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RESEARCH ARTICLE

THE ROLE OF REHABILITATION OF CARDIOVASCULAR PATIENTS AFTER MYOCARDIAL INFARCTION

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Abstract: Rehabilitation of patients after myocardial infarction is considered as an integral component of comprehensive management and secondary prevention of cardiovascular diseases. The aim of the study was to evaluate the impact of a structured cardio-rehabilitation program on the clinical and functional state, quality of life, and frequency of readmission in patients after myocardial infarction.Rehabilitation of patients after myocardial infarction is considered as an integral component of comprehensive management and secondary prevention of cardiovascular diseases. The aim of the study was to assess the impact of a structured cardio-rehabilitation program on the clinical and functional state, quality of life, and frequency of repeated hospitalizations in patients after myocardial infarction who underwent treatment and follow-up at the Regional Cardiology Dispensary JSC (Astrakhan).80 patients with myocardial infarction were under observation, who were divided into a group with participation in the rehabilitation program and a standard follow-up group. Clinical and instrumental methods, a six-minute walking test, and scales for assessing the quality of life and mental and emotional state were used.The follow-up period was 12 months. It was found that participation in the rehabilitation program is associated with a significant improvement in exercise tolerance, a decrease in the functional class of angina pectoris and chronic heart failure, a decrease in the severity of anxiety and depression, as well as a decrease in the frequency of repeated hospitalizations for cardiovascular reasons. The data obtained confirm the key role of rehabilitation in improving the long-term prognosis and quality of life of cardiovascular patients after myocardial infarction and correspond to modern concepts of cardio rehabilitation as a mandatory element of secondary prevention.

Keywords: myocardial infarction, cardio-rehabilitation, secondary prevention, quality of life, physical training, psycho-emotional status, re-hospitalization, Astrakhan.

INTRODUCTION

Cardiovascular diseases remain the leading cause of death and disability in the world and in the Russian Federation. A significant contribution to the structure of cardiovascular mortality is made by myocardial infarction, accompanied by a high risk of early and late complications, decreased exercise tolerance, deterioration in quality of life and disability. Against the background of the development of invasive and drug-based treatment methods, the importance of rehabilitation programs aimed at restoring functional status and preventing repeated cardiovascular events is increasing.

Cardio-rehabilitation is considered as a comprehensive medical and social technology, including metered-dose physical activity, teaching the patient the principles of secondary prevention, correction of risk factors, psychological and social support [2]. Modern clinical guidelines and consensus documents emphasize that cardiac rehabilitation programs after acute coronary syndrome can reduce overall and cardiovascular mortality, the frequency of repeated hospitalizations, and improve quality of life, while the effect achieved is comparable in scale to the results of lipid-lowering therapy [5].

A number of domestic and foreign studies [13, 14] demonstrate that patients undergoing a full-fledged cardio rehabilitation program demonstrate a more pronounced increase in exercise tolerance, better adherence to drug therapy, a more pronounced decrease in atherogenic lipids and blood pressure, as well as a

lower incidence of repeated heart attacks and hospitalizations for decompensation of heart failure compared with patients limited only by standard outpatient care [6].

At the same time, there is still insufficient coverage of patients with cardiac rehabilitation programs in clinical practice. Some patients prematurely stop classes, while others do not get into organized programs due to organizational, socio-economic, or motivational reasons. In Russian conditions, this problem is exacerbated by the territorial heterogeneity of the availability of specialized centers, as well as insufficient awareness of patients and sometimes medical staff about the proven effectiveness of rehabilitation measures [12].

Of particular relevance is the study of the results of cardiac rehabilitation in specific regions, taking into account the characteristics of the demographic structure, the prevalence of risk factors and the capabilities of the regional health system. The Astrakhan region is characterized by a high prevalence of traditional risk factors, including hypertension, overweight, smoking and low physical activity, which causes a significant burden of coronary heart disease. In this regard, the evaluation of the effectiveness of the regional rehabilitation program for patients after myocardial infarction is of practical and scientific importance.

The purpose of this study was to evaluate the role of a structured cardio-rehabilitation program in improving the clinical and functional status, quality of life, and frequency of recurrent cardiovascular events in patients who had suffered a myocardial infarction and were being monitored at a medical facility in Astrakhan.

METHODOLOGY & MATERIALS

The study was conducted at the Regional Cardiological Dispensary JSC (Astrakhan), in the department of medical rehabilitation of patients with cardiovascular diseases, which provides specialized care to patients with acute myocardial infarction and performs subsequent outpatient follow-up.

The study included patients of both sexes aged 45 to 75 years who had suffered a myocardial infarction with or without ST segment elevation, received standard drug therapy in accordance with current recommendations and had no absolute contraindications to physical rehabilitation.

The total sample was 80 people. The patients were divided into two age and gender-matched groups. The main group included 40 patients who underwent a structured cardiac rehabilitation program. The comparison group included 40 patients who received standard outpatient follow-up without participating in an organized rehabilitation program. The distribution into groups was carried out taking into account the clinical indications and the willingness of patients to participate in regular classes.

The cardiac rehabilitation program included a hospital stage with early activation, followed by an early outpatient stage and a late outpatient stage. At the hospital stage, gentle and training motor activity was used with a gradual increase in the duration and intensity of walking, breathing exercises and elements of physical therapy in the ward and along the corridor [7].

The early outpatient stage included group and individual physical therapy sessions three times a week, controlled aerobic exercise on a track or bicycle ergometer, patient training in self-monitoring of blood pressure, heart rate, body weight, and angina symptoms, as well as counseling on nutrition, smoking cessation, and lifestyle modification. The late outpatient stage consisted of supportive classes with a lower frequency under the supervision of a specialist and independent physical activity according to an individual program with regular medical supervision [3].

To assess the clinical and functional state, objective examination data, heart rate and blood pressure, electrocardiographic parameters, as well as the functional class of angina according to the Canadian classification and the functional class of chronic heart failure were used. Exercise tolerance was assessed using a six-minute walking test using a standard technique with recording of distance traveled and subjective shortness of breath on a visual-analog scale [8].

The quality of life was assessed using a questionnaire that included scales of physical functioning, role functioning, general health and mental well-being [5]. The psycho-emotional status was assessed using anxiety and depression scales used in cardiological practice [10]. Within 12 months, repeated hospitalizations for cardiovascular reasons, episodes of unstable angina, repeated myocardial infarction, and cases of cardiovascular death were recorded according to medical records and a telephone survey.
The initial clinical and demographic distribution of patients is presented in Table 1.

Table 1 – Clinical and demographic characteristics of the examined patients (M±SD or n, %)

Indicator	Main group (n=40)	Comparison group (n=40)
Average age, years	61,2 ± 8,1	60,7 ± 7,9
Men, n (%)	26 (65,0)	25 (62,5)
Women, n (%)	14 (35,0)	15 (37,5)
Anterior myocardial infarction, n (%)	19 (47,5)	18 (45,0)
ST segment elevation infarction, n (%)	28 (70,0)	27 (67,5)
Hypertension, n (%)	32 (80,0)	31 (77,5)
Type 2 diabetes mellitus, n (%)	11 (27,5)	10 (25,0)
Active smoking, n (%)	18 (45,0)	17 (42,5)
Body mass index, kg/m2	29,1 ± 3,4	28,8 ± 3,6

The groups did not differ in the main demographic and clinical characteristics, including the prevalence of hypertension, diabetes mellitus, smoking, and type of heart attack, which allows for a correct comparison of further results.

The assessment was carried out at three time points: at discharge from the hospital, six months later, and twelve months after the moment of the myocardial infarction index. Descriptive statistical characteristics were used, and the comparison of averages was performed using parametric criteria under the condition of a normal distribution or nonparametric criteria, otherwise the differences were considered statistically significant at a level of $p<0.05$.

RESULTS

By the sixth month of follow-up, patients in the main group showed a marked improvement in exercise tolerance according to the results of the six-minute walking test. The average distance traveled increased from 320±65 m to 420±70 m, while in the comparison group the increase was less pronounced and amounted from 325±60 m to 365±68 m. After twelve months, the distance in the main group reached 450±72 m, in the comparison group 380±70 m. The intergroup differences after six and twelve months were significant. These data are consistent with the results of studies demonstrating that systematic training as part of cardiac rehabilitation significantly increases the functional capabilities of patients after myocardial infarction.

In parallel, a decrease in the functional class of angina pectoris and chronic heart failure was noted. In the main group, the proportion of patients with functional class II angina increased from 35.0% to 70.0% by the twelfth month, while the proportion of patients with class III decreased from 52.5% to 17.5%. In the comparison group, the improvement was less pronounced, the proportion of patients with functional class II increased from 37.5% to 52.5%, and with class III decreased from 50.0% to 32.5%.

A similar trend was observed in relation to the functional class of heart failure. The severity of clinical symptoms of shortness of breath and fatigue decreased more significantly in patients who systematically participated in the rehabilitation program, which emphasizes the importance of metered-dose physical activity in combination with risk factor control.

Table 2 – Dynamics of functional parameters in patients after myocardial infarction (M±SD or n, %)

Indicator	Follow-up period	Main group (n=40)	Comparison group (n=40)
Distance of a 6-minute walk, m	Discharge from the hospital	320 ± 65	325 ± 60
	6 months	420 ± 70	365 ± 68
	12 months	450 ± 72	380 ± 70
Angina pectoris II FC, n (%)	Discharge from the hospital	14 (35,0)	15 (37,5)
	12 months	28 (70,0)	21 (52,5)
Angina pectoris III FC, n (%)	Discharge from the hospital	21 (52,5)	20 (50,0)
	12 months	7 (17,5)	13 (32,5)

Reducing the frequency of repeated hospitalizations for cardiovascular reasons was one of the key results of the study. During the twelve-month period, six hospitalizations were registered in the main group (15.0% of patients), with unstable angina or decompensation of heart failure becoming the cause.

In the comparison group, the number of repeat hospitalizations was higher and amounted to thirteen cases (32.5% of patients), with a comparable range of causes. The revealed trend is consistent with data from large clinical and epidemiological studies demonstrating that participation in cardiac rehabilitation programs is accompanied by a decrease

in the overall frequency of hospitalizations and mortality by tens of percent compared with patients who do not undergo rehabilitation.

The quality of life of patients, assessed on the combined scales of physical and mental health, significantly improved in both groups, but the increase in the corresponding indicators in the main group was more pronounced. Patients undergoing rehabilitation were more likely to notice a decrease in restrictions in daily activity, a decrease in the severity of pain and shortness of breath, and a return to work and a socially active life.

Psycho-emotional indicators showed a significant decrease in anxiety and depression levels, whereas in the comparison group, some patients maintained steadily elevated values that required additional psychological and drug correction. The importance of psychological support and educational components of cardiac rehabilitation is also emphasized in modern reviews, which indicate that the combination of physical training with psychoeducational and behavioral interventions ensures maximum long-term effect.

Special attention was paid to the modification of risk factors. By the twelfth month, the proportion of patients in the main group who continued to smoke decreased from 45.0% to 12.5%, while in the comparison group the corresponding decrease was less pronounced, from 42.5% to 27.5%. Blood pressure and atherogenic lipid levels reached target values more often in the main group, reflecting higher adherence to drug therapy and lifestyle recommendations. The presence of a structured educational part of the rehabilitation program, including discussions on nutrition, physical activity levels, smoking cessation and weight control, contributes to a lasting change in behavior, which is confirmed by the data of modern publications.

The structure of the cardio-rehabilitation program implemented in a medical institution in Astrakhan is shown in Figure 1.

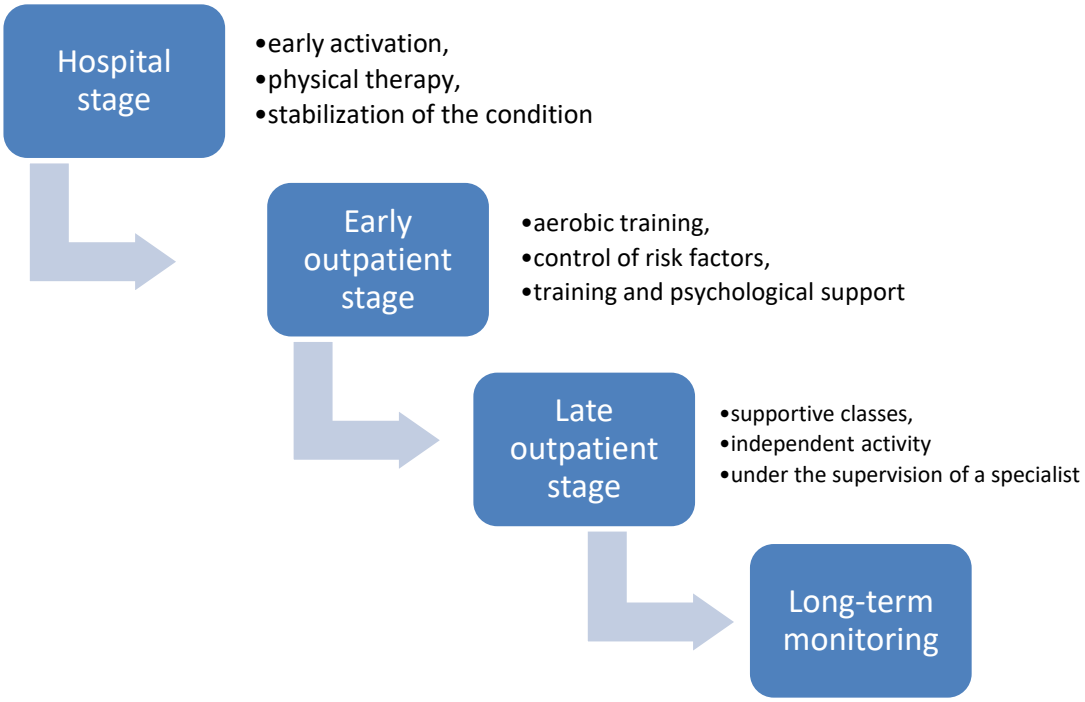

Figure 1 – Diagram of the stages of cardio-rehabilitation of patients after myocardial infarction

Such a step-by-step structure corresponds to modern ideas about the continuity of cardiac rehabilitation and ensures a consistent expansion of the motor regime while correcting risk factors and psycho-emotional state.

Discussing the results, it should be emphasized that the data obtained are consistent with international and domestic studies, which consider cardio-rehabilitation as one of the key elements of secondary prevention of coronary heart disease. Meta-analyses show a decrease in the relative risk of general and cardiovascular mortality by about 20-25% with the participation of patients in rehabilitation programs compared with standard follow-up, while reducing the frequency of hospitalizations and improving the quality of life.

Taking into account the data obtained in the study, as well as modern ideas about cardio-rehabilitation as a key area of secondary prevention of coronary heart disease, it seems advisable to develop a set of recommendations aimed at different levels of the medical care system. Of particular importance are organizational decisions at the level of GBUZ JSC "Regional Cardiological Dispensary" (Astrakhan), standardization of the work of medical personnel, formation of

stable motivation of patients for long-term participation in rehabilitation programs and the introduction of a performance monitoring system.
The practical focus of the study makes it possible to single out as a priority the continuity of the rehabilitation process from the hospital stage to the late outpatient and long-term follow-up stage. To achieve this goal, it is recommended to formalize the routing of a patient who has suffered a myocardial infarction, including in local clinical protocols the mandatory referral of all clinically stable patients to the department of medical rehabilitation. Such a decision should be accompanied by a clear record of the indications and contraindications for cardiac rehabilitation in the medical documentation, as well as the designation of those responsible for informing the patient and organizing the start of the program.

The expansion of interdisciplinary cooperation within the institution is essential. The optimal model is one in which a cardiologist, a physical therapy specialist, a doctor or clinical psychologist, a nutritionist, and, if necessary, a medical rehabilitation doctor participate in the management of the patient. The consolidation of the efforts of these specialists makes it possible not only to individualize physical training programs, but also to provide targeted correction of psycho-emotional disorders, to form patient's self-control skills and sustained commitment to treatment. It is advisable to regulate interdisciplinary conferences within the Department of Medical Rehabilitation to analyze complex clinical cases and assess the dynamics of patients with a high risk of recurrent cardiovascular events.

The results obtained indicate a significant impact of the educational component and psychological support on the quality of life and the modification of risk factors. In this regard, it seems reasonable to include in the program regular structured training sessions for patients and their relatives, conducted both in a group and in an individual form. The content of such classes is recommended to focus on practical aspects: physical activity regimen, principles of rational nutrition, algorithms for self-monitoring of blood pressure and heart rate, rules for taking medications, recognition of symptoms of instability and the need for timely medical attention. The psychological component should be aimed at reducing anxiety and depression levels, forming realistic expectations from rehabilitation, and increasing the patient's confidence in their ability to control their condition.

To increase the effectiveness of secondary prevention, it is advisable to create personalized follow-up plans for a period of at least twelve months after a myocardial infarction. Such plans should include a schedule of medical visits, repeated examinations and control tests with a six-minute walk, as well as planned stages of adjustment of drug therapy and training activities. The introduction of written individual plans, which are given to patients upon discharge from the hospital or upon completion of the next stage of rehabilitation, contributes to a better understanding of the sequence of actions, increases a sense of responsibility and simplifies interaction between the outpatient unit and the specialized rehabilitation department [11].

An important aspect is to increase the commitment of patients to the modification of risk factors. The study showed that participation in a structured program was accompanied by a more pronounced cessation of smoking, improved blood pressure control and lipid profile. Based on this, it is recommended to conduct systematic motivational conversations on quitting smoking using the principles of short–term counseling, and, if necessary, refer patients to specialized programs to combat nicotine addiction. Blood pressure and lipid profile monitoring should be considered not only as a doctor's task, but also as the patient's area of responsibility, which requires training in self-monitoring skills and monitoring diaries.

It is important for the management level of GBUZ JSC "Regional Cardiological Dispensary" to implement a system for monitoring the quality and results of rehabilitation programs. Such a system may include registration logs for all patients who have undergone rehabilitation, recording initial characteristics, dynamics of functional indicators, completed program stages, frequency of repeated hospitalizations and cardiovascular complications. Regular analysis of these data will make it possible to identify "bottlenecks" in the organization of the process in a timely manner, adjust stress regimes, expand the range of psychological and educational activities, and justify the need for additional resources.

A brief integration of the main directions of the recommendations is presented in table 3, which systematizes the proposed measures by levels of responsibility and expected results.

Table 3 – Recommendations for improving cardio-rehabilitation of patients after myocardial infarction at the Regional Cardiology Dispensary JSC (Astrakhan)

Level of implementation	Content of recommendations	Expected result
Organization of medical care	Formalize the routing of all clinically stable patients with myocardial infarction to the department of medical rehabilitation; fix indications and contraindications for cardiac rehabilitation in local protocols; appoint those responsible for the direction and launch of the program	Increase patient coverage with structured rehabilitation; reduce the proportion of patients who drop out of programs at early stages
Interdisciplinary collaboration	To ensure the participation of a cardiologist, a physical therapy specialist, a psychologist, a nutritionist and a medical rehabilitation doctor in patient management; to regulate interdisciplinary consultations and joint reviews of complex cases	To enhance the individualization of programs; more effective correction of psycho-emotional disorders and risk factors
Educational programs	Include mandatory group and individual classes for patients and their relatives on secondary prevention, self-monitoring and recognition of symptoms of instability	Improvement of adherence to drug therapy and lifestyle modification; reduction of the frequency of late visits and decompensation
Work with risk factors	To introduce systematic motivational consultations on quitting smoking; to teach how to keep diaries of blood pressure, heart rate and body weight; to use scales for assessing readiness to change behavior	Reducing smoking prevalence, improving blood pressure and lipid control; reducing the risk of recurrent cardiovascular events
Individual monitoring plans	To develop and issue to the patient a written individual monitoring and rehabilitation plan for 12 months, indicating the dates of visits, examinations, control tests and targets	To increase the patient's responsibility for compliance with the regime; improve coordination between the hospital, rehabilitation and polyclinic
Effectiveness monitoring	Create a registry of patients who have undergone cardiac rehabilitation; regularly analyze the dynamics of functional indicators, quality of life, frequency of complications and repeated hospitalizations	The possibility of rapid assessment of the quality of the program; justification of the need for resource support and further modernization

The presented recommendations can be used to formulate local protocols and standards for the work of the Department of Medical Rehabilitation of the Regional Cardiological Dispensary JSC (Astrakhan). Their implementation can further reduce the frequency of repeated hospitalizations and complications, deepen the interdisciplinary nature of rehabilitation, and increase the availability of modern secondary prevention technologies for patients in the region. Taking into account the advantages of structured cardiac rehabilitation demonstrated in the study, it is advisable to consider these recommendations as a basis for developing a regional program for the rehabilitation and secondary prevention of cardiovascular diseases in patients who have suffered a myocardial infarction.

CONCLUSION

The rehabilitation of patients after myocardial infarction in a medical institution in Astrakhan, based on the principles of phasing, complexity and an interdisciplinary approach, has demonstrated a significant positive impact on the clinical and functional state, quality of life and frequency of recurrent cardiovascular events. Participation in a structured cardio rehabilitation program was accompanied by a significant increase in exercise tolerance, a marked decrease in the functional class of angina pectoris and chronic heart failure, a decrease in anxiety and depression levels, as well as a more pronounced modification of risk factors, including quitting smoking and achieving targets for blood pressure and lipid profile.

The decrease in the frequency of repeated hospitalizations for cardiovascular reasons in the group of patients undergoing rehabilitation, compared with the standard follow-up group, confirms the role of such programs as an effective tool for secondary prevention. The data obtained are consistent with current clinical recommendations and the results of meta-analyses, according to which cardio-rehabilitation is considered an essential component of patient management after myocardial infarction and is a clinically and economically sound strategy.

The results of the study emphasize the need to expand the availability of cardiac rehabilitation programs for patients in the region, introduce uniform standards for patient selection and routing, and increase attention to educational and psychological aspects of rehabilitation. Taking into account the data obtained, it is advisable to

consider cardio-rehabilitation not as an optional addition to drug therapy, but as an equal component of complex treatment that determines the long-term prognosis of cardiovascular patients after myocardial infarction.

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