



How to Implement Recommendations on Multidisciplinary Heart Failure Management Program Into Practice? Lithuanian Experience



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Despite clear guideline recommendation to involve heart failure (HF) patients into multidisciplinary programmes (MP), availability of this specialized care remains insufficient throughout European countries. The aim of this study is to analyse the process of establishment, implementation metrics, and quality indicators (QIs) of heart failure multidisciplinary programme (HF-MP) in Lithuania. We conducted a retrospective analysis of the requisites, steps of initiation and development of HF-MP as a national service reimbursed since 2016. HF-MP is structured as 4 encounters with a specialized HF team during 1 year after HF decompensation. Based on the National Health Insurance Fund (NHIF) administrative data we present the effect of HF-MP intervention on cardiovascular readmissions, survival, and ICD implantations from 2018 to 2022. Aggregated 2018 to 2022 data from the NHIF showed that the odds for 1-year survival were 2.4 to 2.9 times higher in HF-MP cohort compared to usual care (UC), while the chances to survive without readmissions were 1.3 to 1.7 times greater than with UC. Health-related quality of life, index of self-care, and 6-min walk test had improved significantly at the last visit of HF-MP service ($p < 0.001$). In conclusion, sharing practical experience from HF clinics in Sweden and HF recommendations help to transfer HF multidisciplinary programmes to the national Lithuanian context. The effects of the intervention include reduction of morbidity and early mortality as well as improvement of quality of life of patients with heart failure.

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The prevalence of known heart failure (HF) is 1 to 4% in the adult population of the western world¹ and reaches 3.1% in Lithuania.² The rate of HF rehospitalizations in Lithuania remains unacceptably high: among patients admitted to tertiary hospitals with acute HF, 21%, 39% and 54% of them are repeatedly hospitalized within 1, 3, and 6 months, respectively.³ We showed that each rehospitalization increases the risk of death by 3 to 4 times.³ In 2016, approximately 23.6 million euros were spent on inpatient treatment of patients with acute HF in Lithuania, making the disease a massive burden for

the healthcare system. Although it is widely recognized that the best treatment results can be achieved through meticulous guidelines implementation by specialized care teams, however, in many European countries, there is still a shortage of HF multidisciplinary programmes (HF-MP) and HF nurses. Studies performed in different countries and health care systems^{4–10} have proved that the frequency of readmissions decreases when the specialized nursing staff is involved in a multidisciplinary HF-MP after discharge. A systematic review and meta-analysis of randomized controlled trials found that nurse-led interventions contribute to the reduction in hospital readmissions, cost-benefit, higher patient functioning, and improved quality of life (QoL).^{11–13} Based on this evidence, the European

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Society of Cardiology (ESC) highly recommends (recommendation class I, level of evidence A) that HF management be provided in the multidisciplinary program.¹⁴ The aim of this study is to analyse the establishment process, status, and quality indicators (QIs) of HF-MP in Lithuania, as well as to demonstrate its impact on patient survival using administrative data.

Materials and Methods

Study design

We retrospectively analysed the initiation, organization, and delivery of a national HF-MP service in a public healthcare system. We identified 8 requisite steps in the establishment of HF-MP:

1. Gaining experience – meetings and documents of the Heart Failure Association of the ESC and official visit to Linköping University.
2. Development of education programs for HF nurses and HF cardiologists.
3. Compiling the HF-MP service design, indications, and quality indicators.
4. Completing the decree by the Minister of Health.
5. University-based training of HF specialists.
6. Initiation phase of HF-MP service with early adopters.
7. Establishment of HF-MP quality indicators (QIs).
8. Implementation of HF-MP investment project with service expansion.

In Lithuania HF-MP service is specifically designed for patients discharged from the hospital after worsening HF, with ICD-10 (the International Classification of Diseases, Tenth Revision) codes I50, I11.0, I13.0. The HF-MP consists of 4 visits to a specialized HF team within 1 year after HF decompensation (Figure 1).

For the analysis of the effect of the intervention based on hard outcomes, we used only aggregated data from nationwide registries, with no individual data. Hospitalisation, mortality, and outpatient HF-MP encounters data from 1 January 2018 to 31 December 2022 were obtained from the National Health Insurance Fund (NHIF) and Compulsory Insurance Information System SVEIDRA. Data on rehospitalizations included admissions for any cardiovascular reasons (ICD-10 codes I00-I99). Use of implantable cardioverter-defibrillators (ICDs) was identified using the ACHI codes (648, 653); because we only had access to administrative records at the national level, it was not possible to calculate the use of resynchronization therapy due to the lack of ACHI codes. Aggregated data on outcomes were obtained from the NHIF comparing 2 groups of patients: those who underwent specialized HF-MP and patients who received usual care (UC) provided by general practitioners or general cardiologists. Patients referred to hospice or nursing facilities during 1 year after worsening HF (as having a very poor prognosis and not eligible for HF education) and those admitted with acute coronary syndrome (I21-22) or acute cerebrovascular disease (I60-64) (as a reason for admission other than HF) were excluded from the analysis.

Statistical analysis

Pearson's chi-square test was used to analyse the impact of HF-MP on aggregated data of readmissions, survival and ICD implantations. Patient-reported outcomes (assessed with the European Heart Failure Self-Care Questionnaire and Minnesota Quality of Life Questionnaire) and functional capacity assessed with the 6-minute walk test (6MWT) were available at one center of Vilnius University Hospital Santaros Klinikos (VUH SK). The Shapiro-Wilk normality test was used to test the normal distribution of the scores of questionnaires and the 6MWT data. The nonparametric Wilcoxon signed-rank test was used to compare the results of the first and last visits. A p-value < 0.05 was considered statistically significant.

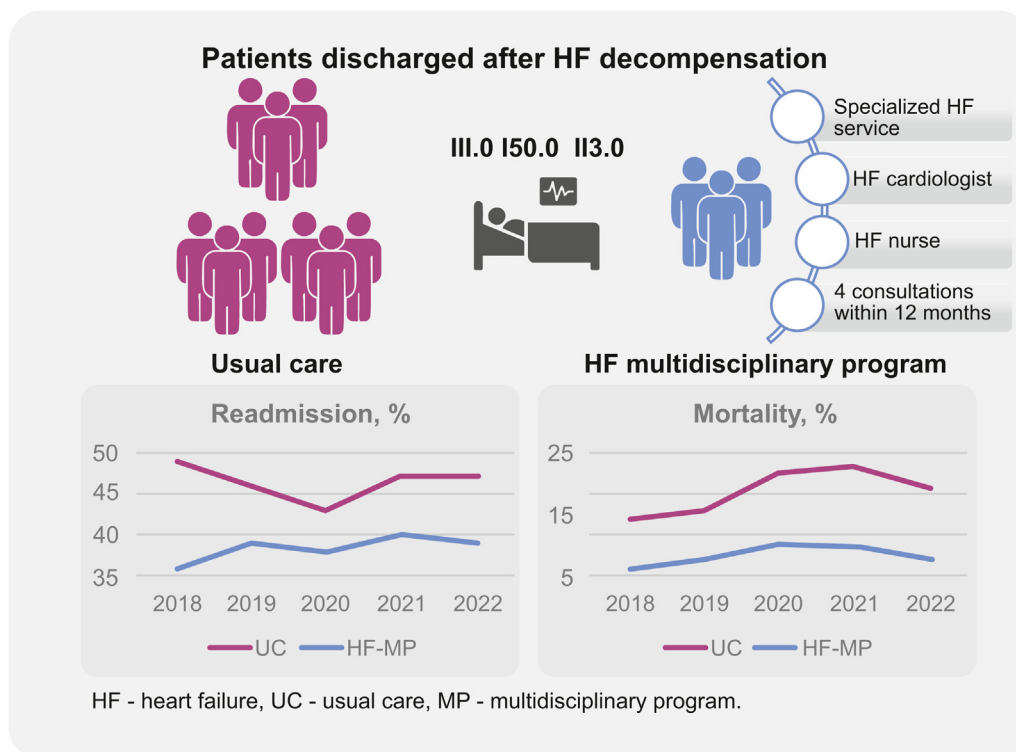


Figure 1. Design and effectiveness of the HF-MP intervention.

Table 1
Actions performed by HF nurses

Patient health status assessment	- Takes medical history - Assesses patient symptoms - Assesses main heart failure signs - Assesses everyday activities (exercise tolerance expressed in METs) - Measures arterial blood pressure, heart rate, weight and waist circumference - Administers and evaluates blood tests - Performs lung ultrasound (for pleural effusion and B lines) and bioimpedance Cardiography.
Patient education	- Interviews the patient and evaluates the patient awareness of heart failure - Assesses patient education needs - Creates a plan of educational sessions - Performs patient and his/her family members education using visual aids and methodical material - Evaluates knowledge and skills acquired in previous education sessions.
Other functions:	- Performs a 6-minute walking test - Reports patient data to HF cardiologist, and discusses the patient condition and helps to draft a plan for further care - Organizes and plans further care.

Results

Gaining experience – meetings and documents of the Heart Failure Association of the ESC, and visit to Linköping University

The Lithuanian Society of Cardiology (LSC) HF working group of the has set a goal to establish a network of HF clinics staffed by

multidisciplinary teams of specially trained medical professionals, in line with the ESC recommendation. The HFA standards of care stipulate that 25% of cardiologists in tertiary care centres should have HF expertise and that each hospital should aim to achieve a rate of 1 HF nurse per 100,000 population.¹⁵ In 2015, in cooperation with the Ministry of Health of the Republic of Lithuania, a delegation of medical professionals headed by the Minister Rimantė Šalasevičiūtė, accompanied by Vilnius University professors Aleksandras Laucevičius and Jelena Čelutkienė, visited the HF Clinic of Linköping University Hospital. This clinic is the first nurse-led HF clinic not only in Sweden, but also in the rest of Europe. Professors Anna Stromberg and Tiny Jaarsma and the HF team at Linköping university hospital shared their knowledge in the organization of nurse-led HF clinics and the role of nurses in HF-MP service.

Development of education programmes for HF nurses and HF cardiologists

Specialised educational programs for cardiologists and nurses were developed by HF experts in Vilnius University (VU) and Lithuanian University of Health Sciences (LUHS). The 288-hour postgraduate course „Specialised Nursing Care of HF Patients” provides nurses with the knowledge they need to work as a team with HF cardiologists to provide evidence-based, high-quality care. This program is based on the HF nurse curriculum,¹⁶ ESC Guidelines for diagnosing and treating acute and chronic heart failure¹⁴ and practical recommendations on self-care management of HF from the Patient Care Committee of the HFA. The role of HF nurses includes patient education, assessment of patient status and treatment effect to participate in subsequent clinical decision making in the management of HF (Table 1).

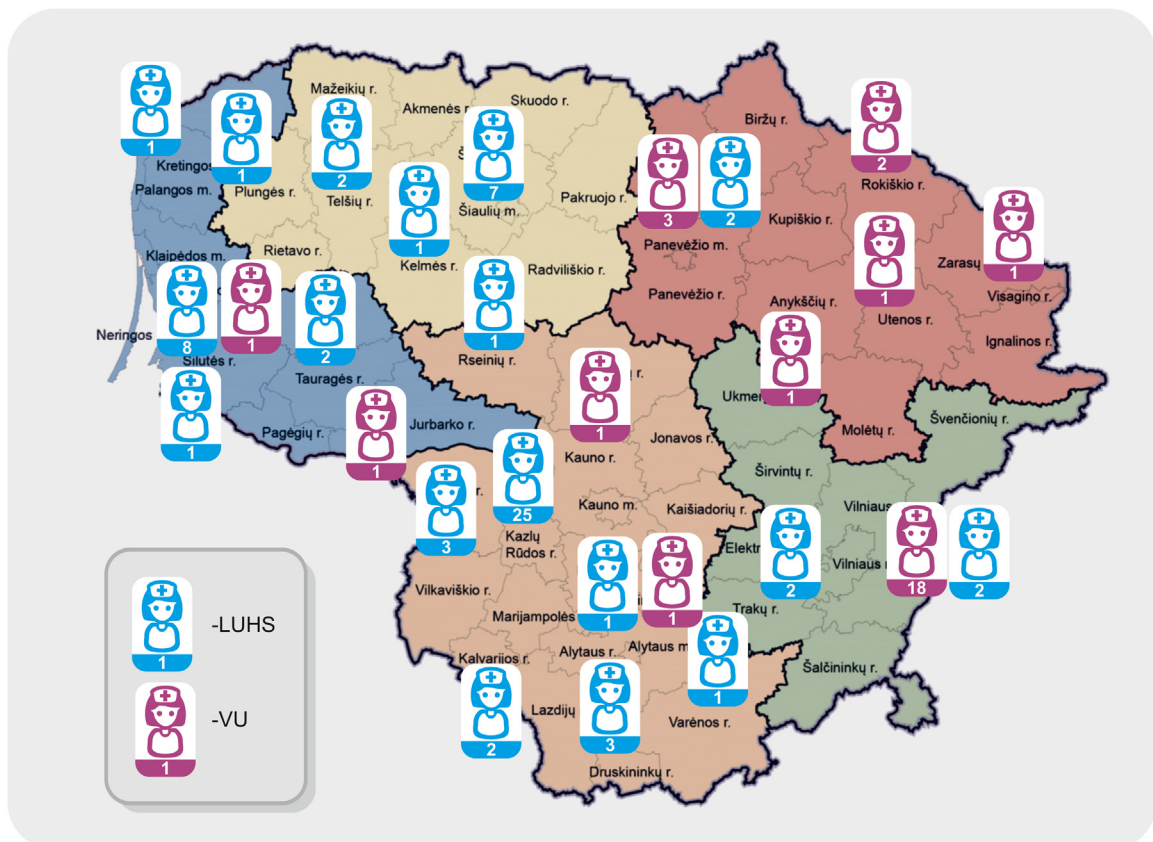


Figure 2. Specialised heart failure nurses who received training at Vilnius University (VU) and at the Lithuanian University of Health Sciences (LUHS) until 2023.

The 72-hour postgraduate program “Heart Failure Diagnostics, Treatment and Outpatient Management” is designed to certify specialized HF cardiologists to develop personalized treatment plans, up-titrate medications and identify indications for nonpharmacological therapies. The regulative order states that certification of HF specialists must be renewed every 5 years.^{17,18}

Compiling the HF-MP service design, indications, and quality indicators

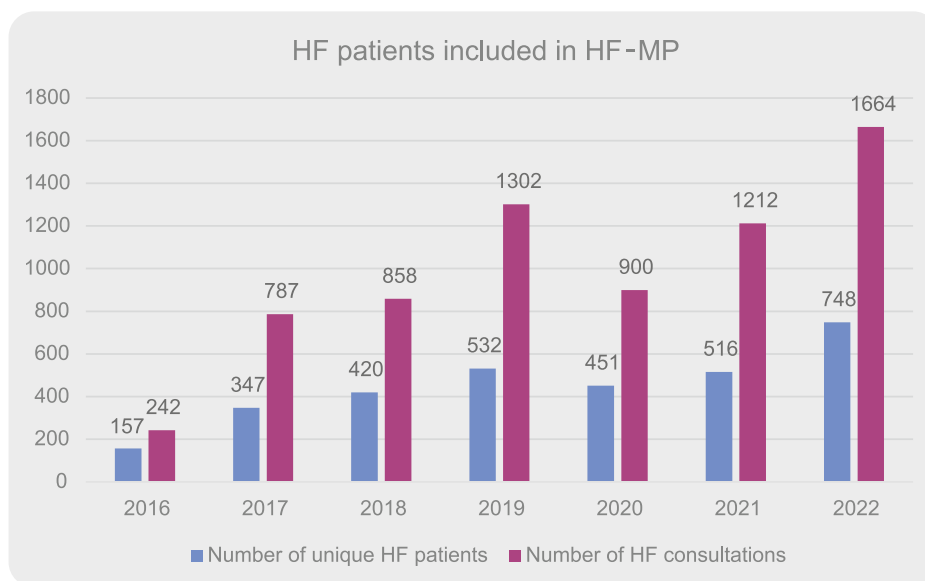
The working group, formed by the Ministry of Health, designed the protocol of the HF-MP service in Lithuania based on ESC HF

guidelines and recommendations. Patients after hospitalisation due to HF decompensation are referred to the specialised HF-MP service by cardiologists, internists, or general practitioners. Patients with HF are offered up to 4 consultation services within 12 months from the most recent inpatient treatment due to HF deterioration.

Completing the decree by the Minister of Health

In 2015, the Minister of Health issued an order “The requirements for provision of specialized care that includes patient education to individuals with heart failure by HF cardiologist and HF nurse,” which

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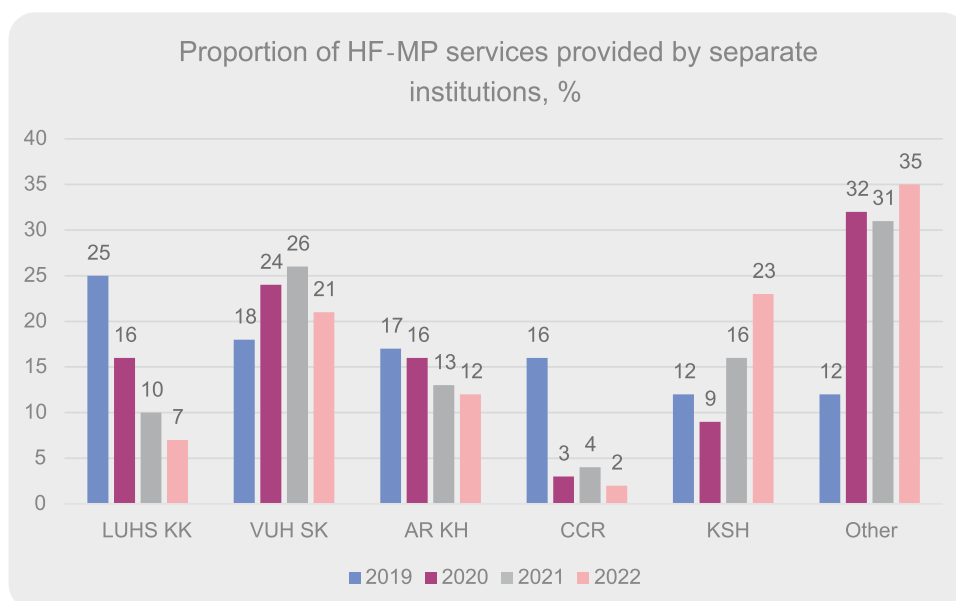


Figure 3. Implementation metrics of heart failure management program (HF-MP) services in Lithuania (2016 to 2022). (A) Number of patients included in HF-MP; (B) proportion of HF-MP services provided by separate institutions. AR KH = Alytus Region S. Kudirkos Hospital; CCR = Clinic of Cardiology and Rehabilitation; HF = heart failure; HF-MP = heart failure management program; KSH = Klaipeda Seamen's Hospital; LUHS KK = Lithuanian University of Health Sciences Kauno Klinikos; VUH SK = Vilnius University Hospital Santaros Klinikos.

Table 2
Indicators of heart failure management group (HF-MP) service availability and quality

No.	Indicator description	Target value of the indicator
1.	Proportion of HF patients who received the service out of all discharged after decompensation HF patients (%)	Observation of service intensity
2.	Patients with HF who did not receive service and died within 12 months from the provision of inpatient services for active treatment, share of all HF patients (%)	Indicator for comparison
3.	In patients with HF who received service 12 – month death rate after HF hospitalization (%)	≤ 7% - outcome measure
4.	Proportion of all patients who did not receive the service and who were re-hospitalized for inpatient active treatment (diagnosis I00–I99) within 12 months after the provision of inpatient services, (%)	Indicator for comparison
5.	The proportion of all patients who received the service and who were re-hospitalized for inpatient active treatment (diagnosis I00–I99) within 12 months after the provision of inpatient services, (%)	≤ 36 %
6.	Proportion of HF patients with implanted defibrillators out of all HF patients who received HF service (%)	≥ 2%
7.	Proportion of all HF patients who received the service and who had been tested for natriuretic peptides at least 2 times, out of all HF patients who received the HF service (%)	≥ 30% - process indicator
8.	Proportion of all HF patients with a self - care score difference improvement of at least 10 in the first and last consultation according to the European Self - Care Questionnaire for Heart Failure (%)	≥ 60% - outcome measure
9.	Proportion of all HF patients who received the service and whose quality-of-life index according to the Minnesota Quality of Life Questionnaire decreased improved by at least 10 points during the first and last consultation, out of all HF patients who received the service (%)	≥ 55% - outcome measure
10.	Proportion of all HF patients who received the service and whose 6-minute walk test result increased by at least 30 meters during between the first and last consultation (%)	≥ 40% - outcome measure
11.	HF patients who received the service timely, within 30 days after hospitalization or diagnosis of HF (for the first time), out of all HF patients who received the service (%)	≥ 40% - process indicator
12.	Proportion of HF patients who received fulfilled services all 4 times visits out of all HF patients who received the service (%)	≥ 30% - process indicator
13.	Number of patients with HF who were provided with a service in one of the HF clinics during one calendar year	≥ 100 patients - process indicator

entered into force at the beginning of 2016.¹⁹ It defines the scope of service, the content of education, requirements for certification of specialists and documentation of visits. Consultation services are financed from the Compulsory Health Insurance Fund budget in accordance with the legislation of the Republic of Lithuania.

University-based training of HF specialists

In 2016 the first 27 cardiologists and 28 nurses completed courses for HF professionals in 2 universities. As of the end of 2023, there were 96 fully trained specialised nurses and 81 HF cardiologists in Lithuania (general country population is about 2.8 million people, Figure 2). The training was based on the ESC guidelines, HFA recommendation documents, knowledge of frequent comorbidities, and theories of adult education.^{16,20,21}

Initiation phase of HF-MP service, early adopters, and implementation metrics

From mid-2016 to the end of 2022, 3,168 patients received specialised HF-MP services, with 12 HF clinics providing 6,965 encounters (Figure 3A). In 2019, the majority (88%) of all consultations were conducted in 5 out of 12 healthcare facilities (Figure 3B). Due to the COVID pandemic, access to healthcare services was limited, resulting in a reduction in the number of HF consultations in 2020. Table 1 shows the proportion of patients involved in HF-MP and rate of survival, readmissions and ICD implantations compared to UC.

Establishment of HF-MP quality indicators

In 2020, following an exploratory analysis of clinical outcomes from initial HF-MP encounters, the Ministry of Health working group developed quality indicators to assess the effectiveness of specialised HF care (Table 2). The QIs included:

1. Process indicators: timing of the first HF-MP visit (target visit within 30 days after discharge), service completeness (all four HF visits within 1 year), and natriuretic peptide testing.
2. Accessibility indicators: nationwide proportion of patients receiving HF-MP and number of patients managed at each HF clinic.
3. Result indicators: 1-year mortality rate, number of CV readmissions, ICD implantations, and improvement in quality of life, self-care skills, and functional capacity.²²

The choice of QIs was limited by the absence of a dedicated HF registry in Lithuania and the lack of systematic data on HF medications and resynchronization therapy; therefore, variables available in

Table 3
Implementation metrics and effect of specialized HF-MP service on readmissions, survival, and ICD implantations in 2018 to 2022 compared with usual care

Year	All patients discharged after AHF, N	Patients involved in HF-MP, N	Patients referred to HF-MP within 30 d., N (%)	Survival without readmissions in HF-MP vs UC, OR (CI)	Overall survival in HF-MP vs UC, OR (CI)	Chance to receive ICD in HF-MP vs UC, OR (CI)
2018	26,993	317	80 (25%)	1.7 (1.4 – 2.1)*	2.6 (1.6 – 4.2)*	19.0 (7.8 – 46.5)*
2019	26,241	336	90 (27%)	1.4 (1.1 – 1.7)**	2.9 (2.8 – 4.6)*	7.8 (2.8 – 21.9)*
2020	19,009	259	61 (24%)	1.3 (1.0 – 1.6)	2.4 (1.6 – 3.6)	n.a.
2021	17,486	368	101 (27%)	1.3 (1.1 – 1.6)***	2.7 (1.9 – 3.8)*	n.a.
2022	20,192	534	181 (34%)	1.4 (1.2 – 1.7)*	2.8 (2 – 3.8)*	n.a.

* p < 0.001.

** p = 0.03.

*** p = 0.035.

Pearson's chi-square test was used to calculate odds ratio (OR); no data were available for ICD in 2020 – 2022.

AHF = acute heart failure; HF-MP = heart failure management program; ICD = implantable cardioverter defibrillator; UC = usual care.

the administrative database were used, supplemented by patient-reported outcomes that were prospectively collected by HF nurses.

The effect of HF-MP intervention

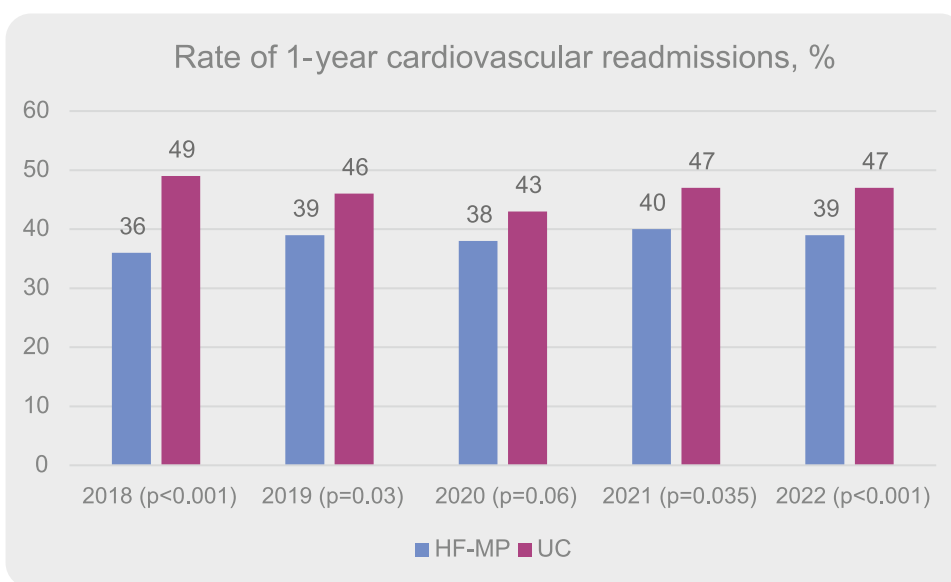
The analysis revealed significantly lower 1-year readmission and mortality rates among patients receiving HF-MP services compared to those receiving UC: the odds for 1-year survival were 2.4 to 2.9 times higher in HF-MP cohort compared to UC, while the chances to survive without readmissions were 1.3 to 1.7 times greater than with UC. (Table 3, Figure 4). Table 4 represents the single-centre

results from VUH SK, showing positive changes in patient-reported outcomes assessed with the European Heart Failure Self-Care Questionnaire and Minnesota Quality of Life Questionnaire, as well as in functional capacity assessed with the 6MWT.

Expanding HF-MP service by means of investment project

Positive quality assessment results have contributed to the expansion of specialized HF-MP services. This was achieved through a public investment program funded by the European Union (EU) for the 2014 to 2020 period, with a total allocation of 2.7 million euros.²³

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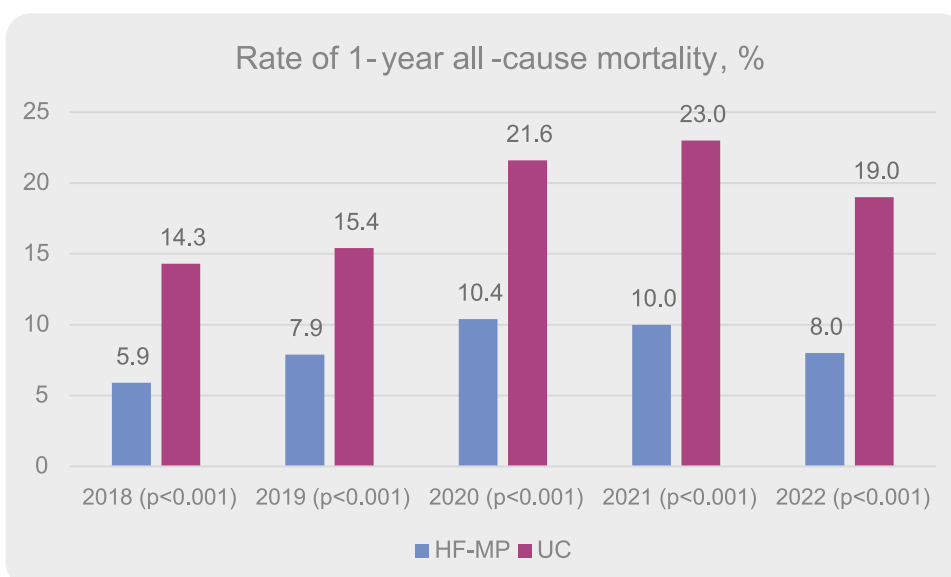


Figure 4. Effectiveness of heart failure management program (HF-MP) intervention: readmission and mortality rates. (A) Readmission rates of patients included in HF-MP compared to patients receiving usual care (UC); (B) mortality rates of patients included in HF-MP compared to patients receiving UC.

Table 4
Dynamics of quality of life score, self-care score, and the 6-minute walk test at VU Hospital Santaros Klinikos (2021 to 2022)

	Year	Number of patients	First visit score, median (Q1;Q3)	Last visit score, median (Q1;Q3)	Average change (SE)	Target value of the indicator	Number of patients with target reached, N (%)
MLHFQ score	2021	67	39 (22;50)	18 (13;32)	–15.0 (1.8)*	≥ 55% improved by ≥ 10 points	37 (55%)
	2022	69	35 (15;52)	15 (9;25)	–16.7 (2.4)*		42 (61%)
EHFScBs score	2021	67	27 (24;35)	17 (15;20)	–11.5 (1.0)*	≥ 60% improvement of ≥ 10	39 (58%)
	2022	69	28 (21;37)	16 (13;20)	–11.6 (1.2)*		38 (55%)
6MWT, m	2021	60	390 (328;470)	420 (355;511)	34.5 (7.4)*	≥ 40% increased by ≥ 30 meters	33 (55%)
	2022	61	390 (330;450)	420 (375;480)	47.3 (5.8)*		41 (67%)

* p value <0.001.

EHFScBs = European Self-care Behaviour scale; MLHFQ = Minnesota Living with Heart Failure Questionnaire; 6 MWT = 6-minute walk test.

The Minister of Health has issued an order to allocate these funds to improve the availability of specialized HF services with the aim of reducing morbidity and early mortality among HF patients. Funded activities included training of HF specialists and the purchase of impedance cardiographers, echocardiographers, and other medical equipment.²⁴ The result of the program was the establishment of 35 specialized HF clinics in Lithuania. Priority was given to regions where the cardiovascular mortality rate exceeds the national average.

Discussion

Despite the ESC guidelines for multidisciplinary care for patients with HF,¹⁴ significant gaps in real-world practice remain, contributing to high rates of hospitalisations and mortality. Patients admitted with HF have a 20% to 30% risk of dying within a year.²⁴ The 2024 American College of Cardiology (ACC) expert consensus decision pathway on patients hospitalized with HF emphasizes the need for continuation of care early after discharge and the critical importance of up-titration of neurohormonal modulation along with education of patients, families, and caregivers.²⁵

The recent multinational STRONG-HF study demonstrated that patient outcomes can be significantly improved by high-intensity care, including an up-titration of treatments to 100% of recommended doses within 2 weeks of discharge and 4 scheduled outpatient visits over the next 2 months. After 180 days, the risk of HF readmission or all-cause death was 8.1% lower in the high-intensity care group than in usual care group (15.2% and 23.2%, respectively).²⁶

However, many European countries lack a structured HF postdischarge management. The independent interdisciplinary Heart Failure Policy Network conducted a comprehensive analysis of national policies regarded to heart failure across 11 European countries: Belgium, Denmark, England, France, Germany, Greece, Ireland, Italy, Poland, Portugal, and Spain. This analysis identifies key gaps in existing policies and shows barriers such as insufficient funding, poor continuity of care and limited access to HF specialists that many European countries face.²⁷ Only 3 of the 11 countries have dedicated strategy on HF, and in the others, the plans may need to be updated, lack funding or may have stalled. Despite evidence that HF nurse-led programs reduce hospital admissions,^{12,13,15} the role of HF nurses is formally accredited only in England, Germany, and Ireland.

In Central and Eastern Europe, only four out of the 11 countries (Czechia, Hungary, Lithuania, and Serbia) have developed national HF strategies. Furthermore, only Hungary and Lithuania have patient pathway programs in place, while most countries in the region lack coordinated care programs that include HF specialists and nursing support. Additionally, these countries do not have long-term national HF registries; instead, they rely on administrative databases.²⁸

Despite EU investment funds aimed at improving access to HF treatment to reduce morbidity and early mortality in the Lithuanian population, this funding did not reach healthcare institutions in a timely manner. The limited interest of politicians and hospital

administrators to such kind of activities along with substantial bureaucracy are the biggest obstacles to the faster development of services. As a result, many Lithuanian institutions that trained specialists did not start providing HF-MP. Still, only a small sample of discharged HF patients undergo encounters with the specialized team in Lithuania. Furthermore, due to the COVID-19 pandemic, the European Union investment action program has come to a near standstill for some time. In addition, the development of the service was negatively affected by such factors as the low initial reimbursement of the service set by the NHIF, high workload, and shortage of nursing staff. Thus, by the end of 2021, there were only 12 HF-MP facilities in 8 cities, with more than half of them providing only a few specialized consultations. Some of HF nurses either do not provide services at all or do that only a small part of their working time. Although slowly, the number of specialized HF consultations in Lithuania is growing. According to regulations adopted by the Ministry of Health in 2020, each institution providing specialized service must consult at least 100 patients per year (meaning 400 consultations in total); in addition, the procedure for referral to HF specialists is simplified by including internists and general practitioners. These measures should increase the availability of services while reducing the number of readmissions.

It is hoped that further investment in the training of specialized HF nurses will allow them to expand their competencies, gain higher professional status and receive a greater financial reward.

Conclusion

A specialized multidisciplinary heart failure management program has been successfully implemented in Lithuania under the guidance of international experts. Although a significant number of specialized heart failure nurses and cardiologists have been trained in recent years, the number of patients receiving specialized services remains quite low in Lithuania. Specialized services for heart failure patients are likely to become more accessible with the help of the European Union-funded investment action program 2014 to 2020.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Jelena Čelutkienė: Writing – review & editing, Supervision, Conceptualization. **Edita Lycholip:** Writing – original draft, Methodology, Data curation. **Greta Burneikaitė:** Writing – original draft, Visualization, Data curation. **Laura Kalakauskaitė:** Writing – review & editing, Formal analysis. **Gintarė Karaliūtė:** Writing – review & editing, Formal analysis. **Daiva Kriukelytė:** Data curation. **Jūratė Barysienė:** Conceptualization. **Gitana Zuoženė:** Conceptualization.

Diana Žaliaduonytė: Methodology, Data curation. **Aušra Kavoliūnienė:** Methodology, Data curation. **Roma Puraonaitė:** Formal analysis, Data curation. **Vaida Morkvėnienė:** Data curation. **Algimantas Girčys:** Data curation. **Lukas Žilinskas:** Data curation. **Anna Stromberg:** Visualization, Investigation, Conceptualization. **Tiny Jaarsma:** Visualization, Investigation, Conceptualization.

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