozdanie/paszport-pacjenta_z%20NS.pdf. A certified nursing education program is also available for nurses who would like to expand their competencies regarding the care of HF patients and become specialized HF educators.

The onset of HF is accompanied by the onset of depressive symptoms, loneliness, anxiety, and withdrawal [37, 38], so it is advocated that psychosocial support be provided to patients, their families, and/or caregivers. In recent years, cognitive behavioral therapies based on mindfulness techniques, applied in a group of HF patients, have confirmed the significant effect of this type of intervention on reducing depressive symptoms [39–41].

Patients admitted to the hospital for HF exacerbation can be discharged home if [42]:

- they are clinically stable (no signs of cardiovascular decompensation — in extreme HF this condition not always can be met) and hemodynamically stable;
- are in euvolemia, and their renal function parameters have been stable for >24 hours;
- have been properly educated in the context of both self-monitoring and HF itself.

The patient, when leaving the hospital, should receive [43]:

- a discharge letter with details of his/her hospital stay;
- recommendations for prevention and monitoring of symptoms;
- information specifying the course of rehabilitation;
- recommendations for post-discharge management regarding both the patient and his/her primary care physician (PCP).

It is also advisable to schedule a follow-up visit within 1–2 weeks after discharge from the hospital (Table 2). Such early outpatient follow-up (preferably on day 7) is primarily aimed at assessing signs of fluid overload, tolerability of pharmacotherapy, and the possible need to change the treatment, including doses of disease-modifying drugs and diuretics. The introduction of a follow-up visit on day 7 after discharge reduces the rate of 30-day readmission by 30% [13, 44–47]. In the early post-discharge phase, it is extremely important for patients to perform consciously and responsibly self-monitoring with regard to the presence of clinical symptoms, BP, heart rate, body weight, periodic assessment of clinical chemistry parameters (in PCP or cardiac center setting) as well as adhere to diet and physical activity recommendations [48]. It is recommended that HF patients

undergo regular medical checks, whose frequency depends on the treatment stage of the disease in a given patient. When planning care after HF exacerbation requiring hospital treatment, follow-up visits should be more frequent and scheduled at the time of patient discharge from the hospital. During post-hospital follow-up, indications for electrotherapy (implantable cardioverter-defibrillator, cardiac resynchronization therapy) should also be verified after a >3-month period of optimal pharmacotherapy. In the period between exacerbations, once the patient's condition is stabilized and all planned interventions have been carried out, outpatient check-ups may occur less frequently, but no less than every 6 months. These visits should take place regardless of the presence/severity of symptoms to optimize the pharmacotherapy and detect asymptomatic disease progression early. Patients with a history of HF exacerbation and significant modification of pharmacotherapy should be monitored more frequently, but the guidelines do not specify at what intervals. Recommendations for the frequency of follow-up visits in CHF — according to the ESC guidelines — are shown in Table 2 [13].

INDIVIDUALIZATION OF THERAPY — AN IMPORTANT ASPECT OF DISCHARGE MANAGEMENT

According to the 2021 ESC guidelines, optimizing therapy after hospitalization for AHF reduces the risk of readmissions, cardiovascular death and improves quality of life. Individualization of HF therapy is one of the areas of emphasis in the current guidelines, and it is based on clinical profiles that take into account the following data [13, 49]:

- BP;
- HR;
- heart rhythm type (especially the presence of AF);
- renal function and/or hyperkalemia;
- fluid overload.

The individualization of therapy should also take into account the patient's preferences and abilities. The guidelines place particular emphasis on careful assessment of fluid overload features in patients before discharge and optimization of oral diuretic treatment. In fact, the presence of fluid overload features in a patient discharged after HF exacerbation is associated with high risk of death and readmissions [50, 51]. For patients not previously treated with beta-blockers, but who show fluid overload features, these drugs should not be the first line of therapy, as they may lead to clinical deterioration.

In the pre-discharge period (once acute cardiovascular decompensation is under control), HFrEF patients must receive oral medications to improve their prognosis. This stage is possible in those patients who have achieved hemodynamic stability and have no significant fluid retention. The introduction of these drugs into therapy requires consideration of both the clinical profile and form of AHF (*de novo*, CHF exacerbation), as highlighted above. Primary medications for HFrEF that modify the course of the disease include beta-blockers, ACEI/ARB/angiotensin receptor neprilysin inhibitors (ARNI), mineralocorticoid receptor antagonists, (MRA), and sodium-glucose co-transporter 2 (SGLT2) inhibitors [13, 52, 53]. The TRANSITION and PIONEER-HF trials confirmed the clinical benefits of ARNI therapy in patients hospitalized for acute manifestation of HFrEF, both *de novo* and as CHF exacerbation [9, 10]. On the other hand, the PERSPECTIVE study — presented during the recent 2022 ESC congress in Barcelona — showed that ARNI does not impair cognitive function compared to valsartan in patients with HF with mildly reduced EF (HFmrEF) or HFpEF, although there was a reduction in the deposition of β-amyloid in the brain in patients treated with ARNI, which requires further research. The results of the studies showed that initiating ARNI therapy in the predischarge period is safe and is associated with early and sustained improvements in reducing the risk of major cardiovascular events and lowering biomarkers (NT-proBNP, troponin). It is noteworthy that patients with *de novo* HF benefited most from ARNI therapy introduced in the pre-discharge period. ARNI treatment can be started if SBP is not <100 mm Hg, eGFR is >30 ml/min/1.73 m^2, and potassium is <5.4 mmol/l. In persons previously receiving ACEI, 36 hours must elapse from the last dose of the drug. Given the current state of knowledge, in the opinion of the experts of the Heart Failure Association of the Polish Cardiac Society, ARNI (sacubitril/valsartan) should be the preferred drug over ACEI/ARB in HFrEF patients. This is supported by the recommendations in the latest 2022 AHA/ACC/HFSA guidelines.

The clinical benefits of beta-blocker treatment in HFrEF have been confirmed in a number of studies. Moreover, retrospective analyses have documented that dose reductions of these drugs or their discontinuation in patients hospitalized for HF exacerbation were associated with a worse prognosis [54]. The inclusion or continuation of MRA and SGLT2 inhibitor therapy, on the other hand, can be safely carried out even in patients with low SBP values (<90 mm Hg), except those with coexisting chronic coronary syndrome (CCS) for whom SBP >120 mm Hg is recommended [13]. The EMPA-RESPONSE-AHF trial in AHF patients treated with empagliflozin reported a reduction in the risk of a composite endpoint consisting of worsening HF, readmissions, and cardiovascular death at 60-day follow-up [55]. On the other hand, in the SOLOIST-WHF study in patients with T2DM and HF exacerbation, treatment with sotagliflozin, initiated before or shortly after discharge, resulted in a significantly lower total number of cardiovascular deaths and HF hospital admissions and urgent visits compared to placebo [56]. The latest EMPAG-HF study shows that early inclusion of empagliflozin in standard diuretic therapy increases the effectiveness of diuresis without adversely affecting renal function in AHF patients. These results somewhat accord with the EMPULSE study mentioned below, which showed, among others, the safety of empagliflozin therapy in stable patients just after an AHF episode.

It is worth recalling that high HR is an unfavorable prognostic factor on discharge. Reducing HR is an important therapeutic goal in the treatment of HFrEF. This strategy is beneficial for patients with sinus rhythm and HR greater than or equal to 70 bpm. The ETHIC-AHF trial and the Optimize Heart Failure Care program have demonstrated that intensification of treatment before discharge with concomitant administration of beta-blockers and ivabradine to patients stabilized after decompensated HFrEF resulted in benefits as early as in the first month of therapy (higher percentage of patients with HR <70 bpm) and after one year of followup [8, 57, 58]. For patients treated with beta-blockers and ivabradine, improved LVEF, reduced risk of death and readmission for HF, and better quality of life have been reported after 12-month follow-up [57, 58]. Although according to the latest ESC guidelines, it is optimal to use representatives of all four drug groups (beta-blockers, ACEI/ARB/ARNI, MRAs, and SGLT2 inhibitors), even at the expense of possibly not reaching target doses, this is not always possible in daily practice [13]. Table 3 shows the clinical profiles for each drug group. The therapy established before discharge is the starting point for further optimization in the outpatient setting. The pre-discharge period usually does not allow for achieving optimal doses of the listed HF course-modifying drugs, so after the patient is discharged from the hospital, it is necessary to gradually increase them until the target or maximum drug doses tolerated by the patient are reached. Such information should be included in the hospital discharge letter and in the information for the family doctor.

While for main HFrEF pharmacotherapy, the current ESC and AHA/ACC/HFSA guidelines are convergent (the use of beta-blockers, ACEI/ARB/ARNI, MRAs, and SGLT2 inhibitors has a class I recommendation), except for the positioning of ARNI versus ACEI/ARB, some important differences emerge for patients with LVEF >40%. For patients with HFmrEF, the ESC guidelines recommend the use of beta-blockers (to reduce the risk of HF hospitalization and death), ACEI/ARB/ARNI, MRAs, and SGLT2 inhibitors (recommendation class IIb), without specifying recommendations for pharmacotherapy to improve prognosis in HFpEF patients (beyond treatment of concomitant diseases and control of risk factors). In part, this was because the guidelines were published before the results of recent studies on treatment options for HFpEF [13]. The more recent AHA/ACC/HFSA guidelines from this year recommend the use of SGLT2 inhibitors as first-line therapy for both HFmrEF and HFpEF (class IIa), before beta-blockers, ACEI/ARB/ARNI, MRAs (class IIb) [53]. This is largely due to the results of studies such as EMPEROR-Preserved and DELIVER. The EMPULSE trial evaluated empagliflozin versus placebo in patients hospitalized for AHF regardless of LVEF. For patients receiving empagliflozin during 90 days of follow-up, it was shown

Table 3. Pharmacological treatment of heart failure depending on the patient's clinical profile [49]

Patient with low BP (<90/60 mm Hg)	
HR 60–70 bpm	**HR >70 bpm**
MRA SGLT2 inhibitor ↓ beta-blocker ↓ diuretic ↓ ACEI/ARB/ARNI	MRA SGLT2 inhibitor ↓ beta-blocker ↓ diuretic ↓ ACEI/ARB/ARNI **Ivabradine**
Patient with high BP (>140/90 mm Hg)	
ACEI/ARB/ARNI SGLT2 inhibitor Beta-blocker MRA Diuretic **Vericiguat** **Hydralazine/isosorbide dinitrate**	
Patient with low heart rate (<60 bpm)	
BP >90/60 mm Hg	**BP <90/60 mm Hg**
ACEI/ARB/ARNI SGLT2 inhibitor MRA diuretic ↓ beta-blocker **Vericiguat**	SGLT2 inhibitor MRAs ↓ beta-blocker ↓ ACEI/ARB/ARNI ↓ diuretic
Patient with increased heart rate (>70 bpm)	
ACEI/ARB/ARNI SGLT2 inhibitor Beta-blocker MRA Diuretic **Ivabradine**	
Patient with AF	
QRS complex frequency >60 bpm	**BP <90/60 mm Hg**
Beta-blocker ACEI/ARB/ARNI SGLT2 inhibitor MRAs Diuretic **Digoxin** **Oral anticoagulant (NOAC of choice)**	SGLT2 inhibitor ACEI/ARB/ARNI MRAs ↓ beta-blocker ↓ diuretic **Oral anticoagulant (NOAC of choice)**
Patient with CKD	
eGFR <30 ml/min/1.73 m^2	**eGFR >30 ml/min/1.73 m^2**
SGLT2 inhibitor Beta-blocker Diuretic **Vericiguat** Hydralazine/isosorbide dinitrate	SGLT2 inhibitor Beta-blocker ACEI/ARB/ARNI MRA Diuretic **Vericiguat** Hydralazine/isosorbide diazotate
Patient with hyperkalaemia (K^+ >5.5 mEq/l)	
SGLT2 inhibitor Beta-blocker Diuretic ↓ ACEI/ARB/ARNI ↓ MRA **Potassium-binding products** (e.g., polystyrene sulfonate, Resonium A) **vericiguat**	

↓ Dose reduction or drug discontinuation

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; AF, atrial fibrillation; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor neprilysin inhibitor; BP, blood pressure; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; HR, heart rate; MRA, mineralocorticoid receptor antagonist; NOAC, non-vitamin K antagonist oral anticoagulant; SGLT2, sodium-glucose co-transporter 2

that they were 36% more likely to experience a clinical benefit in terms of reduced risk of cardiovascular death, hospitalization for HF, and improved quality of life. The drug was started once clinical stability had been achieved, usually on the 3rd day of hospitalization [59, 60]. The benefit of treating HF without significantly reduced ejection fraction (LVEF >40%) has also been demonstrated for another SGLT2 inhibitor, dapagliflozin. The DELIVER study confirmed that in patients with HFpEF/HFmrEF (LVEF >40%), dapagliflozin significantly reduces the risk of cardiovascular death or HF exacerbation [61].

IMPACT OF COMORBIDITIES ON INPATIENT COURSE AND OUTPATIENT CARE PLANNING

Heart failure is often accompanied by other cardiovascular conditions and diseases of other organs and systems. According to the ESC Pilot Survey registry, 74% of HF patients have at least one non-cardiovascular concomitant disease, which translates into a significant increase in mortality in this patient population [62]. The current guidelines devote a great deal of attention to treatment of comorbidities as important causes of readmissions when they are not recognized and/or not treated effectively [13]. Particularly noteworthy in the peri-discharge period are:

- among cardiovascular conditions: CCS, AF, arterial hypertension (AH);
- beyond cardiovascular conditions: iron deficiency (ID), T2DM, CKD.

Chronic coronary syndromes

The most common cause of HF in our population is coronary artery disease, which can lead to significant abnormalities in LV contractility, size, and shape. Myocardial ischemia should therefore be considered whenever patients are hospitalized for AHF, especially if a reduction in LVEF is observed *de novo*. Documenting ischemia using non-invasive exercise tests can be difficult in HF patients due to often poor exercise tolerance and chronically elevated LV end-diastolic pressure. Coronary angiotomography or invasive coronary angiography can be performed to determine the presence and severity of CCS, which will be critical in determining possible indications for coronary revascularization if stenocardial symptoms persist despite optimal pharmacotherapy [63]. Beta-blockers, which are one of the main groups of drugs in the treatment of HFrEF patients, are also recommended in CCS, primarily for their antianginal effects. Ivabradine, on the other hand, should be considered as an alternative to beta-blockers (if contraindicated) or as an additional treatment to reduce ischemia in patients with HR >70 bpm [63]. Other antianginal drugs (primarily calcium antagonists, nicorandil, ranolazine, and nitrates) can also be effective in treating angina symptoms. Moreover, the addition of trimetazidine, which improves LV function and exercise tolerance in patients with HFrEF and CCS already treated with chronic beta-blockers, may be considered. In HF patients, short-acting nitrates should be used with caution because they can cause hypotension. It is also important to note that diltiazem and verapamil are contraindicated in HFrEF patients [13].

Atrial fibrillation

Atrial fibrillation is the most common type of arrhythmia in HF patients (15%–30%), especially those >65 years old. The risk of AF is particularly high in HFpEF patients (40%), and it is an independent factor for a worse prognosis in this group of patients (increased risk of stroke, thromboembolic complications, hospitalization for HF, and death) [13]. The finding of AF in an HF patient requires first and foremost:

- identifying and treating the causes and triggers of cardiac arrhythmias;
- treatment of HF;
- prophylaxis of thrombotic complications;
- choosing a strategy for sinus rhythm control or ventricular rate control.

In all patients with HF and paroxysmal, persistent, or permanent AF, chronic oral anticoagulant treatment is recommended unless contraindicated. Non-vitamin K oral anticoagulants are preferred for preventing thromboembolic incidents because they have similar efficacy to vitamin K antagonists and a lower risk of bleeding [64]. However, this applies to patients with AF without significant mitral valve stenosis or the presence of a mechanical valve prosthesis. In patients with a contraindication to oral anticoagulant therapy, left atrial appendage closure may be considered.

The cornerstone of AF treatment is symptom control through HR control. In cases of significant irreversible myocardial impairment with obviously enlarged cardiac cavities (especially the left atrium), a strategy of ventricular rate control rather than rhythm type control may be recommended. This is due to the low probability of both restoring and maintaining sinus rhythm in this group of patients. Pharmacological control of the ventricular rate can be achieved by using primarily beta-blockers and digoxin [64]. The choice of drugs depends on the HF phenotype, symptoms, comorbidities, and potential side effects. Dronedarone, diltiazem, and verapamil are contraindicated in HFrEF patients while amiodarone, due to its numerous side effects, can usually be used only for a short period (<6 months) [13]. The acceptable resting ventricular rate in patients with permanent AF is 110 bpm, although some experts suggest that it should be in the range of 60–100 bpm [65, 66].

Hypertension

Hypertension is one of the main risk factors for the development of HF, and nearly two-thirds of HF patients have a history of AH. Hypertension causes LV hypertrophy, thereby impairing its diastolic function; it is also a strong predictor of HF development (even with preserved LVEF), thus playing a special role in HFpEF etiopathogenesis. AH treatment significantly reduces the risk of developing

HF and hospitalization for HF, especially in people over >65 years of age. It must be remembered that inadequately controlled AH can lead to episodes of acute cardiovascular decompensation manifesting as pulmonary edema. The most important recommendations for the treatment of AH in patients with HF are as follows [13, 67]:

- in HFrEF patients, ACEI/ARB, beta-blockers, diuretics, and/or MRAs are recommended. With inadequate BP control, treatment with dihydropyridine calcium antagonists (amlodipine or felodipine) can be added to therapy;
- in HFpEF patients, treatment is based on ACEI/ARB, beta-blockers, diuretics, and calcium antagonists. BP thresholds for starting treatment and therapeutic goals should be the same as those for HFrEF patients.

ARNIs are also effective in lowering BP; moreover, they significantly improve the prognosis of HFrEF patients. Drugs in this group are, therefore, recommended as an alternative to ACEI/ARB for the treatment of AH in HFrEF patients. Non-dihydropyridine calcium antagonists (diltiazem, verapamil), alpha-blockers, and centrally acting drugs, such as moxonidine, are not recommended in HFrEF patients [13].

Iron deficiency and anemia

ID is an important comorbidity in HF patients. There is evidence that ID is associated with greater severity of HF symptoms, more frequent HF hospital stays, and increased risk of death [68, 69]. Clinical trials have indicated that intravenous iron supplementation (in the form of iron carboxymaltose) has significant benefits in HF patients [70–72]. It should be emphasized that oral iron supplementation in HF patients is ineffective and not recommended [73]. In the latest ESC recommendations for HF diagnosis and treatment, the place of intravenous iron supplementation is as follows [13]:

1. The use of intravenous ferric carboxymaltose should be considered in patients with stable symptomatic HFrEF (LVEF <45%, so also in patients with HFmrEF) and ID to improve the quality of life, exercise capacity, and to reduce the severity of HF symptoms [70, 71].
2. Intravenous ferric carboxymaltose should be considered in patients with HFrEF and HFmrEF (LVEF <50%) clinically stabilized after an AHF episode (current or recent hospitalization) and ID to reduce the risk of subsequent unplanned hospitalization for HF progression [72].

Given the aforementioned benefits, all HF patients, regardless of hemoglobin levels, renal function, and LVEF values, should be periodically screened for ID, also during hospitalization for AHF. Iron deficiency in HF patients is diagnosed based on ferritin levels <100 µg/l or ferritin level 100–299 µg/l (in this case, if accompanied by transferrin saturation <20%). If ID is found during hospitalization for AHF, the first dose of ferric carboxymaltose should be given in the hospital. In addition, intravenous iron supplementation can (and should!) be continued and carried out on an outpatient basis. In the CONFIRM-HF and AFFIRM-AHF studies, patient body weight and hemoglobin levels were taken into account when dosing intravenous ferric carboxymaltose in patients with HF and ID. The drugs are given at baseline and at 6 weeks. A total dose of 0.5–2.0 g of ferric carboxymaltose is given in a regimen of up to 1.0 g at baseline and the remaining dose at 6 weeks [72, 73]. If the hemoglobin level is >15 g/dl, intravenous iron should not be administered. Abnormal renal function, BP, and HR values are not contraindications to the administration of intravenous ferric carboxymaltose. Patients on intravenous iron should be re-evaluated for iron status after 3–6 months and, if required, supplemented again. It should also be mentioned that no allergy tests need to be performed before the first intravenous administration of ferric carboxymaltose.

Type 2 diabetes mellitus

Data from the literature indicate that up to 30% of HF patients have comorbid T2DM, and as many as two-thirds of the HF patient population have carbohydrate metabolism disorders (diabetes or pre-diabetes) [13]. Type 2 diabetes mellitus significantly increases the risk of developing HF and is one of the leading causes of CHF along with CCS and AH. T2DM patients have a 2–5 times higher risk of developing HF compared to those with normal glucose metabolism. In cases where T2DM and HFrEF are established, it is recommended that SGTL2 inhibitors (empagliflozin or dapagliflozin) be used first and foremost, which, in addition to their hypoglycemic effects, are, as already mentioned, one of the four groups of drugs included in the fundamental therapy of HFrEF [74, 75]. Metformin is a safe drug in HF patients; however, it should not be used in patients with eGFR <30 ml/min/1.73 m^2 and those with liver failure because of the risk of developing lactate acidosis. Glucagon-like peptide-1 (GLP-1) analogs and dipeptidyl peptidase 4 (DPP-4) inhibitors (except saxagliptin which increases the risk of hospitalization for HF) are not currently recommended in HF patients due to their neutral effects on the risk of death and hospitalization for HF [13, 76]. The use of sulfonylurea derivatives and thiazolidinediones (glitazones) is associated with increased risk of HF and/or hospitalization for HF and hence is not indicated for T2DM therapy in patients at risk of HF or those already diagnosed with CHF [13, 76].

For type 1 diabetes mellitus, insulin remains the drug of choice. Its use leads to sodium retention in the body, which can result in increased fluid retention and consequent cardiovascular decompensation in HF patients. Therefore, initiation of insulin therapy in HF patients and diabetes requires close monitoring of the patient's condition for early detection of possible fluid retention and incipient exacerbation of HF [13, 76]. It should be emphasized that a patient with diabetes mellitus and HF requires special monitoring (PCP, cardiology, diabetes) in the outpatient setting.

Renal impairment

Heart failure and CKD share common risk factors, such as T2DM and AH. CKD is one of the major independent determinants of increased mortality and morbidity in HF. In the course of CHF, especially when the disease is exacerbated, renal function often deteriorates. One reason for the increase in plasma creatinine levels is the use of diuretics in combination with ACEI/ARB/ARNI, MRAs, SGLT2 inhibitors, and nephrotoxic drugs, which include iodine contrast agents, certain antibiotics (gentamicin, trimethoprim), and non-steroidal anti-inflammatory drugs (NSAIDs). It should also be remembered that patients with impaired renal function may accumulate renally excreted drugs such as digoxin, insulin, and low-molecular-weight heparin. It is therefore very important to adjust the dosage of these drugs appropriately according to the degree of kidney damage.

Patients with HF and coexisting CKD are at higher risk of cardiovascular incidents. In the presence of renal impairment or in people over >65 years of age with good baseline renal function after inclusion of RAAS, ARNI, or SGLT2 inhibitors, the initial drop in glomerular filtration pressure may lower eGFR and increase serum creatinine. These changes generally resolve during long-term treatment. An increase in serum creatinine by <50% above baseline (as long as it is <266 µmol/l), or a decrease in eGFR by <10% compared to baseline (as long as it is >25 ml/min/1.73 m^2), may be considered acceptable. Transient deterioration of renal function during initiation of therapy should not lead to its discontinuation, as the new drugs recommended for the treatment of HFrEF (ARNIs, SGLT2 inhibitors) show a nephroprotective effect [77, 78]. ARNI, compared to enalapril, has been shown to reduce the rate of renal function deterioration [79]. A similar benefit has been indicated for the use of SGLT2 inhibitors (dapagliflozin, empagliflozin) compared to placebo, both in patients with HFrEF and those with CKD [77, 80].

With regard to diuretic treatment, small and transient increases in serum creatinine levels during treatment of acute HF are also not associated with a worse prognosis. In patients with very low eGFR, the effectiveness of diuretics (thiazide and loop diuretics) may be reduced. Diuretics should, therefore, be used in properly adjusted doses, as often a similar effect can be achieved with smaller and safer doses.

MONITORING A PATIENT WITH HEART FAILURE — THE ROLE OF TELEMEDICINE

The current ESC guidelines indicate that home telemonitoring of HF patients can be considered to reduce the risk of cardiovascular death, hospitalization, and HF exacerbation [13]. This form of patient care is associated with a 20% reduction in overall mortality and a 37% reduction in HF hospitalization. Telemonitoring turned out to be a particularly valuable tool during the COVID-19 pandemic. Monitored parameters such as symptoms, body weight, heart rate, and BP can be collected and stored in an electronic health record as part of medical record keeping and used to optimize therapy or provide medical advice remotely [75]. Teleconsultation is a relatively new tool in patient care in Poland. Teleconsultation was officially introduced into the National Health Fund's catalog in March 2020 in connection with the COVID-19 pandemic, as procedure no. 89.0099 — medical advice via ICT or communication systems.

The simplest form of teleconsultation is telephone advice, which allows for monitoring of the patient's condition, reminds of the need to take medication, and makes sure the patient is using the appropriate dosage. Telephone advice permits therapy optimization if the physician knows the patient and has seen him/her recently at the medical facility. During the phone call, the patient should be asked about his/her current well-being as well as any recent changes, the presence of peripheral edema, body weight changes, and modifications in treatment. The patient should also provide values of regular home BP and heart rate measurements, as well as the results of previously ordered laboratory tests. During such a telephone consultation, the doctor provides the patient with further recommendations, and may also suggest the need to visit a medical facility in person or, in exceptional urgent cases, to go to the hospital.

Ideally, the first follow-up visit after discharge from hospitalization for HF exacerbation should be a personal visit. However, this was not always possible, especially during the COVID-19 pandemic. If such a visit is to have the form of telephone consultation, then during such a consultation the physician should, first of all:

- assess the patient's general condition and degree of cardiovascular compensation (NYHA class, possible severity of symptoms indicative of decompensation);
- analyze and, if necessary, modify drug treatment;
- continue to educate the patient about HF (including self-management of symptoms) and related lifestyle modification, in which the Heart Failure Patient Passport is a great help;
- define and discuss the essential goals of treatment with the patient again;
- assess the compensation and treatment of comorbidities;
- make an assessment on the need for a personal visit at the office or readmission.

Many implanted therapeutic devices can wirelessly and remotely provide information about the device itself (generator and electrode function), rhythm disturbances, or the patient's clinical data (heart rate, activity, heart tone volume, bioimpedance). There is strong evidence that remote monitoring can detect device malfunctions earlier than conventional monitoring and may be useful in detecting cardiac arrhythmias such as AF. However, there is little evidence that device monitoring reduces HF admissions or mortality.

INPATIENT AND OUTPATIENT CARDIAC REHABILITATION IN PATIENTS WITH HEART FAILURE — THE CHALLENGE OF MODERN TIMES

Numerous clinical studies and meta-analyses classify cardiac rehabilitation with physical training, whose importance has changed over the years, as one of the most important non-pharmacological management options for HF patients [81–84]. Physical training is safe and recommended for HF patients, and the benefits of systematic controlled exercises outweigh the associated risks [85]. However, in patients with advanced HFrEF combined with multimorbidity, a cardiac rehabilitation program based on supervised exercise should be considered [13]. Figure 2 shows a diagram of cardiac rehabilitation dedicated to HF patients, which indicates the various stages of rehabilitation depending on the patient's condition.

TELEREHABILITATION IN HEART FAILURE — OPPORTUNITIES IN THE 21ST CENTURY

HF patients diagnosed with COVID-19 or survivors, i.e. so-called convalescents, are a new challenge in cardiac rehabilitation. The individualized cardiac rehabilitation of these patients depends on both CHF severity, symptoms, and short- and long-term health consequences of COVID-19. Such rehabilitation invariably includes education of the patient and his/her family, as well as physical training (breathing, endurance, resistance exercises, relaxation). It is worth using the modified 10-point Borg dyspnea scale, especially in more severe clinical cases [86, 87]. Following consultation with a physician and analysis of risk factors, a return to recreational low- to moderate-intensity sports can be considered, in parallel, however, with a structured exercise program under specific supervision of a specialist regarding the type and intensity of exercise [13, 85]. Regular physical activity should always be individualized and well monitored as well as tailored to the patient's current needs and lifestyle, taking into account the factors that affect them [82, 88, 89].

It is emphasized that cardiac rehabilitation during the pandemic period should be carried out with the shortest length of stay in a facility in favor of monitored home rehabilitation, using new technologies and telemonitoring [13, 88–90]. In 2021, a consensus of four prestigious arrhythmology societies, the International Society for Holter and Noninvasive Electrocardiology, Heart Rhythm Society, European Heart Rhythm Association, and Asia-Pacific Heart Rhythm Society, was published on ambulatory electrocardiographic telemonitoring, outlining cardiac telerehabilitation as a dedicated procedure for patients with cardiovascular conditions [91]. The COVID-19 pandemic made telerehabilitation sometimes the only possible intervention, so the European Association of Preventive Cardiology was calling for action to widely implement cardiac telerehabilitation during the COVID-19 pandemic as the optimal way to conduct secondary prevention [92].

Hybrid telerehabilitation is one of the possible forms of implementing cardiac rehabilitation programs funded by the National Health Fund. Published data indicate that it is effective, safe, and accepted by patients, resulting in good interactive patient cooperation [93–95]. It also leads to improvement in the quality of life [96]. It may be of particular importance for patients discharged from the hospital. Telerehabilitation should be conducted by a team of trained specialists including a doctor, physiotherapist, nurse, psychologist, and nutritionist. It uses equipment that allows remote monitoring of symptoms, parameters (electrocardiogram, BP, body weight), and control of physical training.

Hybrid telerehabilitation consists of two stages:

- the first preliminary stage is carried out in inpatient or outpatient settings;
- the second basic stage is carried out at home (telemonitored training sessions).

The initial stage is aimed at assessing clinical condition, exercise capacity, education, planning, and conducting several training sessions. If it is carried out in an outpatient clinic, it begins with an initial visit, during which, in addition to standard examinations, the patient has an exercise test, which is the basis for a training plan. Over the following 5 days, the patient participates in educational meetings that include learning how to use the telerehabilitation equipment and exercise techniques, consultations with a nutritionist and psychologist, and lectures on pro-healthy lifestyles, diet, benefits of regular physical activity, and first aid. In the case of implementation of the initial stage during hospitalization, all the procedures described above take place during hospitalization, and after discharge, the patient implements the second stage of telerehabilitation at home. After the telerehabilitation cycle, a follow-up visit is scheduled with an exercise test, and further recommendations are given to the patient [97, 98].

During the pandemic period, to minimize the exposure of medical personnel and patients, a modification of the hybrid telerehabilitation procedure was prepared [99]. It was proposed to shorten the initial outpatient stage to 2 days and conduct further training using audio/video communicators, with the patient already at home. In addition, when the initial stage takes place during hospitalization, it has been proposed that it can be carried out by specialized teams (meeting the requirements for hybrid telerehabilitation outlined in the relevant protocols of the National Health Fund) in each center/department, and not, as is currently the case, only in rehabilitation centers/departments. In addition, in well-defined cases, the authors propose conducting the final visit using only ICT systems [99].

The increasingly common availability of hybrid telerehabilitation in HF provides an opportunity to involve a much larger number of patients in rehabilitation and to reduce regional disparities. Possible modifications make it optimal, and in the case of high-risk patients such as those

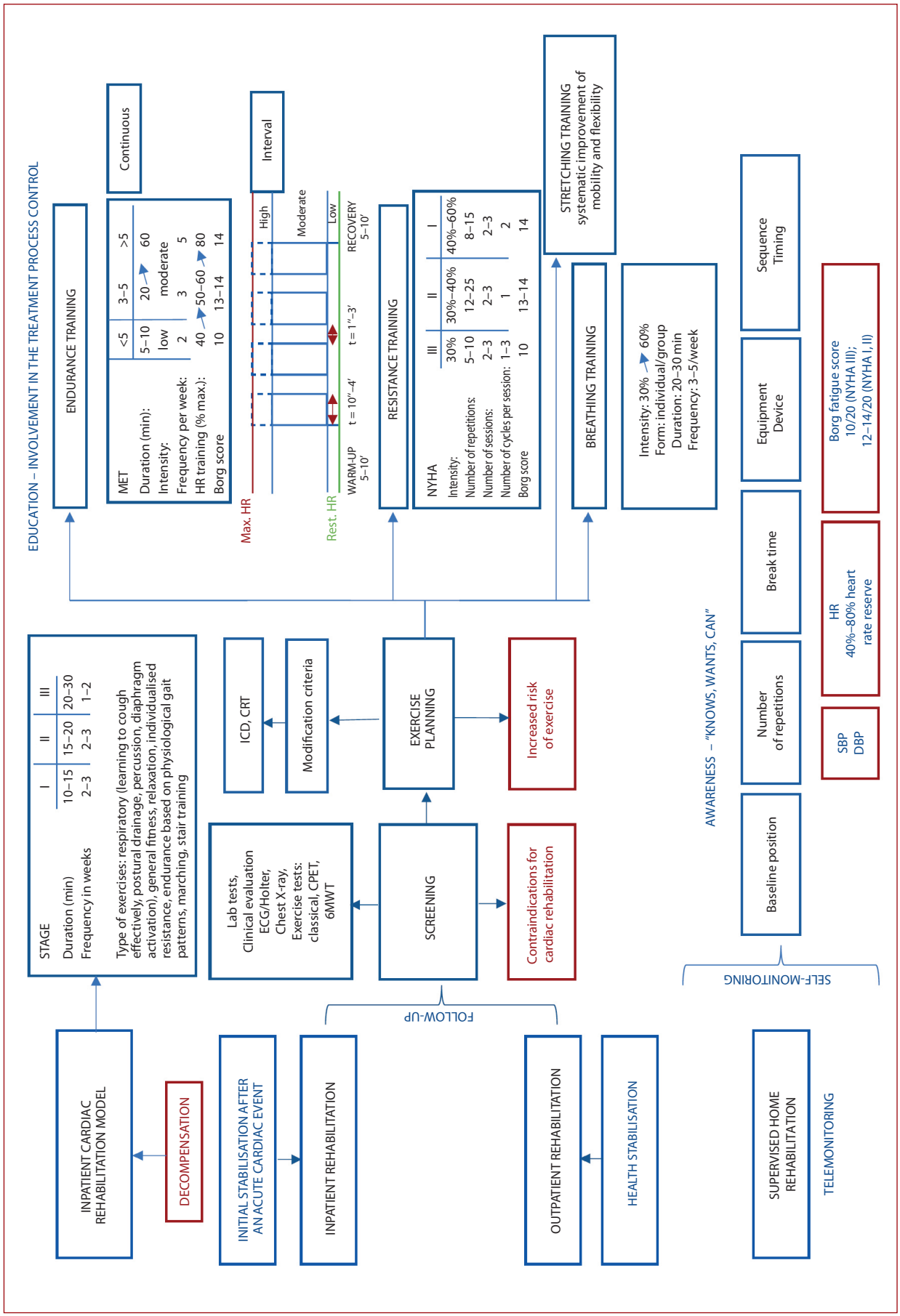

Figure 2. Cardiac rehabilitation scheme in patients with heart failure

Abbreviations: 6MWT, sixminute walk test; CPET, cardiopulmonary exercise test; CRT, cardiac resynchronization therapy; DBP, diastolic blood pressure; HF, heart failure; HR, heart rate; ICD, implantable cardioverter defibrillator; MET, metabolic equivalent; SBP, systolic blood pressure

with HF, it sometimes becomes the only possible form of rehabilitation during infectious disease epidemics.

TASKS AND COMPETENCIES OF THE FAMILY PHYSICIAN IN THE TREATMENT OF PATIENTS WITH HEART FAILURE

A family physician provides medical care for a population of healthy and sick people of all ages who have chosen him or her as a primary care provider. Each family physician cares for an average of 12 to 24 HF patients [100, 101].

The tasks of the family physician in the care of HF patients have been described in detail in numerous international and national management recommendations [101–104]. They emphasize teamwork, including collaboration with an environmental/family nurse and a cardiology specialist. Intersectoral cooperation, especially with social welfare institutions, is also important with regard to the care of a portion of the HF patient population. In the period immediately following the discharge of a patient hospitalized for HF, the most important tasks of the family physician include [102]:

- Optimizing pharmacotherapy implemented in the hospital setting.
- Monitoring relevant clinical parameters and laboratory and imaging results.
- Identifying and treating comorbidities [105].
- Educational activities conducted jointly with the environmental/family nurse for both the patient and his/her caregivers and immediate family members.
- Implementing significant preventive measures and, if necessary, referring the patient for hospital treatment.
- Assistance in solving social problems [101].
- Implementing the immunization program, especially against influenza and *Pneumococcus*. Vaccination against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is also of particular importance owing to the recent pandemic. As already emphasized, the first medical consultation should take place within 1–2 weeks (optimally 7 days) after the patient's discharge from the hospital [101]. An indication for readmission of an HF patient in the peri-discharge period is a significant exacerbation of the disease course.

In terms of pharmacotherapy, it is particularly important to increase the dosage of HF course-modifying drugs (beta-blockers, ACEI/ARB/ARNI, MRAs) to the target or maximum dose tolerated by the patient, and to include new drugs recommended in the guidelines if the patient has not received them before (e.g., SGLT2 inhibitors). Depending on the patient's profile and baseline cardiovascular risk, it is possible to apply different types of interventions to an individual patient with class II drugs (ivabradine, digoxin, ferric carboxymaltose, vericiguat). Family doctors should [104]:

- adjust the selection and dosage of diuretics according to the patient's current clinical condition (assessment of fluid overload, BP);
- periodically monitor renal function (creatinine/eGFR, urea) and electrolyte levels (sodium, potassium) in the HF patient, especially during the period of drug therapy modification;
- decide whether to include other drugs, such as ivabradine and digoxin, in the treatment;
- make decisions about discontinuing/replacing medications that can worsen HF (e.g., glitazones, NSAIDs, calcium antagonists, tricyclic antidepressants) [13].

The decision to reimburse (30% payment) SGLT2 inhibitors (dapagliflozin and empagliflozin) for HF patients as of 1 May 2022 in Poland will certainly increase the availability of this effective treatment. The reimbursement indications include patients with HFrEF (LVEF <40%), regardless of comorbid diabetes, who have persistent symptoms, in NYHA class II–IV despite therapy based on beta-blockers, ACEI/ARB/ARNI and, if such treatment is indicated, MRA [106]. Patients with diabetes and CKD will additionally benefit from the inclusion of SGLT2 inhibitors. Reimbursed treatment with SGLT2 inhibitors can be introduced by any physician in the system caring for an HF patient, not just a cardiologist.

One of the most important considerations for making therapeutic decisions for patients after HF hospitalization is to monitor their body weight, hydration status, and signs of circulatory congestion (including increased sensation of fatigue/dyspnea, lower extremity edema ascites, and auscultatory features of pulmonary congestion), BP, HR, and respiratory rate. These parameters allow not only for the optimization of pharmacotherapy but also deciding on the timing of possible readmission of the patient [13, 103]. Laboratory parameters that may need to be monitored include peripheral blood count, iron deficiency markers, thyrotropic hormone, liver aminotransferases, glucose levels (or glycated hemoglobin), and lipid profile. A laboratory test of great utility is the determination of natriuretic peptide (BNP, NT-proBNP) levels. The listed goals of treatment and tasks related to the care of HF patients in primary healthcare will certainly improve coordinated care introduced to practices of family doctors in Poland. Within the entrusted budget, it is possible to perform an extended panel of diagnostic tests and carry out specialist consultations with the patient, without the need to refer the patient to outpatient specialist care. An HF patient within the framework of coordinated care in primary healthcare should be provided with:

- a comprehensive visit with the development of an individual medical care plan (once a year),
- individual follow-up visits (depending on the clinical condition),
- the possibility of consulting a cardiologist — directly (if the patient's condition requires it) or in the form of a medical consultation using telemedicine techniques (a primary care physician — cardiologist),
- educational advice (nursing and dietary),
- selected additional tests.

These tests include primarily: NT-proBNP, electrocardiographic stress test, transthoracic echocardiography, continuous Holter ECG monitoring, and continuous ambulatory blood pressure monitoring. These tests should be used in HF patient care, depending on indications, clinical assessment made by the family physician, and, in selected cases, also after consultation with a cardiologist. If it is necessary to extend the diagnosis or conduct specialist treatment, the patient, as indicated earlier, should be referred for outpatient specialist care [107].

THE ROLE OF THE NURSE IN CARING FOR HEART FAILURE PATIENTS

The current ESC guidelines invariably point to adherence to self-management as an important element in improving outcomes for HF patients, reducing mortality, and improving quality of life [13]. Therefore, most recommendations for HF management place a strong emphasis on promoting self-management behavior, such as lifestyle modifications and restrictions in fluid intake [108].

Nursing care is considered a very important part of the healthcare system for CHF patients [109, 110]. Nurses should conduct educational activities by identifying access to professional information, promoting patients' health awareness, and thereby empowering them [111, 112].

Many countries have programs in which HF nurses provide continuity of care, working closely with the family physician, cardiologist, patient, and his/her family/caregivers [113, 114]. The role of the nurse focuses on:

- educating the patient about his/her disease (definition, etiology, and risk factors of HF), symptoms that require a medical appointment, and factors that contribute to HF exacerbation;
- taking part in monitoring patient adherence to therapeutic recommendations (drug dosage, options for flexible supply of diuretics);
- providing advice and recommendations on diet, physical activity, fluid intake, recommended vaccinations, and more;
- education on techniques for measuring heart rate, BP, saturation, respiratory rate, and body weight, assessing peripheral edema and feeling of dyspnea, as well as monitoring for any adverse effects of the treatment, pointing out the possibility of modifying doses of certain drugs (primarily diuretics and BP-lowering drugs).

These activities aim to prepare the patient for self-management and self-care. Self-care can be assessed using standardized questionnaires [115–121]. This is of particular importance because, as already mentioned, the reasons for the high mortality rate of cardiac patients after hospital discharge are mainly: inappropriate lifestyle, irregular use of medications or interruption of prescribed pharmacotherapy, lack of control of risk factors, insufficient access to specialized cardiac care after hospitalization, and complications and comorbidities [119].

During the COVID-19 pandemic, the emphasis on social distancing and self-care for HF patients was greater than ever. Hospital stays were associated with higher risk of SARS-CoV-2 infection, and hospitalization for HF carries a poorer long-term prognosis. Medication adherence may be a differentiating factor in this regard. Careful attention to symptoms, as well as daily body weight, can alert patients, their families, and healthcare professionals about the onset of a CHF exacerbation. Introducing appropriate treatment modifications at this early stage of HF deterioration may save some of these patients from subsequent hospitalization. Nurses can play a key role in this process, for example, by maintaining telephone contact with patients, and thus promoting self-care [120].

HEART FAILURE DURING THE COVID-19 PANDEMIC

Due to the COVID-19 pandemic, HF patients faced difficulties in receiving scheduled services for primary and secondary care, in both inpatient and outpatient settings [122, 123]. This affected their safety and made it difficult to exercise proper monitoring. In the vast majority of patients (>80%), SARS-CoV-2 infection is asymptomatic or paucisymptomatic [124–128]. Severe disease develops in about 18% of confirmed cases of SARS-CoV-2 infection [129]. The so-called cytokine storm (3%–4% of patients with viral sepsis) leading to multi-organ failure can be one of the causes of the patient's death [126, 130, 131].

SARS-CoV-2 has high potential to cause multi-organ damage, including cardiac damage, both *de novo* (without prior heart disease), and as increased damage of the already diseased myocardium. Whether it occurs as a CHF exacerbation or develops in patients without prior heart disease, AHF is associated with a very high mortality rate of nearly 50% [132, 133].

Both the burden of cardiovascular disease and cardiovascular involvement in COVID-19 are associated with a worse prognosis, especially in patients over >65 years of age [134–136]. The most common burdens include AH (more than half of patients), obesity, and T2DM [137–140]. Some of the cardiovascular complications are due to inflammation and/or acute myocardial damage due to SARS-CoV-2 infection [122, 141–146], and they include

- thromboembolism;
- AHF *de novo* or as CHF exacerbation;
- Takotsubo syndrome;
- abnormal heart rhythm;
- ACS.

Confirmation of acute myocarditis is often possible with cardiac magnetic resonance imaging [146, 147]. It is noteworthy that in patients with confirmed COVID-19, cases of Takotsubo syndrome have also been reported, mainly affecting women [148, 149]. Cardiac arrhythmias (AF, ventricular tachycardia, and ventricular fibrillation) during hospitalization for COVID-19 have been reported

Table 4. Selected clinical data to help differentiate SARS-CoV-2 infection and HF exacerbation

	COVID-19	HF exacerbation
History of cardiovascular disease	+/–	+
Fever	+	–
Cough	+	+/–
Myalgia	+	–
Leg oedema	–	+
Leukocyte and CRP levels	Lymphocytopenia and increase in CRP, leukocytosis with secondary bacterial infection	Usually unchanged (unless the cause of the exacerbation is an infection)
Elevated NT-proBNP, BNP	In patients with a severe course of COVID-19	+
Troponin concentration	Elevated only in patients with severe COVID-19 and myocardial damage	Usually stably elevated
ECG	Sinus tachycardia (arrhythmia in severe infection)	Tachyarrhythmias (including AF), non-specific ST-segment changes
Echocardiography	Usually normal	Depending on the HF phenotype (reduced global left ventricular contractility, enlarged cardiac cavities, dilated inferior vena cava)
Lung imaging (X-ray, CT)	Subpleural consolidations, "ground glass" opacities, radiographic features of ARDS and diffuse consolidations ("white lung") in stage 4. COVID-19	Congestive changes, pleural fluid, pulmonary oedema in advanced exacerbation of left ventricular failure

Abbreviations: AF, atrial fibrillation; ARDS, acute respiratory distress syndrome; BNP, B type natriuretic peptide; COVID-19, coronavirus disease 2019; CRP, C-reactive protein; CT, computed tomography; ECG, electrocardiogram; HF, heart failure; NT-proBNP, N-terminal pro-B-type natriuretic peptide; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2

in a varying percentage of patients, from 7% of those who did not require intensive care unit care to as many as 44% of patients treated in these units [150–152].

Differentiating symptoms of SARS-CoV-2 infection alone from those of HF exacerbation can be problematic, especially since these conditions can co-occur (145). All available clinical data should be considered (Table 4) [132, 146]. Testing for SARS-CoV-2 should be considered in all HF patients suspected of having COVID-19, even if they have already undergone the infection or have been vaccinated, and those qualified for urgent hospitalization.

SUMMARY — A DECALOGUE OF PRE- AND POST-DISCHARGE RECOMMENDATIONS

The pre- and peri-discharge management of patients with HF and disease exacerbations is a great challenge not only for modern cardiology but also for the many specialists who provide care for these patients. The following are basic recommendations that, if followed, should help manage patients in the peri-discharge period:

1. Consideration of the inpatient course of AHF or exacerbated CHF in pre-discharge management. Determining the etiology, phenotype of HF, and clinical profile of the patient, enables implementation of personalized treatment.
2. Introducing drugs from the four fundamental groups that improve prognosis in HFrEF (beta-blockers, ACEI/ARB/ARNI, MRAs, and SGLT2 inhibitors) if possible before hospital discharge.
3. Careful evaluation of the patient's clinical condition in terms of the level of residual cardiovascular risk and fluid retention (including a decision on the intensity of diuretic treatment) and introduction of drugs from class II recommendations.
4. Recognizing and properly treating comorbidities (including ID).
5. Including, in the discharge letter, a treatment plan with follow-up appointments for a PCP, cardiologist, and other specialists as needed.
6. Continued therapy escalation in outpatient setting according to guidelines after hospital discharge (primarily increasing doses of the primary medications to the maximum tolerated dose in HFrEF treatment: beta-blockers, ACEI/ARB/ARNI, MRAs, inclusion of SGLT2 inhibitors if the patient had not previously received them).
7. Considering the role of cardiac rehabilitation in CHF treatment, both inpatient, outpatient, and hybrid telerehabilitation.
8. Incorporating new effective monitoring methods based on telemedical systems into HF patient care.
9. Continuous education of patients and their families about HF, especially symptoms, treatment, and self-care.
10. Cooperation and proper division of responsibilities during HF patient care among cardiologists, family physicians, nurses, and other specialists.

Modern medicine offers a range of treatment options for HF patients. Their use in this growing group of patients should translate into reduced hospital admissions and mortality as well as improved quality of life.

Article information

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