

ABSTRACT

dissertation of doctoral student Baibolova Moldir Kanatovna on the topic «Aspects of the Exercise of a Systematized Program of Cardiac Rehabilitation in Patients After Open Heart Surgery», submitted for the degree of Doctor of Philosophy (PhD) in the educational program "8D10110 Medicine"

Relevance of the study

Mortality from cardiovascular disease is the leading cause of death worldwide, and Kazakhstan is no exception. According to the WHO, cardiovascular disease accounts for 31% of mortality worldwide, and in Kazakhstan, according to the Republican Center for Healthcare Development (RCHD), it is 23%. Furthermore, the incidence of cardiovascular disease (CVD) in 2020 compared to 2019 increased by 5.9%, and mortality by 18.2% (World Health Organization, 2021, 2023, Ringer T. et al., 2017).

Following complex cardiac surgery, the patient's body is subject to complex and varied consequences. The body, while acting as a protective force in its functional capacity, can develop various pathological processes and complications before and after the procedure (that is, during the subsequent recovery period). Successful overcoming of these consequences and the prevention of early and late postoperative complications demonstrates the effectiveness of the entire range of cardiac rehabilitation measures (Zaree A. et al., 2023).

Cardiac rehabilitation (CR) is an established treatment model developed to reduce the burden of cardiovascular disease (CVD) worldwide (Gallo et al., 2024). The main benefits of CR include a 33% increase in metabolic equivalents and a 16% increase in maximal oxygen consumption. This improvement in exercise capacity is associated with beneficial effects on quality of life and cardiovascular outcomes. CR is a comprehensive approach because it includes multiple components. Therefore, the nature and quality of CR services may vary, which in turn affects the degree of benefit to the patient. Currently, 20 indicators of CR components are used. However, whether CR is specified according to these standards is poorly described. According to a meta-analysis, cardiac rehabilitation can reduce the risk of death and rehospitalization after open heart surgery by approximately 20% (Aboyans V. et al., 2017, Mancini G. B. J. et al., 2014, Abramson B. L., Huckell V., 2005, Gerhard-Herman M. D. et al., 2017).

Furthermore, large cardiovascular clinics recommend the appropriate use of all reasonable components and individual elements of secondary cardiovascular disease prevention (e.g., smoking cessation, nutrition and stress management counseling, medication administration, etc.) (Rousan T. A., Thadani U., 2019, Bauersachs R. et al., 2019). However, information on the number and nature of cardiovascular health programs, as well as on hospitals and departments providing rehabilitation care to the population of Kazakhstan, is extremely limited; furthermore, it is unknown how this affects the provision of all essential components of cardiovascular disease prevention, including cardiovascular disease risk factors. By providing a multidisciplinary education and training program to prevent morbidity and mortality, CVD is a critical component of the continuum of

care for people with cardiovascular disease, and this issue is being addressed internationally through various CVD program models (Babu AS et al., 2021, Cowie A et al., 2019).

This dissertation is the first to be conducted in Kazakhstan. Unlike programs developed at other clinics (Mayo Clinic, Cleveland Clinic, Trust Clinics, the Russian Scientific Cardiology Center, the Belarusian Scientific Cardiology Center, etc.), it presents a systematic exercise program for patients after open-heart surgery. The Wong-Baker scale is used for subjective pain assessment, and patient adaptation to the exercises is determined by calculating the Borg scale. Another difference is that the effectiveness of the exercises in the systematic program is characterized by determining METs and maximum oxygen consumption. However, although the SF-36 scale is widely used by many cardiac rehabilitation researchers, a unique feature of this study is that the impact of patient-performing exercises on quality of life is assessed in comparison with patients receiving only drug treatment.

The purpose of the study

To systematize the methodological aspects of a cardiac rehabilitation program for patients following open-heart surgery by identifying a set of exercises, evaluating their effectiveness, and assessing quality of life using questionnaires.

Research objectives

1. To systematize the methodological aspects of a cardiac rehabilitation program for patients following open-heart surgery by identifying a set of exercises;
2. To study the effectiveness of a systematic cardiac rehabilitation program in patients following open-heart surgery;
3. To evaluate the impact of a systematic cardiac rehabilitation program in patients following open-heart surgery;
4. To assess the quality of life of patients following open-heart surgery using the SF-36 questionnaire.

Research methods

Before the start of rehabilitation activities, patients are briefed on the program. Each patient is given a methodological guide with a detailed description of the rehabilitation program and its structure. The study is conducted in four stages.

Stage 1 – Preparatory. A general literature review is conducted to determine the research topic and present the program. The research goal and objectives are defined. The research object and methodology are determined. A research protocol is developed. A questionnaire is developed.

Stage 2 – Program development and research implementation.

Stage 3 – Analysis and synthesis of the obtained data.

Stage 4 – Processing and synthesis of the obtained data.

Subject of the research

Patients admitted to the rehabilitation department of the Kardiomed Clinic's hospitalization bureau after open-heart surgery were selected for the study in accordance with the hospital admission criteria.

Research Topic

This study examined the methodological aspects of using exercises in a systematic cardiac rehabilitation program for patients after open heart surgery, in terms of pain assessment, quality of life, and physical activity.

The main provisions submitted for defense

1. Taking into account longitudinal sternotomy during open heart surgery, which violates the integrity of the chest, it is necessary to choose optimal physical exercises for cardiorehabilitation of patients, and then develop a special cardiorehabilitation program.
2. Optimally selected physical exercises during the cardiorehabilitation program for patients after open heart surgery are effective and easy to perform in hospital conditions.
3. When carrying out a cardiorehabilitation program with systematic physical exercises, the quality of life of patients after open heart surgery improves.
4. Correctly selected physical exercises increase training and physical activity of patients after sternomediastinitis, and also improve general well-being and psychological status.

Scientific novelty of research

1. Systematized methodological aspects of the exercise in the program of systemic cardiorehabilitation of patients after open heart surgery, studied the effectiveness of the exercise, its implementation and effect in patients in the clinic.
2. The impact of the cardiorehabilitation program on the quality of life of patients after systemic open heart surgery is described.
3. For the first time in Kazakhstan, rehabilitation exercises were carried out in patients with complicated sternomediostenitis and their effects were investigated.

Practical significance of the research

1. Specialists in the field of practical health care can effectively and systematically apply exercises performed by patients after open heart surgery.
2. Systematic exercises can be implemented in the implementation of daily rehabilitation measures at the level of day hospital, hospital and outpatient rehabilitation.
3. Systematic exercises do not require special equipment and are adapted for implementation, and are also easily performed by trained patients at home.

Description of the main results of the research

The Wong-Baker scale was used to assess the intensity of physical exertion during the rehabilitation program. In the first group, before rehabilitation, the patients showed an increase in Wong-Baker scale indicators by 3-4-5-6 points, less often there were indicators of 7-8-9-10 points, and after rehabilitation, most often only 1-2-3 points were scored, that is, the feeling of stress decreased significantly. In group 2, 3-4-5-6 points were most often scored, only 1 patient scored 8 points, and only 11 scored 7 points. After treatment, the scores of 3-4-5-6 points increased independently, no significant changes were observed, however, to assess the overall effect, it is advisable to monitor the pain level and its dynamics using the SF-36 questionnaire.

In the course of the study, to evaluate the quality of the results of rehabilitation measures, statistical data processing was carried out by comparing the results of the 6-minute walk test (TSH) of two groups. When analyzing the dynamics of TLC, an increase in the distance covered by patients of both groups was revealed, as well as a statistically significant improvement in the indicators of cardiorehabilitation exercises, that is, the effectiveness and improvement of the indicators of the applied exercises were higher when they were used in combination with drug therapy. This is also confirmed by paired Student's t-test.

The rehabilitation routing scale before rehabilitation (SRM) is 4.5 ± 0.87 points, and after rehabilitation — 1.2 ± 0.45 points. Thus, there is a decrease in the ShRM indicator, which characterizes the positive influence of the cardiorehabilitation program and the exercises performed ($p=0.0023$).

When examining the quality of life during the rehabilitation period and after it using the SF-36 questionnaire, a statistically significant improvement was noted in all patients. According to the data obtained as a result of the quality of life assessment, it was established that the intensity of pain decreased by 1.3 times (20%), the quality of life increased by 1.2 times (17%), and the psychological state improved by 1.2 times (15%). Not only the physical, but also the emotional preparation of patients has increased, which positively affects the quality of life and social adaptation of patients.

Therefore, it is important to be cautious about current activity restrictions after sternotomy, since in our study the duration of exercise in the group with sternomediastinitis increased from 1 minute to 15.34 minutes in 6 months. In addition, none of the patients in the study group who developed sternomediastinitis underwent sternal reconstruction.

Personal contribution of the doctoral student

The dissertation research work was carried out with the direct participation of the doctoral student and with the consulting support of the scientific supervisor. All the main stages of the research process - the collection and analysis of scientific literature, the definition of research goals and objectives, the formation of a methodological base, the collection, processing and statistical analysis of primary and clinical data, as well as the interpretation of the obtained results and the drawing up of conclusions - were performed by the doctoral student personally.

Conclusion

1. It was established that after open heart surgery, a specially developed program of rehabilitation exercises was performed, as a result of which the duration of exercise increased by 8.9 times in 6 months.

2. It was established that in patients after open heart surgery, rehabilitation exercises increased the parameters of the 6-minute walk test, used as an indicator of heart failure, by 1.44 times compared to patients receiving only drug treatment. In addition, the pain symptom on the Wong-Baker scale in patients after rehabilitation was 1–3 points, while in patients receiving only drug treatment, it was 3–7 points, that is, specially selected systematic exercises significantly reduce pain.

3. According to the results of the SF-36 questionnaire, which evaluates the implementation of the cardiorehabilitation program in patients after open heart surgery, the quality of life increased by 17%, the intensity of pain decreased by 20%, and the psychological status improved by 15%.

4. Systematically selected physical exercises increase the physical activity of patients after stenomediastinitis, as well as improve general well-being and quality of life.

Dissertation approval

The main results of the work were presented and discussed at the 3rd International Conference of Cardiologists and Cardiac Surgeons on Chronic Heart Failure (Turkestan, 2021) and the ESC Congress on Preventive Cardiology – 2022 (online).

Publications on the topic of the dissertation

11 scientific works on the materials of the dissertation, including 2 publications in foreign scientific publications included in the SCOPUS database; 4 publications in Kazakh periodicals recommended by the Committee for Supervision and Certification in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan; in the materials of the conference of cardiologists and cardiac surgeons on chronic heart failure, 3 theses were published in the journal "Cardiovascular System" (Turkestan, 2021) and 1 thesis in the journal "Prophylactic Cardiology" (online, 2022). In addition, 2 author's certificates were issued for the rehabilitation program.

Scope and structure of the dissertation

The work consists of 92 pages (not including the appendix), includes an introduction, a literature review, research materials and methods, a chapter devoted to the results of an individual study, conclusions, practical recommendations, a list of references, as well as 22 figures and 24 tables.