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Research article

ANALYSIS OF MORTALITY AMONG PATIENTS SUFFERING FROM HEART FAILURE, USING THE EXAMPLE OF A MEGALOPOLIS

A.V. Koltsov, V.V. Tyrenko, V.A. Kachnov

Kirov Military Medical Academy, Saint Petersburg, Russia

ABSTRACT

The medical documentation (*n* = 146912) introduced into the system "Regional fragment of the unified state information system in the field of healthcare" of Saint Petersburg for 2019–2021 was analyzed. To evaluate the mortality of patients due to heart failure, all deceased patients from 2019 to 2021 in Saint Petersburg (*n* = 192133) were taken as a basis, and based on a thorough study of medical documentation, patients who died from cardiovascular diseases and because of heart failure were singled out separately. The total mortality from all causes in Saint Petersburg in 2019 was 53025 people; in 2020, 66468 people; and in 2021, 72640 people. The analysis of mortality due to cardiovascular diseases from 2019 to 2021 showed an upward trend of 20.1% over the 3-year period of data analysis. When analyzing the prevalence of heart failure among deceased patients, an increase of 129.4% was noted over this period. The obtained results of the prevalence, mortality, and mortality of patients due to heart failure on the example of a megalopolis are the most relevant at the current time; they indicate a steady increase in the number of patients suffering from heart failure with an increase in the burden on the city's healthcare system. Simultaneously, there is insufficient continuity in the provision of medical care to patients suffering from heart failure, which is because of not only a shortage of medical personnel at all stages of medical care but also insufficient compliance of patients who either do not want to be treated or cannot continue treatment. Moreover, a significant disconnect was found in the continuity of medical care at the stages of pre-hospital and hospital treatment, as well as further outpatient follow-up of patients suffering from heart failure in the metropolis. All this leads to a significant increase in the mortality and mortality of patients suffering from heart failure, despite all the existing modern effective drug therapies. It appears critical to create a unified register platform for recording patients with heart failure, which will allow for a more accurate understanding of epidemiological aspects, the solution of which will improve the quality of medical care, identify the need for the crucial medicines, and reduce mortality, and mortality rates due to heart failure.

Keywords: heart failure; cardiovascular diseases; mortality; lethality; comorbid pathology; quality of medical care; bed stock; new coronavirus infection.

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Научная статья

АНАЛИЗ ЛЕТАЛЬНОСТИ СРЕДИ ПАЦИЕНТОВ, СТРАДАЮЩИХ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТЬЮ, НА ПРИМЕРЕ МЕГАПОЛИСА

А.В. Кольцов, В.В. Тыренко, В.А. Качнов

Военно-медицинская академия имени С.М. Кирова, Санкт-Петербург, Россия

Резюме

Проанализирована медицинская документация (*n* = 146 912), введенная в систему «Региональный фрагмент единой государственной информационной системы в сфере здравоохранения» г. Санкт-Петербург за 2019–2021 гг. Для анализа смертности пациентов по причине сердечной недостаточности за основу были взяты все умершие пациенты за период с 2019 по 2021 г. в Санкт-Петербурге (*n* = 192 133) и на основе тщательного изучения медицинской документации отдельно выделены пациенты, умершие по причине сердечно-сосудистых заболеваний в целом и по причине сердечной недостаточности в частности. Общая смертность от всех причин в Санкт-Петербурге в 2019 г. составила 53 025 человек, в 2020 г. — 66 468 человек, в 2021 г. — 72 640 человек. Анализ смертности по причине сердечно-сосудистых заболеваний за период с 2019 по 2021 г. показал тенденцию к росту на 20,1 % за 3-летний период анализа данных. При анализе распространенности сердечной недостаточности среди умерших пациентов за данный период времени отмечен рост в 129,4 %. Полученные результаты распространенности, летальности и смертности пациентов по причине сердечной недостаточности на примере мегаполиса являются наиболее актуальными на настоящее время, они свидетельствуют о неуклонном росте количества пациентов, страдающих сердечной недостаточностью, с увеличением нагрузки на систему здравоохранения города. При этом имеет место недостаточная преемственность в оказании медицинской помощи пациентам, страдающим сердечной недостаточностью, что не только является недоработкой медицинского персонала всех этапов оказания медицинской помощи, но и недостаточной комплаентностью пациентов, которые либо не хотят, либо по тем или иным причинам не могут продолжать лечиться. Также выявлено значительное разобщение преемственности оказания медицинской помощи на этапах догоспитального и госпитального лечения, а также дальнейшего амбулаторного наблюдения пациентов, страдающих сердечной недостаточностью, в мегаполисе. Все это приводит к значительному росту летальности и смертности пациентов, страдающих сердечной недостаточностью, несмотря на все существующие современные эффективные медикаментозные схемы терапии. Представляется необходимым создание единой регистровой платформы учета пациентов, страдающих сердечной недостаточностью, которая позволит более точно понять эпидемиологические аспекты, решение которых позволит улучшить качество оказания медицинской помощи, выявить потребность в необходимых лекарственных препаратах и снизить показатели летальности и смертности по причине сердечной недостаточности.

Ключевые слова: сердечная недостаточность; сердечно-сосудистые заболевания; смертность; летальность; коморбидная патология; качество оказания медицинской помощи; коечный фонд; новая коронавирусная инфекция.

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BACKGROUND

Heart failure (HF) is becoming a relevant problem over the past decade. Despite this, the Russian literature presents limited information on the prevalence, lethality, and mortality rate of HF. This is largely due to the insufficient development of registries for such patients, which are used not only to record the prevalence, lethality, and mortality rate but also to evaluate the implementation by the medical staff of clinical recommendations for the treatment of such patients, efficiency and adherence to therapy, and continuity of medical care at various stages.

According to the latest Russian publications, HF affects 8.2% of the general population, and 3.1% of the patients exhibit severe clinical manifestations [1]. Considering the results of Russian epidemiological studies, HF affects 7% of the general population, of which 4.5% have clinically severe HF, increasing from 0.3% in individuals aged 20–29 years old to 70% in patients aged > 90 years [2–4]. However, these data are outdated and do not reflect the current state of the problem, and the results of modern large all-Russian multicenter studies on the prevalence of HF have not yet been published. The PRIORITET-HSN study is currently being performed, where approximately 20 000 patients with HF from 50 Russian regions are planned to be included. The study started on December 23, 2020, and ended on December 31, 2023.

Previously, we analyzed the prevalence of HF in St. Petersburg and assessed the burden of the patients from 2019 to 2021 [5]. The prevalence of HF was assessed by collecting information from the database of the State Information System of St. Petersburg "Regional fragment of the unified state information system in the field of healthcare" based on the standard ICD-10 code I50.x. The expanded coding of HF was also used, namely, ICD-10 codes I 09.9, I 11.0, I 13.0, I 13.2, I 25.5, I 42.0, I 42.9, I 43.0, I 43.1, I 43.8, I 42.5, I 42.7, and I 42.8. In addition to assessing the prevalence, the mortality rate due to HF was analyzed over a similar time.

This study aimed to analyze the prevalence of and mortality from HF using data from a city (St. Petersburg) from 2019 to 2021.

MATERIALS AND METHODS

The study was conducted using the database of the State Information System of St. Petersburg "Regional fragment of the unified state information system in the field of healthcare". To assess the prevalence of HF in St. Petersburg, medical documentation (n = 146.912) entered into the registry system in 2019–2021 was extracted and comprehensively analyzed. The study included patients who had HF of any etiology and were at least 18 years of age. In this study, HF referred to patients with chronic HF and those with acute decompensated HF. In addition, to analyze the HF-related mortality rate, data of all patients who died between 2019 and 2021 in St. Petersburg (n = 192,133) were taken as reference, and based on a thorough study of medical documentation, patients who died due to cardiovascular diseases (CVD) in general and HF in particular were selected. Standard descriptive statistical methods were used. This study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS AND DISCUSSION

In total, in St. Petersburg, 53 025 patients died from all causes in 2019, 66 468 patients in 2020, and 72 640 patients in 2021. An analysis of CVD-related mortality from 2019 to 2021 showed an upward trend of 20.1% in 3 years (31 041 patients in 2019, 37 846 patients in 2020, 37 279 patients in 2021). Moreover, HF-related mortality rate showed a significant increase of 101.7% using expanded coding. This result may be due to the realities of providing medical care during the COVID-19 pandemic. In the analysis of HF prevalence among patients who died over this period, a significant increase of 129.4% was noted (CHF I50.x was registered in 4277 patients in 2019 and 9812 patients in 2021). Data are presented in Figure 1. Thus, the prevalence data of HF-related mortality in St. Petersburg were 46.3 per 100 000 populations in 2019, 86.7 per 100 000 populations in 2020, and 81.5 per 100 000 populations in 2021.

Subsequently, an analysis of the mortality rate of patients hospitalized due to HF in city hospitals was performed, where the mortality rate was considered during the first day of hospitalization and then after 1, 3, 6, and 12 months thereafter. Patients were distributed by sex and age. Figures 2–5 present these data. Thus, data obtained for 2020 were noteworthy because a sharp increase in annual mortality from the first day of hospitalization due to HF was recorded. For example, in male patients aged > 75 years, the mortality rate during the year was 42.8%. The results obtained can be explained by the NCI pandemic. Subsequently, the annual mortality rate had decreased in all categories of patients, which was due to the return to the provision of standard medical care. However, the mortality rate remains mostly above prepandemic levels. This may indicate both a decrease in continuity in the provision of medical care and patient adherence to therapy and the long-term consequences of COVID-19.

The increase in the number of patients with HF admitted to city hospitals from 16.559 in 2019 to 25.478 in 2021 may be due to an increase in the prevalence of HF, more precise coding according to the International Classification of

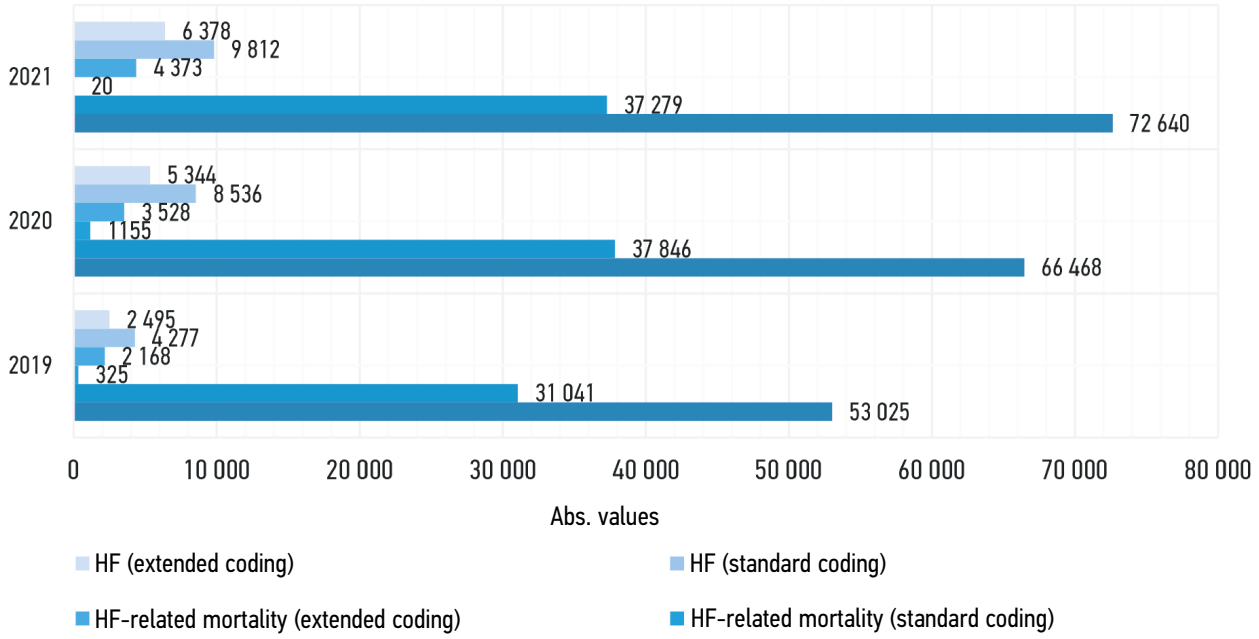

Fig. 1. Mortality in Saint Petersburg from 2019 to 2021
Рис. 1. Смертность в Санкт-Петербурге в период с 2019 по 2021 г.

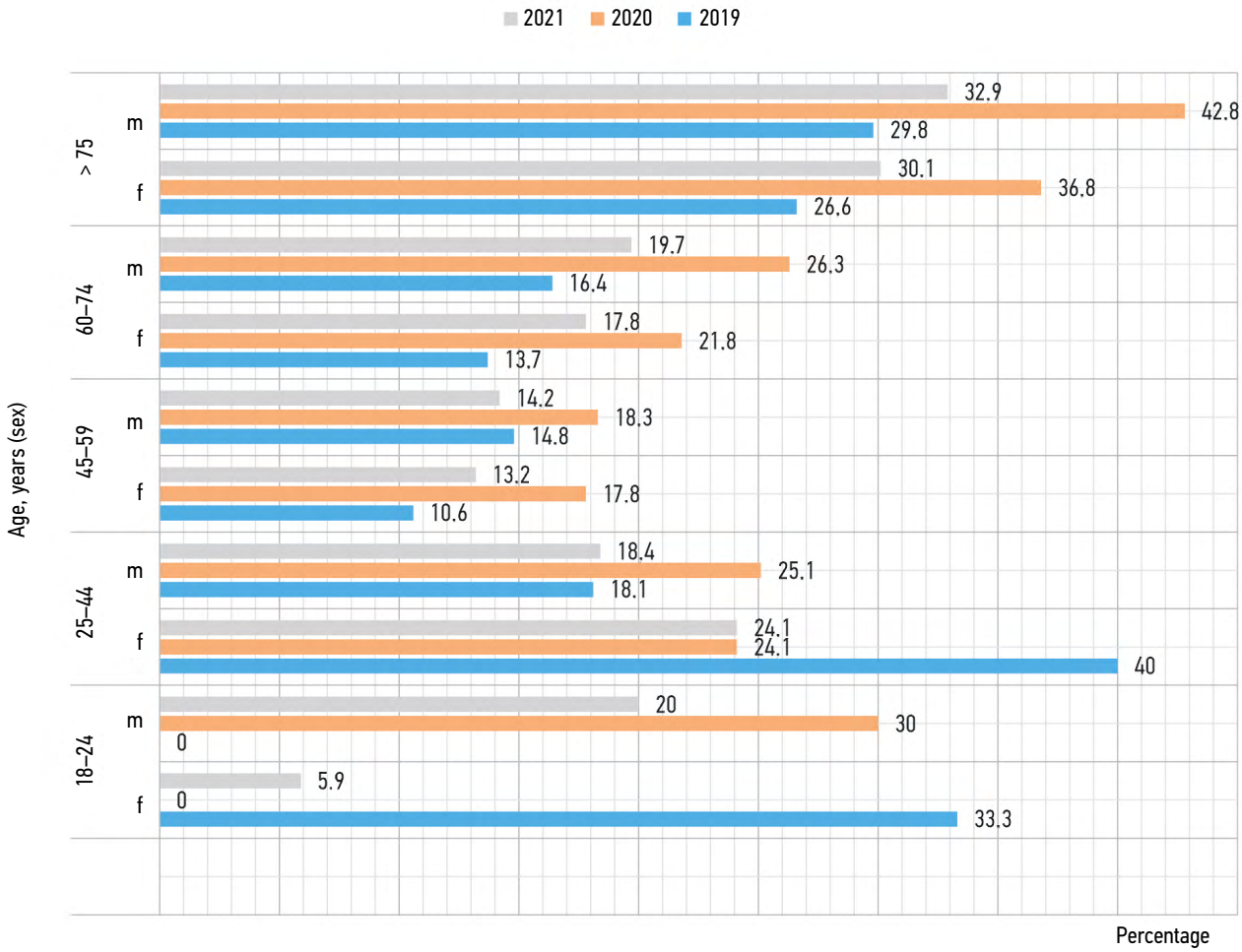

Fig. 2. Annual mortality from the moment of hospitalization due to heart failure in Saint Petersburg
Рис. 2. Годовая летальность от момента госпитализации по причине СН в Санкт-Петербурге

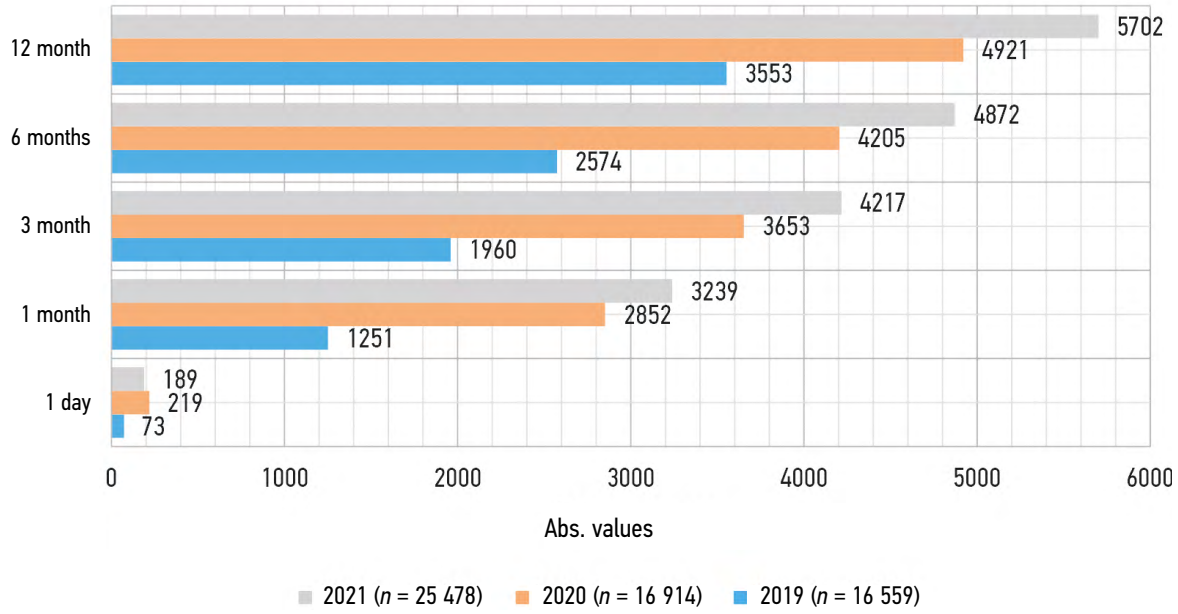

Fig. 3. Annual mortality from the time of hospitalization because of heart failure in Saint Petersburg (*n* = number of hospitalized patients)
Рис. 3. Годовая летальность от момента госпитализации по причине СН в Санкт-Петербурге (*n* = количество госпитализированных пациентов)

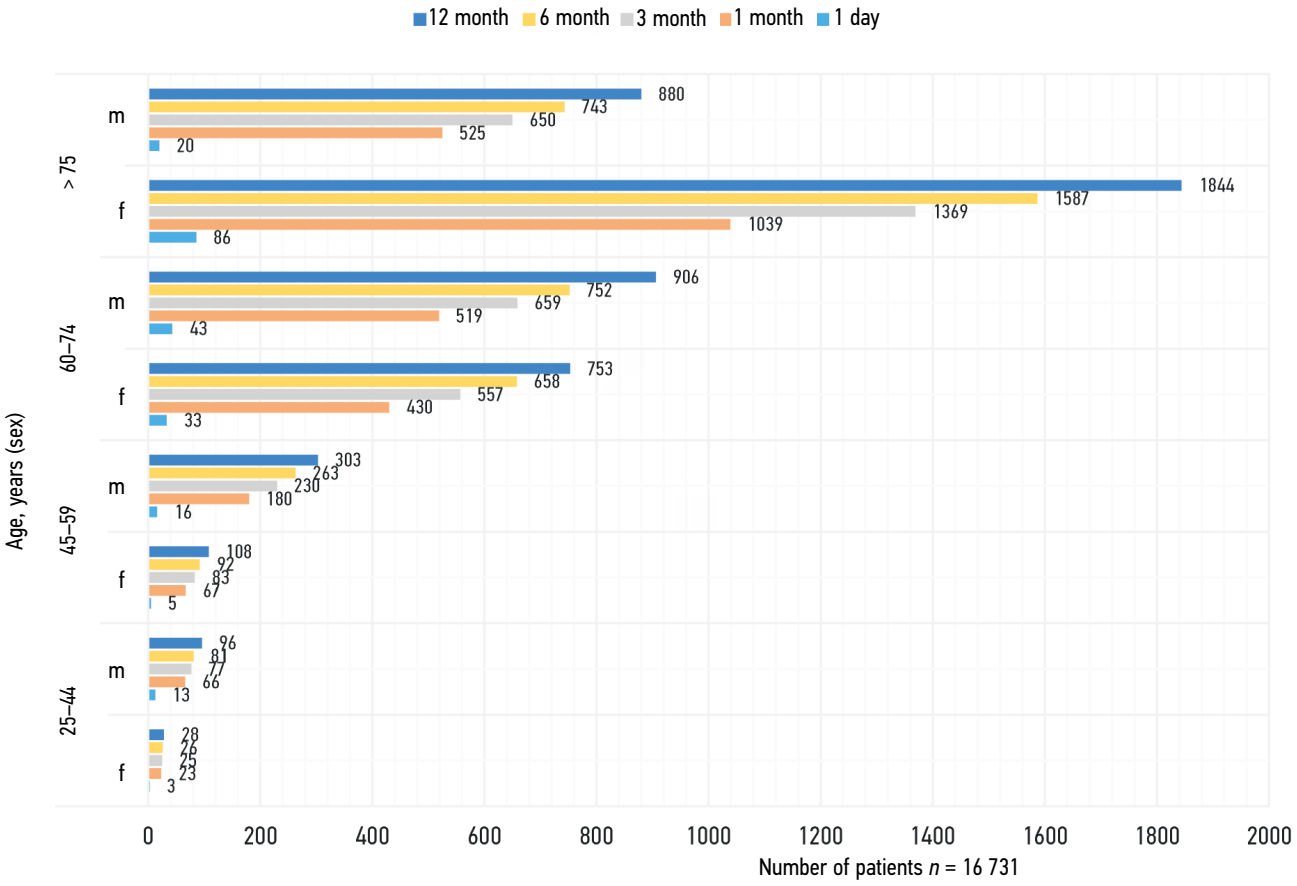

Fig. 4. Annual mortality from the moment of hospitalization because of heart failure in Saint Petersburg for 2020, considering the time of death
Рис. 4. Годовая летальность от момента госпитализации по причине СН в Санкт-Петербурге за 2020 г. с учетом времени наступления летального исхода

Diseases, 10th revision, and changes in patients' perception of the dangers of hospitalization due to COVID-19. Moreover, cases were commonly only coded for the underlying disease in the information system, whereas concomitant pathologies remained unaccounted.

Then, mortality was compared during the year depending on the presence of comorbid pathologies, such as hypertensive disease (HD), ischemic heart disease (IHD), myocardial infarction, atrial fibrillation (AF), and acute cerebrovascular accident (ACVA). The basis was the total number of patients hospitalized for HF in city hospitals, that is, 16,559 in 2019, 16,914 in 2020, and 25,478 in 2021. Subsequently, patients with corresponding comorbid pathologies were identified in this cohort.

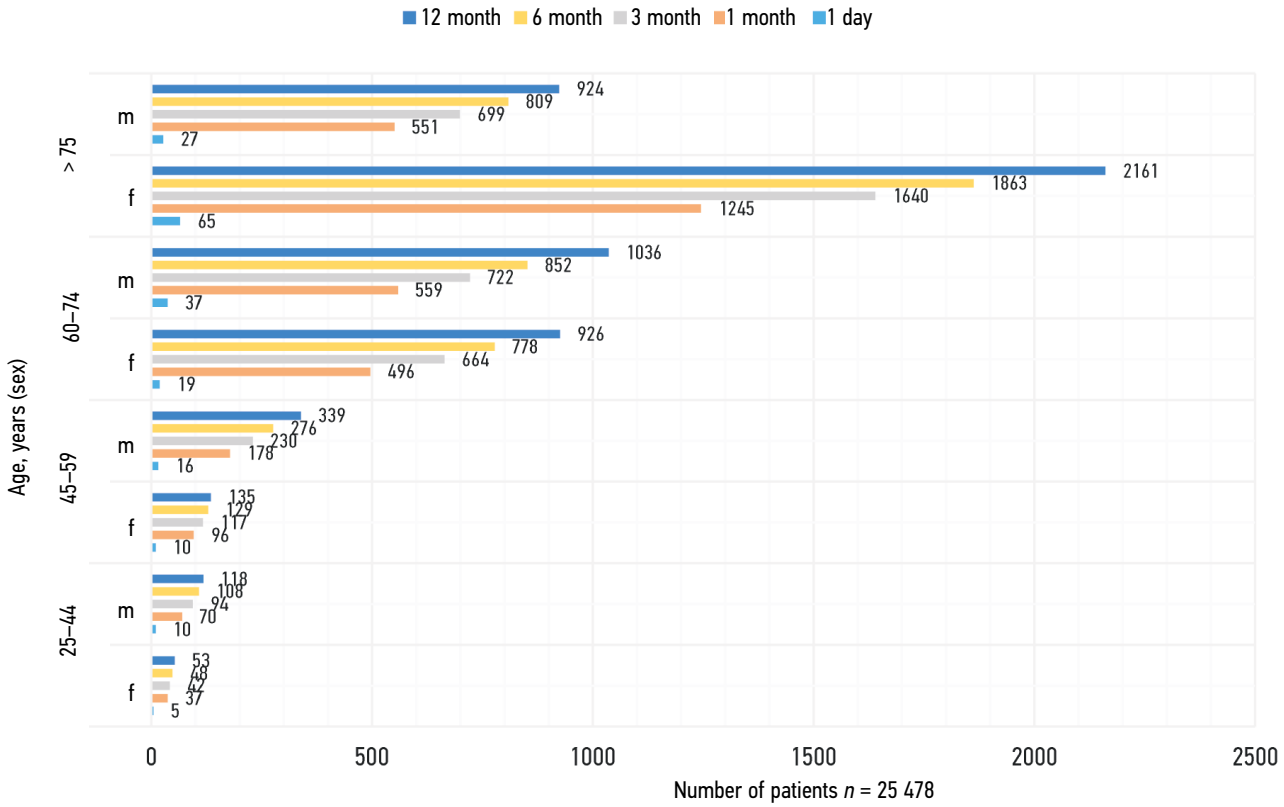

Fig. 5. Annual mortality from the moment of hospitalization due to heart failure in Saint Petersburg for 2021, considering the time of death
Рис. 5. Годовая летальность от момента госпитализации по причине СН в Санкт-Петербурге за 2021 г. с учетом времени наступления летального исхода

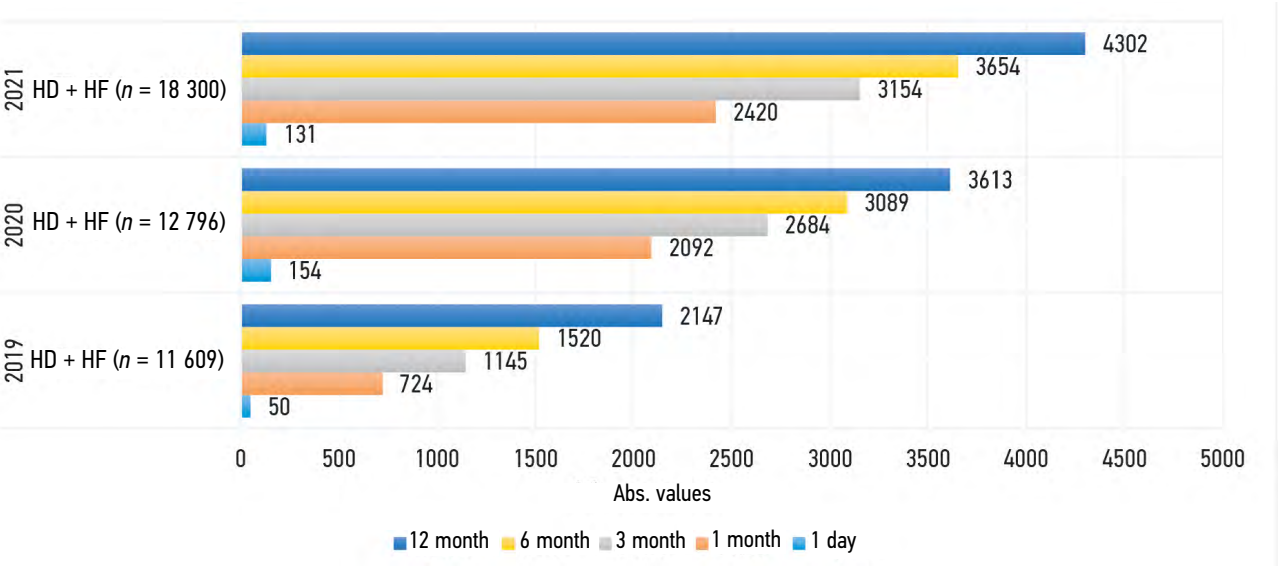

Fig. 6. Annual mortality from the moment of hospitalization due to heart failure and hypertension
Рис. 6. Годовая летальность от момента госпитализации по причине СН и ГБ

A sharp increase in the mortality rate of patients with HF and HD simultaneously was noted, with the largest number of lethal outcomes recorded in 2021, which was due to the overload of the healthcare system and the worsening course of HF against COVID-19 (Fig. 6). This can be due to an increase in the city's bed capacity for patients with cardiology problems, an increase in the continuity in the provision of outpatient medical care, and a decrease in patients' fear of seeking medical help. The pandemic has not only increased healthcare problems from the redistribution of hospital beds but also led to a more severe course of HF in patients aged > 75 years.

The same results were obtained in patients who had MI with HF, where the mortality rate was 25.8% in 2021 (Fig. 7).

A similar situation was noted in patients with IHD, AF, and ACVA as concomitant diseases. The number of hospitalizations with these pathologies has increased steadily, with maximum mortality in 2021 (21.4%). Figures 8–10 present these data. Moreover, the majority (more than half) of lethal outcomes occur in month 1 from the time of hospitalization, which may indicate the low efficiency of the quality of medical care for patients at the outpatient and prehospital stages and accordingly requires the adoption of certain organizational decisions to improve the quality of medical care at these stages.

The continuity of care among patients hospitalized for HF was inconsistent. Thus, out of 16,559 patients treated in city hospitals, only 1,378 were registered at the clinic

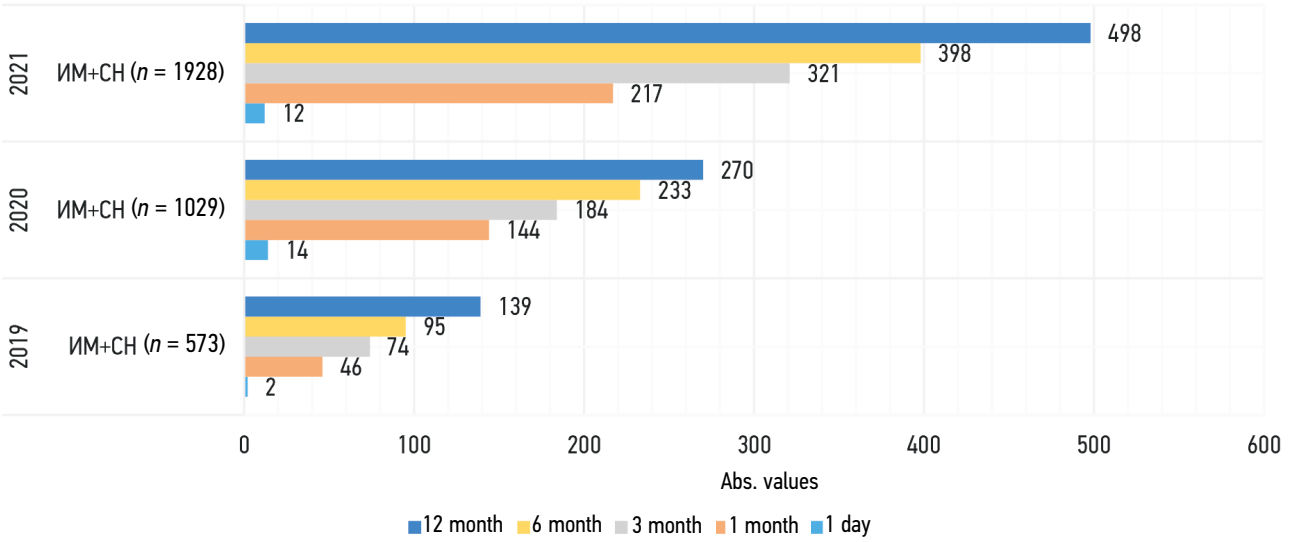

Fig. 7. Annual mortality from the moment of hospitalization due to heart failure and myocardial infarction
Рис. 7. Годовая летальность от момента госпитализации по причине СН и ИМ

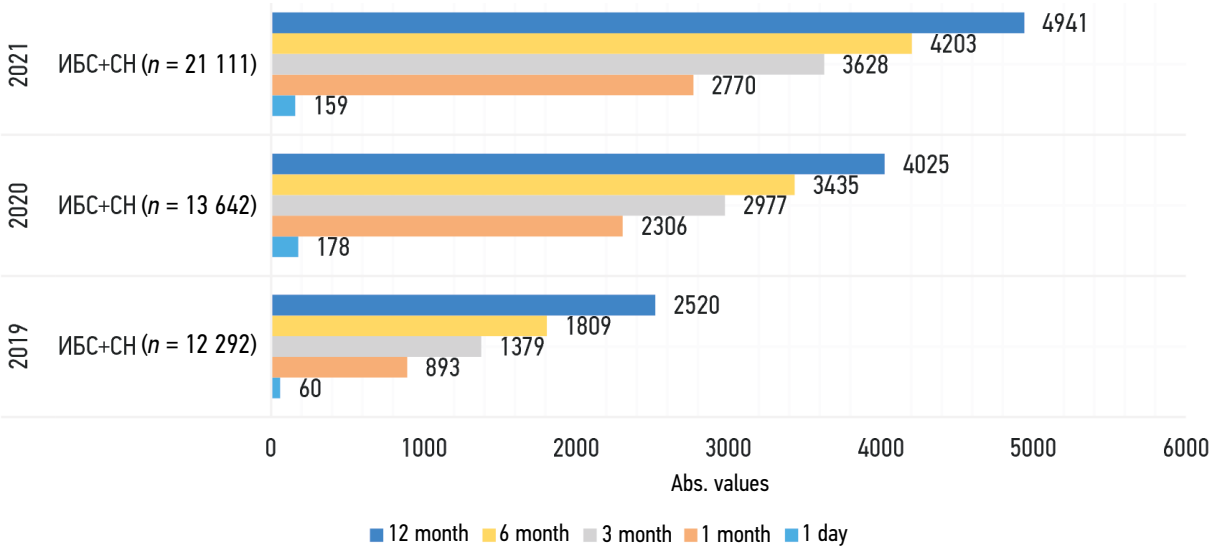

Fig. 8. Annual mortality from the moment of hospitalization due to heart failure and coronary heart disease
Рис. 8. Годовая летальность от момента госпитализации по причине СН и ИБС

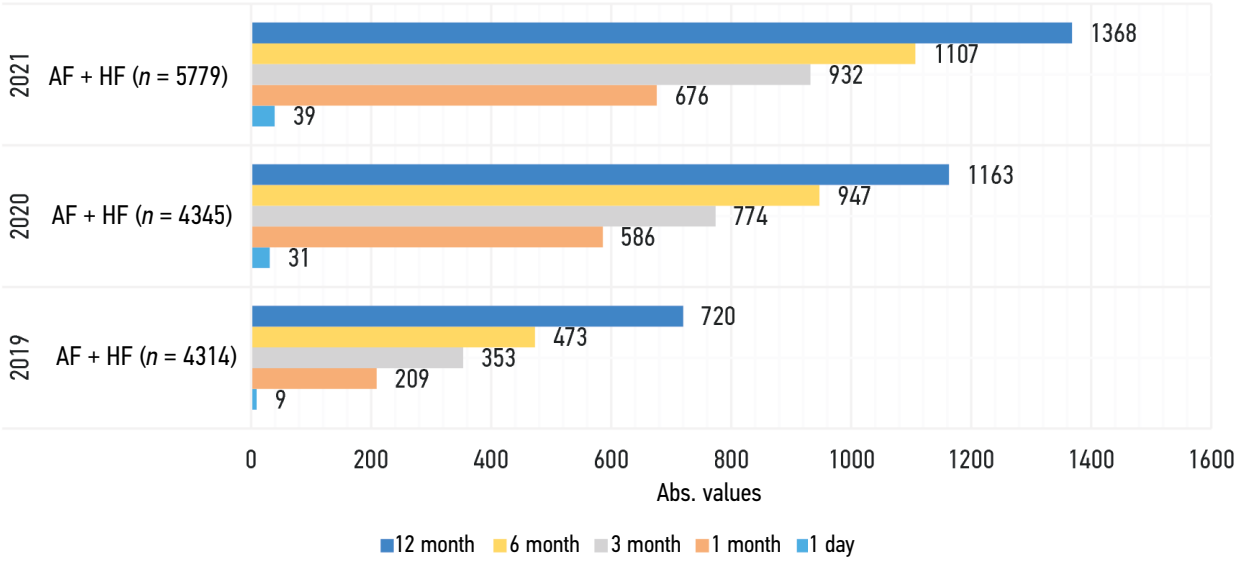

Fig. 9. Annual mortality from the moment of hospitalization due to heart failure and atrial fibrillation
Рис. 9. Годовая летальность от момента госпитализации по причине СН и ФП

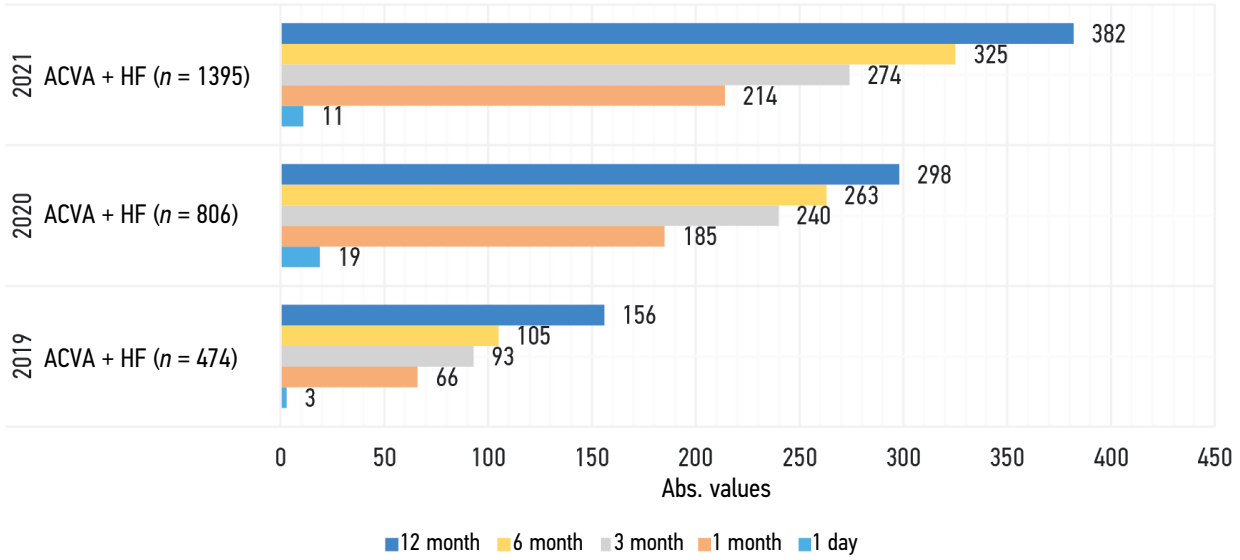

Fig. 10. Annual mortality from the moment of hospitalization due to heart failure and acute cerebrovascular accident
Рис. 10. Годовая летальность от момента госпитализации по причине СН и ОНМК

at their primary healthcare facility. However, this situation did not change. In 2020, only 831 patients were registered; however, this figure was due to COVID-19. In 2021, the situation had not improved, that is, 1,231 of the 25,478 patients hospitalized sought medical help in the clinic again. Thus, the data can suggest low adherence to treatment and insufficient awareness of patients about the need for systematic follow-up by medical personnel. The current situation regarding the lack of continuity in the provision of medical care at the hospital stage and after inpatient treatment also requires certain organizational decisions. In this case, the question arises about the need to create a single register linking all stages of medical care to enable active monitoring and treatment of patients with HF after hospitalization. Considering the decrease in lethal outcomes, the therapy recommended in city hospitals may positively affect the disease course.

CONCLUSION

The obtained results on the prevalence, lethality, and mortality of HF using data from a city (St. Petersburg) are currently the most relevant and indicate a steady increase in the number of patients with HF, with an increase in

the burden on the city's healthcare system. In addition, the lack of continuity in the provision of medical care to patients with HF is noteworthy, which indicates not only an underperformance of medical personnel at all stages of medical care but also insufficient compliance of patients who either do not want or cannot continue treatment. Moreover, the results revealed a significant disconnect in the continuity of medical care at the prehospital and hospital stages and further outpatient monitoring of patients with HF in the city. All these factors induce a significant increase in lethality and mortality rates among patients with HF, despite modern effective drug treatment regimens.

Given the lack of adequate continuity at various stages of medical care, the question naturally arises about possible directions for solving it. Creating a unified registry platform for recording patients with HF, which will enable us to understand more accurately the epidemiological aspects, improve the quality of medical care, identify the need for necessary medications, and reduce HF-related lethality and mortality rates is necessary. In addition, the inclusion of patients with HF in this register and their follow-up at various stages of medical care (both inpatient and outpatient) will significantly improve the continuity of medical care. This study certainly has some limitations because it used data from one city, and the extrapolated data do not represent the entire Russian Federation. The results of the ongoing PRIORITET-HSN study, after its analysis and publication, will help us form a more comprehensive view of the prevalence, lethality, and mortality due to HF in the Russian Federation. However, the current problems identified during the study in providing medical care to patients with HF require solutions.

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AUTHORS INFO

***Andrew V. Koltsov,** MD, Cand. Sci. (Med.);
ORCID: https://orcid.org/0000-0001-9881-4587;
eLibrary SPIN: 8988-4988; e-mail: Andrewkoltsov83@gmail.com

Vadim V. Tyrenko, MD, Dr. Sci. (Med.), professor;
ORCID: https://orcid.org/0000-0002-0470-1109;
eLibrary SPIN: 3022-5038; e-mail: vadim_tyrenko@mail.ru

Vasilii A. Kachnov, MD, Cand. Sci. (Med.);
ORCID: https://orcid.org/0000-0002-6601-5366;
eLibrary SPIN: 2084-0290; e-mail: kvasa@mail.ru

ОБ АВТОРАХ

***Андрей Валентинович Кольцов,** канд. мед. наук;
ORCID: https://orcid.org/0000-0001-9881-4587;
eLibrary SPIN: 8988-4988; e-mail: Andrewkoltsov83@gmail.com

Вадим Витальевич Тыренко, д-р мед. наук, профессор;
ORCID: https://orcid.org/0000-0002-0470-1109;
eLibrary SPIN: 3022-5038; e-mail: vadim_tyrenko@mail.ru

Василий Александрович Качнов, канд. мед. наук;
ORCID: https://orcid.org/0000-0002-6601-5366;
eLibrary SPIN: 2084-0290; e-mail: kvasa@mail.ru

* Corresponding author / Автор, ответственный за переписку