https://russjcardiol.elpub.ru
doi:10.15829/1560-4071-2020-4-3792

ISSN 1560-4071 (print)
ISSN 2618-7620 (online)

Implemented models and elements for heart failure care in the regions of the Russian Federation: prospects for transformation into regional cardiovascular risk management systems

Shlyakhto E. V.[1], Zvartau N. E.[1], Villevalde S. V.[1], Yakovlev A. N.[1], Soloveva A. E.[1], Avdonina N. G.[1], Medvedeva E. A.[1], Endubaeva G. V.[1], Karlina V. A.[1], Solovev A. E.[1], Fedorenko A. A.[1], Vinogradova N. G.[2,3], Fomin I. V.[2], Rogozina N. P.[3], Shlosberg Zh. A.[4], Moiseeva O. M.[1], Sitnikova M. Yu.[1]

The high and growing incidence and mortality of patients with heart failure (HF) should receive priority attention when developing an action plan to reduce cardiovascular mortality in the Russian Federation. The article provides an analysis of the implemented elements of HF care in 40 Russian regions (Northwestern, North Caucasian, Volga, Southern Federal districts), some of the best practices, as well as prospects for implementation of the cardiovascular risk management system.

Key words: heart failure, health care models, transitional care.

Relationships and Activities: not.

[1]Almazov National Medical Research Center, Saint Petersburg; [2]Privolzhsky Research Medical University, Nizhny Novgorod; [3]Heart Failure Therapy Center, City Clinical Hospital № 38, Nizhny Novgorod; [4]Committee on Healthcare of the Pskov Region, Pskov; [5]Pskov city hospital, Pskov, Russia.

Shlyakhto E. V. ORCID: 0000-0003-2929-0980, Zvartau N. E.* ORCID: 0000-0001-6533-5950, Villevalde S. V. ORCID: 0000-0001-7652-2962, Yakovlev A. N. ORCID: 0000-0001-5656-3978, Soloveva A. E. ORCID: 0000-0002-0013-0660, Avdonina N. G. ORCID: 0000-0001-9871-3452, Medvedeva E. A. ORCID: 0000-0002-5130-5192, Endubaeva G. V. ORCID: 0000-0001-8514-6436, Karlina V. A. ORCID: 0000-0001-9912-7789, Solovev A. E. ORCID: 0000-0003-2378-9940, Fedorenko A. A. ORCID: 0000-0002-9836-7841, Vinogradova N. G. ORCID: 0000-0002-3391-7937, Fomin I. V. ORCID: 0000-0003-0258-5279, Rogozina N. P., Shlosberg Zh. A. ORCID: 0000-0002-2288-0104, Moiseeva O. M. ORCID: 0000-0002-7817-3847, Sitnikova M. Yu. ORCID: 0000-0002-0139-5177.

*Corresponding author:
zvartau_ne@almazovcentre.ru

Received: 13.03.2020
Revision Received: 19.03.2020
Accepted: 26.03.2020

For citation: Shlyakhto E. V., Zvartau N. E., Villevalde S. V., Yakovlev A. N., Soloveva A. E., Avdonina N. G., Medvedeva E. A., Endubaeva G. V., Karlina V. A., Solovev A. E., Fedorenko A. A., Vinogradova N. G., Fomin I. V., Rogozina N. P., Shlosberg Zh. A., Moiseeva O. M., Sitnikova M. Yu. Implemented models and elements for heart failure care in the regions of the Russian Federation: prospects for transformation into regional cardiovascular risk management systems. *Russian Journal of Cardiology*. 2020;25(4):3792. (In Russ.)
doi:10.15829/1560-4071-2020-4-3792

Heart failure is a targeted group for programs aimed at reducing cardiovascular mortality

The implantation of effective methods for treating cardiovascular diseases (CVD) contributed to an increase in the life expectancy of patients, but also specified the rapid increase in the prevalence of heart failure (HF). The global demographic transition towards an aging population [1] and poor control of cardiovascular risk factors [2] also contribute to an increase in HF prevalence [3]. In the Russian Federation (RF), the number of HF patients doubled between 1998 and 2014, mainly at the expense of class III-IV cases, and the HF prevalence reached 8,8% [4]. At the same time, despite the availability of effective pharmaceutic and hardware treatment methods, the prognosis of HF patients remains unfavorable. An increase in age and comorbidity in HF, health-seeking behavior of these patients, the risk of recurrent events and death make HF patients "super heavy users" for the healthcare system, who requires expensive medical care. Social and economic losses emphasize the need for priority attention to the HF problem when developing an action plan to reduce the global burden of CVDs around the world [5].

The main directions and necessary elements to improve the quality of HF health care

Despite the high validity and positive effect on hard endpoints demonstrated in a number of cases, the effectiveness of introducing certain healthcare elements for HF remains controversial. Most of them cannot be translated into routine clinical practice, and its isolated use may not lead to the expected result.

Of crucial significance is the providing a "seamless" system of care for HF patients [6] — with information exchange between institutions, ensuring timely medical examination after discharge, widespread use of rehabilitation and palliative care. Interdisciplinary programs for comorbid patients have been validated, since all-cause rehospitalizations may constitute a significant proportion [7]. A recent analysis demonstrated the cost-effectiveness of using transitional care services (disease management clinics, nurse home visits, and nurse case management) for HF patients over 75 years of age compared with the standard approach [8]. These data emphasize that transitional care should be the standard to improve outcomes after discharge, especially for older patients with HF.

The results of a three-year follow-up of patients included in the Russian Hospital Heart Failure Registry (RUS-HFR) [9] demonstrated that the management of patients in multidisciplinary centers with specialized departments of HF and further follow-up by HF specialists is characterized by a higher frequency of prescribing optimal drug therapy and the use of high-tech treatments that are associated with improved outcomes.

The need for timely diagnosing the impairment to prevent hospitalizations due to decompensated HF makes telemedicine useful for remote monitoring of patients. The effect of telemetry on mortality and rehospitalizations due to HF was not demonstrated in all observational and randomized trials and their meta-analyzes [10]. Improving compliance and monitoring effectiveness can be achieved using a mobile application [11]. Optimization of HF therapy based on measuring pulmonary artery pressure by the CardioMems led to a reduction of HF hospitalizations and mortality, with a low rates of complications and device defects [12]. However, the high cost and invasiveness significantly limit its use in widespread practice. An increase in the number of telemedicine consultations between primary care physicians and specialists can significantly improve the quality of healthcare for complicated and non-standard cases of HF and become the basis for a "team" approach in the treatment of this patient cohort.

The multidisciplinary approach necessary for the effective control of HF morbidity and mortality can be implemented as part of cardiovascular risk management system (Figure 1) [13]. Cardiovascular risk management system is a constantly changing, adapting and improving list of rules and measures for identifying, assessing and responding to risks, as well as monitoring and controlling their level in each region and across the country as a whole.

Implemented regional models and elements of HF healthcare system

An analysis of HF healthcare systems in 40 federal subjects of Russia (Northwestern, North Caucasian, Volga, Southern Federal Districts) showed that approaches of improving care for HF patients and reducing associated risk vary significantly between regions (Figure 2). The most widely used specialized strategies for HF are 'patient schools'. We present the best practices of organizing care for HF patients in federal subjects of Russia.

Providing secondary care to HF patients in the Nizhny Novgorod Oblast. On March 04, 2016, the City Center for HF Treatment was formed in Nizhny Novgorod on the basis of City Clinical

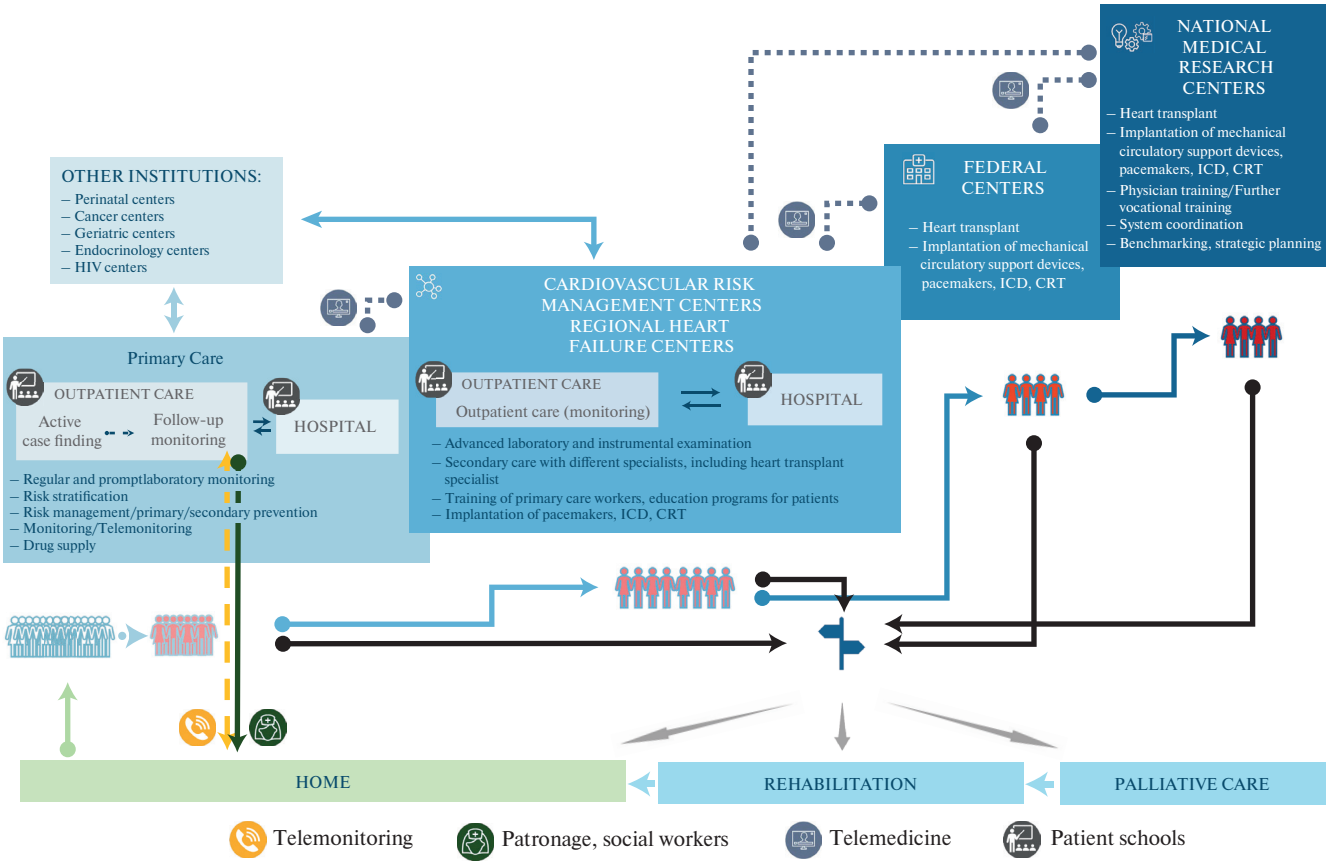

Figure 1. Cardiovascular risk management system for a population of patients with heart failure.
Abbreviations: ICD — implantable cardioverter-defibrillator, CRT — cardiac resynchronization therapy.

Hospital №38. Patients with acute decompensated HF (ADHF) are daily admitted with hemodynamic instability and the need for intravenous loop diuretics. Hospitalization of patients is carried out by ambulance teams or after outpatient visit to City Center for HF Treatment. The hospital includes a cardiology department (30 beds), an intensive care unit (6 beds), a consultation room for HF patients, designed for 400 outpatient visits per month (Figure 3).

The principle of "seamless" outpatient care for HF patients after discharge is implemented in the City Center for HF Treatment. In the hospital, diuretic therapy, drug titration, an education program for HF patients, and physical rehabilitation are performed. Patients master self-monitoring diaries of weight, urine output, blood pressure, pulse, and nutrition. At discharge, patients are recommended to continue monitoring in consultation room for drug titration, treatment of comorbidities, rehabilitation, receiving information and education. Patients who did not agree to follow-up at City Center for HF Treatment are monitored in local health facilities. Re-examination is carried out 1-2 weeks after discharge, depending on the severity, then according to an individual plan once every 1-3 months. Outpatient consultations with a cardiologist are completed by nursing monitoring (phone calls once a month) and interventions (change of lifestyle and adherence to treatment, adjustment of vitamin K antagonist and loop diuretics doses). A registry of patients hospitalized with ADHF was created.

Already after 6 months of follow-up, all-cause mortality was higher in the group of patients monitored in local health facilities compared with those monitored in City Center for HF Treatment: 13,7% versus 1,2%, odds ratio (OR) 12,6, 95% confidence interval (CI) 3,5-45,0; p<0,001 [14].

The high prevalence of atrial fibrillation in HF patients has led to a need for a monitoring of anticoagulant therapy by specialists of consultation room. It was shown that the actual effectiveness of warfarin use in HF patients was 12,6%, which is significantly lower than the values calculated by SAMe-TT_2R_2 score, and the outcomes were worse in patients without anticoagulant therapy. All-

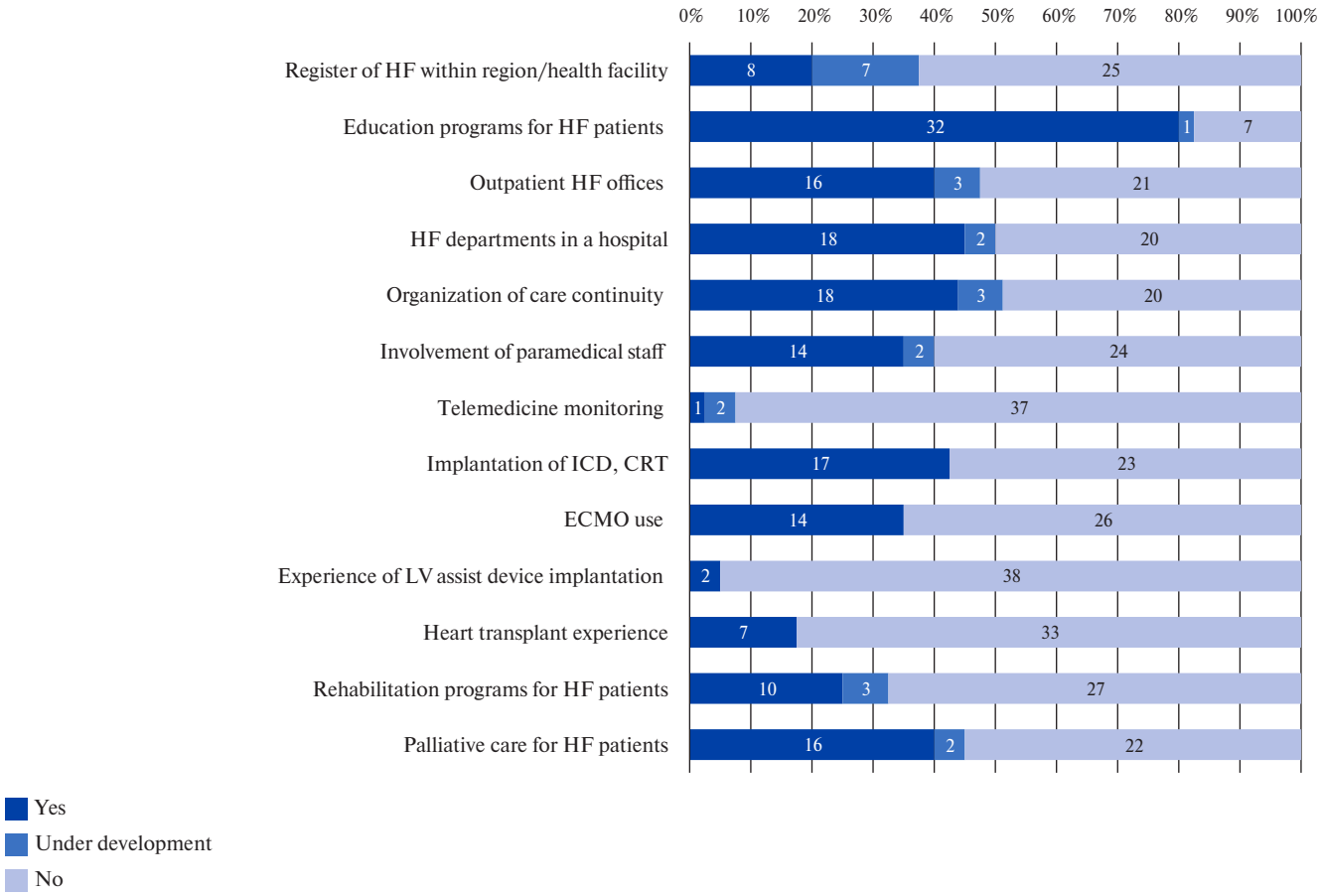

Figure 2. Implemented and expected elements of heart failure care in 40 subjects of the Russian Federation.
Abbreviations: HF — heart failure, CRT — cardiac resynchronization therapy, ICD — implantable cardioverter defibrillator, ECMO — extracorporeal membrane oxygenation, LV — left ventricle.

cause mortality in patients without anticoagulant therapy was higher in comparison with patients receiving anticoagulants (OR 2,4, 95% CI 1,0-5,7; p=0,03) [15].

After 1 year, 38,6% of patients monitored in City Center for HF Treatment stopped visiting, on the contrary, 11,3% of patients monitored in local health facilities started regular visiting the consultation room during the second year of follow-up. The entire sample of patients (n=942) was divided into 4 groups: group 1 (n=313) — patients who were constantly monitored in City Center for HF Treatment for two years (at least 4 consultations per year); group 2 (n=383) — patients who never monitored in City Center for HF Treatment after discharge, group 3 (n=197) — patients who were monitored in City Center for HF Treatment only during the first year, group 4 (n=49) — patients who refused to be monitored after discharge, but changed the decision at the second year. All-cause mortality over 2 years of follow-up was higher in group 2 compared with group 1 (32,4% versus 11,2%, OR 3,8, 95% CI 2,5-5,7; p<0,001), as well as compared with groups 3 and 4. The survival curves depending on the adherence to monitoring are shown in Figure 4 [16].

Thus, patients who were constantly monitored in City Center for HF Treatment were characterized by a lower risk of all-cause mortality compared with patients monitored in local health facilities. These data indicate the high efficiency of the selected monitoring model for HF patients after hospitalization with ADHF in actual clinical practice.

In 2019, based on the data obtained in the Nizhny Novgorod Oblast, a regional program Combating Cardiovascular Diseases was developed, and on December 31, 2019, an order was issued by the Ministry of Health of the Nizhny Novgorod Oblast On opening interdistrict cardiology offices with the function of HF care center

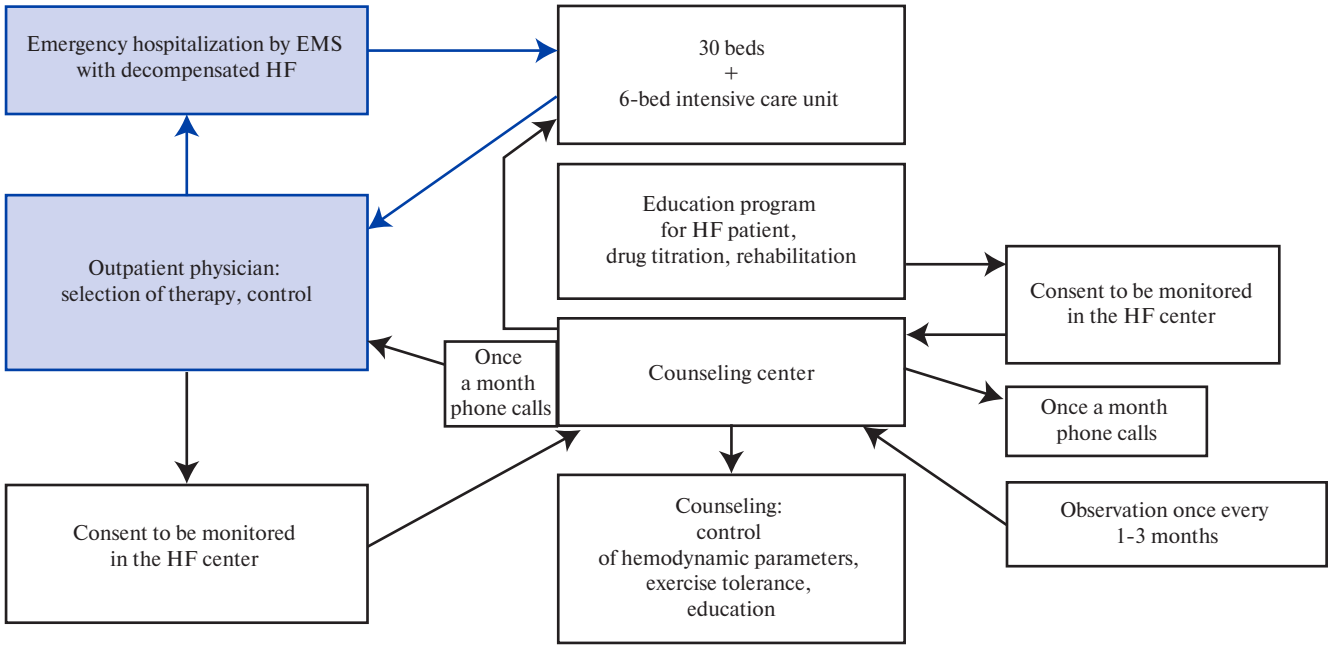

Figure 3. The structure of the City Center for HF Treatment in Nizhny Novgorod.

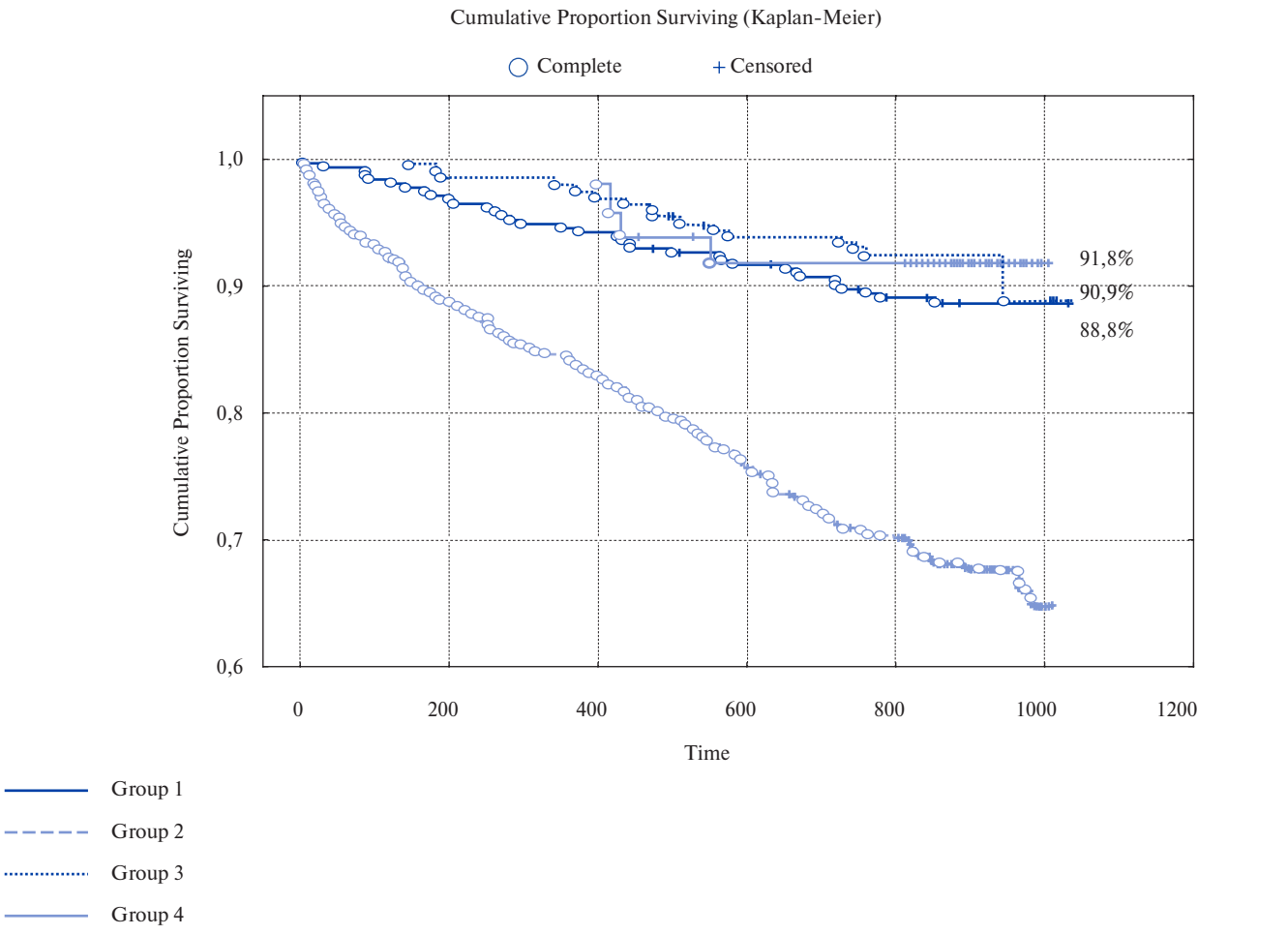

Figure 4. Kaplan-Mayer survival curves depending on patient adherence to monitoring in City Center for HF Treatment.

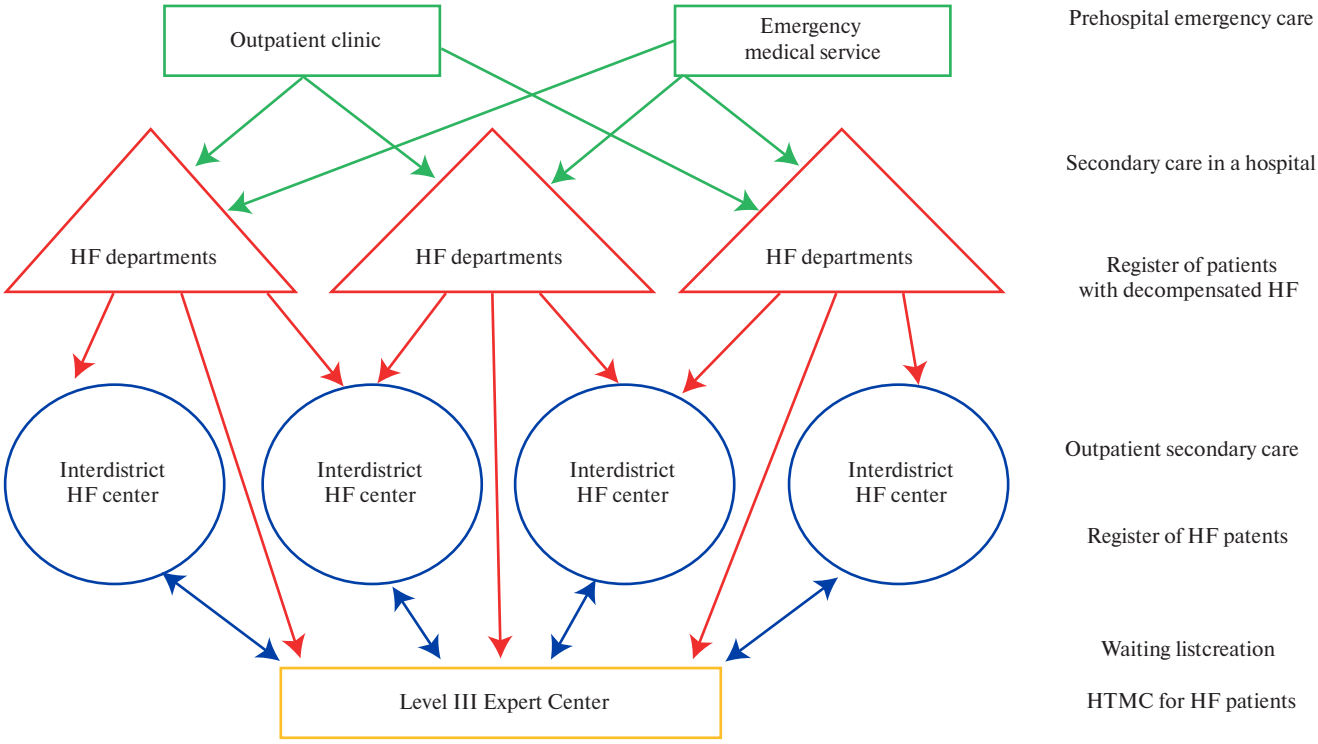

Figure 5. The structure of secondary care for HF patients in the Nizhny Novgorod Oblast.

and level I anticoagulant office. At the moment, there are 3 such cardiology offices. The structure of secondary care for HF patients in the Nizhny Novgorod Oblast is presented in Figure 5.

Heart Failure Center in Pskov Oblast

In 2017, on the basis of the Pskov City Hospital, HF Center was created, which includes a Cardiologist office for HF patients, a "Heart Sufficiency School" office, a nursing service for HF patients, and cardiology department with an intensive care unit (10-12 beds).

The functions of cardiologist office are the follow-up of NYHA class IV and III (in case of hemodynamic instability) HF patients, selection and referral of them to hospitalization in the cardiology department, as well as to provide high-tech healthcare (cardiac resynchronization therapy, heart transplant). Referral of HF patients to the office is carried out by cardiology department specialists at the discharge or by physicians of other medical organizations in Pskov. If a cardiologist in office decide to include a patient in the monitoring group, the relevant information is transmitted to the referring medical organization; therapy and future visits are planned by an office cardiologist. If a patient is not included in the monitoring group, a consultation summary report with recommendations is given.

"**Heart Sufficiency School**" operates both in the consultative and diagnostic department (for patients receiving primary care), and in the cardiology department with an intensive care unit. By agreement, it is possible to conduct classes in other medical organizations of Pskov. The main functions of this education program are conducting classes with HF patients and their relatives caring for patients, providing reading materials (guidelines, memos, patient diaries), increasing adherence to the treatment, and teaching self-care skills. The selection criteria for referral are established by the physician (patients with class I-III HF, having questions for doctors, those with low adherence to treatment, etc.).

The Nursing Service was created to monitor the condition of HF patients. Monitoring is carried out by telephone in a timely manner (in the first month after discharge — weekly; then, in case of stable condition — once a month). During telephone conversation, using the standardized questionnaire, the patient condition is assessed. When symptoms of state deterioration appear, a nurse informs physician for a decision making. There are following solution options: invitation of a patient for therapy change; release of information to the local health facilities for a visit by a physician; calling an ambulance for emergency hospitalization.

To provide **secondary care** in the cardiology department with the intensive care unit, 10-12 beds for the treatment of HF patients are provided.

Indications for hospitalization are:

— decompensated HF of ischemic and non-ischemic nature with an ejection fraction <35% or class III-IV HF in patients receiving angiotensin converting enzyme inhibitors, beta-blockers, mineralocorticoid receptor antagonists, loop diuretics;

— decompensated HF in patients with low adherence to treatment;

— class III-IV HF in patients first hospitalized with this diagnosis;

— acute non-ischemic HF (cardiac asthma, pulmonary edema, cardiovascular collapse). Acute ischemic HF (pulmonary edema, cardiogenic shock with acute coronary syndrome) is an indication for hospitalization in a regional cardiovascular center.

A patient is referred for emergency hospitalization directly by a health professional who has established the indications (ambulance paramedic or doctor, outpatient clinic paramedic, general practitioner, cardiologist of a medical organization).

Currently, about 400 patients are included in the monitoring program.

Pilot project: Improving care for heart failure patients in Saint Petersburg

Since 2017, a HF project has been implemented in St. Petersburg on the basis of value-based medicine, which involves the creation and implementation of new approaches to managing the disease using the methodology of clinical pathways, patient routing optimization, training doctors, organizing patient education programs, and implementing a systematic data collection to monitor the effectiveness.

At the initiation phase, 3 hospitals of St. Petersburg and nearby outpatient facilities took part in the project. At the project preparation, the current data on hospitalization structure, the quality of in- and outpatient care for HF patients were assessed [17]. To assess the continuity, the database of the territorial compulsory medical insurance fund was analyzed (information on rehospitalizations, outpatient visits and emergency calls after the hospital discharge). Inpatient care was characterized by the absence of necessary diagnostics (36%), non-administration or insufficient titration of recommended drugs (23%), insufficient description of recommendations on the continuation of outpatient care (34%). After discharge from the hospital, delayed help-seeking (<30% of patients visit outpatient facilities within 10 days after discharge), insufficient continuity of in- and outpatient facilities regarding the therapy retention, non-continuation drug titration, low awareness of patients about early signs of decompensation symptoms for daily monitoring.

The next step was the development and implementation of a monitoring system for HF patients, covering all stages of care and ensuring continuity between them. Quality-of-care criteria were developed. Management templates for HF patients have been introduced in health information systems (HIS). Experts of the Almazov National Medical Research Center has developed a special discharge summary and outpatient medical certificate for HF patients, the data of which are stored in HIS and transferred in the regional integrated electronic health record. At the same time, a specialist operating in HIS fills in the standard documentation, into which the results of diagnostic tests are automatically added. Based on the data obtained from the health records, a HF registry was created. It allows to unload data on patients with a certain diagnosis in real time, quickly monitor the implementation of the project and evaluate the quality of care.

An important aim of the project is also to compare the effectiveness of different outpatient monitoring models for HF patients. The results can be the basis for changes in ambulatory care of HF patients.

In order to train specialists working in accordance with a particular model, additional educational measures were conducted to raise the awareness about modern approaches and recommendations for management of HF. In 2018-2019, 7 education programs and 26 grand rounds for specialists of medical organizations participating in the project were conducted on the basis of Almazov National Medical Research Center. An algorithm for HF diagnosis has been developed. Education programs for HF patients have been introduced into the daily practice of in- and outpatient facilities. Patients brochures “Diary of a patient with heart failure”, “5 rules of a patient with heart failure” have been developed.

One of the project directions is the introduction of a remote monitoring system for HF patients with creation of a service for analyzing its effectiveness. Currently, work is in progress to increase the number of St. Petersburg medical organizations involved in the project.

Conclusion

The absence or insufficient implementation of elements for HF care can prevent the achieve-

ment of the necessary rate of cardiovascular mortality reduction, established by the Federal project. It is necessary to recognize the socio-economic importance of HF, create a register of HF patients, timely identify such patients and use a multidisciplinary approach for their management. The creation of a cardiovascular risk management system ensuring the continuity of care, timely referral of patients to a specialized facility, the availability of high-tech treatments, rehabilitation and palliative care programs should become the basis for the progressive development of regional healthcare systems to decline the burden of HF and CVD in general.

Relationships and Activities: not.

References

1. Beard J, Officer A, Cassels A. World report on ageing and health, World Health Organization, Geneva (2015) http://www.who.int/ageing/publications/world-report-2015/en/(accessed Feb 19, 2020).
2. Yusuf S, Joseph P, Rangarajan S, et al. Modifiable risk factors, cardiovascular disease, and mortality in 155 722 individuals from 21 high-income, middle-income, and low-income countries (PURE): a prospective cohort study. Lancet. 2019 Sep 3. pii:S0140-6736(19)32008-2. doi:10.1016/S0140-6736(19)32008-2.
3. Ziaeian B, Fonarow GC. Epidemiology and aetiology of heart failure. Nat Rev Cardiol. 2016 Jun;13(6):368-78. doi:10.1038/nrcardio.2016.25.
4. Mareev VYu, Fomin IV, Ageev FT, et al. Russian Heart Failure Society, Russian Society of Cardiology. Russian Scientific Medical Society of Internal Medicine Guidelines for Heart failure: chronic (CHF) and acute decompensated (ADHF). Diagnosis, prevention and treatment. Kardiologiia. 2018;58(6S). (In Russ.) doi:10.18087/cardio. 2475.
5. Ferreira JP, Kraus S, Mitchell S, et al. World Heart Federation Roadmap for Heart Failure. Glob Heart. 2019 Sep;14(3):197-214. doi:10.1016/j.gheart.2019.07.004.
6. Ponikowski P, Voors AA, Anker SD, et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur J Heart Fail. 2016;18(8):891-975. doi:10.1002/ejhf.592.
7. Fudim M, O'Connor CM, Dunning A, et al. Aetiology, timing and clinical predictors of early vs. late readmission following index hospitalization for acute heart failure: insights from ASCEND-HF. Eur J Heart Fail. 2018 Feb;20(2):304-14. doi:10.1002/ejhf.1020.
8. Blum MR, Øien H, Carmichael HL, et al. Cost-effectiveness of transitional care services after hospitalization with heart failure" Ann Intern Med 2020; doi:10.7326/M19-1980.
9. Sitnikova MYu, Lyasnikova EA, Yurchenko AV, et al. Results of 3 years work of the Russian hospital register of chronic heart failure (RUssian hoSpital Heart Failure Registry — RUS-HFR): relationship between management and outcomes in patients with chronic heart failure. Kardiologiia. 2018;58(S10):9-19. (In Russ.) doi:10.18087/cardio.2483.
10. Mareev YuV, Zinchenko AO, Myasnikov RP, et al. Telemonitoring in patients with chronic heart failure. Kardiologiia. 2019;59(9S):4-15. (In Russ.)
11. Grebennikova AA, Stoliarov AU, Lopatin YuM. The use of platform for remote monitoring on the base of mobile app for improving self-care in patients with chronic heart failure. Kardiologiia. 2017;57(S4):11-8. (In Russ.) doi:10.18087/cardio.2413.
12. Veenis JF, Brugts JJ. Remote monitoring of chronic heart failure patients: invasive versus non-invasive tools for optimising patient management. Neth Heart J. 2020 Jan;28(1):3-13. doi:10.1007/s12471-019-01342-8.
13. Shlyakhto EV, Zvartau NE, Villevalde SV, et al. Cardiovascular risk management system: prerequisites for developing, organization principles, target groups. Russian Journal of Cardiology. 2019;24(11):69-82. (In Russ.) doi:10.15829/1560-4071-2019-11-69-82.
14. Vinogradova NG, Zhirkova MM, Polyakov DS, et al. Anticoagulant therapy and prognosis in patients with CHF and AF in the setting of real-life clinical practice. Kardiologiia. 2017;57(4S):4-10. (In Russ.) doi:10.18087/cardio.2430.
15. Vinogradova NG. Effectiveness of specialized medical care in pa tients with chronic heart failure. Russian Heart Failure Journal. 2017;18(2):122-32. (In Russ.)
16. Vinogradova NG. The prognosis of patients with chronic heart failure, depending on adherence to observation in a specialized heart failure treatment center. Kardiologiia. 2019;59(S10):13-21. (In Russ.) doi:10.18087/cardio.n613.
17. Murtazalieva PM, Karelkina EV, Shishkova AA, et al. Pilot project "Improvement of medical care for patients with chronic heart failure": results of the first stage. Russian Journal of Cardiology. 2018;23(12):44-50. (In Russ.) doi:10.15829/1560-4071-2018-12-44-50.