

Exercise training as the main component for treating pediatric patients with chronic heart failure

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Abstract. The recommendations of various countries for the treatment of patients with chronic heart failure are analyzed in the article. Because physical training are included in a comprehensive program of rehabilitation for patients with heart failure, it is established the necessity to develop the program of exercise training for children with heart failure in Ukraine that must be included in a comprehensive rehabilitation program. Because physical activity has positive effect not only on functional capacity and physical development of the children but also helps to stabilize and improve mood, better psychosocial functioning, better perception of drug therapy.

Key words: exercise training, pediatric patients, chronic heart failure.

Introduction

Heart failure (HF) is still one of the most focal problems of cardiology because its prevalence is increasing (Parkhomenko A.N., 2014). Chronic heart failure (CHF) refers to chronic internal diseases with a very poor prognosis (Voronkov L.H., 2014). However, the stable form of HF means to patients a positive prognosis for many years by the conditions of their healthy lifestyle and getting adequate therapy (Parkhomenko A.N., 2014). Despite significant advances in the surgical treatment, physical therapy is currently on insufficient level. And today any conservative or surgical treatment of cardiovascular diseases can not be completed without physical therapy as it has great social and economic importance (Amosov, N.M., & Bendet, Ya.A., 1990).

Despite fact that each patient with cardiovascular disease is subjected for rehabilitation (Amosov, N.M., & Bendet, Ya.A., 1990), in the United States only 30% of patients eligible for cardiac rehabilitation actually are referred to formal cardiac rehabilitation programs (Kraus, W., & Keteyian S., 2007). It promotes for significantly lower rate in other countries, especially in developing countries. For example, in Ukraine it is not enough paid attention to physical therapy for school age children with CHF due to cardiovascular diseases that has negative effect on the disease (Chekhovska, M.Ya., 2015).

Today, physical activity is seen as a behavior that generally has beneficial effects on exercise capacity and many of the physiologic processes involved in the development of, as well as, primary prevention of coronary artery disease. Despite benefits of physical activity, it is absent approximately in 24% of Americans on leisure-time and another 55% of Americans engage in exercise on an irregular basis. Individuals with chronic illnesses such as myocardial infarction (MI), heart failure, and stroke have rates of no leisure-time physical activity that approach 50% (Kraus, W., & Keteyian S., 2007).

Current public health recommendations state that all people over 2 years of age should accumulate 30 min of moderate-intensity endurance-type physical activity on most (preferably all) days of the week (Kraus, W., & Keteyian S., 2007) and the American Heart Association (AHA) recommends that children and adolescents should participate in at least 60 minutes of moderate to vigorous physical activity every day (The AHA's Recommendations for Physical Activity in Children).

The purpose of the research is to justify (to prove) the necessity of physical training as component in treatment pediatric patients with chronic heart failure.

Methods of the research – theoretical analysis and generalization of scientific and methodological data and global Internet information network.

Results and discussion

Since 1972, regular exercise training has become increasingly utilized in patients with a variety of cardiac related problems. Scientists (Miller T., Horgan S., & Lipshults S., 2005) are currently interested in exercise programs for children, with the recognition that early institution of healthy habits in children may have positive behavioral effects later in adulthood, when physical activity usually declines. Many risk factors associated with premature disease and early morbidity in adults take root in childhood. If these risk factors can be minimized in childhood, the incidence of future disease can be greatly reduced. Studies show that physical

exercise has positive influences on the growth and maturation of children. Specific programs designed to improve strength, flexibility, and endurance are safe to children from 6 years old (Miller T., Horgan S., & Lipshults S., 2005).

A hallmark symptom of patients with chronic heart failure is exercise intolerance or dyspnea on exertion. Compared with age-matched healthy normals, peak exercise capacity is reduced approximately 40-50% in patients with heart failure (Kraus, W., & Keteyian S., 2007) that can isolate them socially and contribute to poorer behavioral adjustment (Miller T., Horgan S., & Lipshults S., 2005).

The patient or parent's estimate of the physical abilities of the child with cardiovascular disease can be inaccurate because of the parent's perception of their child's illness. It should be noted that parents of such children despite indications to exercise training, limit them in physical activity that deteriorate their state, both general and functional, and therefore complicates the course of CHF. Children may also have a lack of interest because they are deconditioned or they may fear to participate in activities. Among the complications of CHF are progressive muscle wasting due to fatigue and inactivity, depression, and low exercise tolerance (Miller T., Horgan S., & Lipshults S., 2005). Excluding exercise training is undesirable as it promotes exercise intolerance and reducing adaptation mechanisms of the cardiovascular system (Association of children's cardiologists of Russia, 2010, 2013). That is why exercise intolerance can be estimated as a risk factor of death in heart failure that directly depends on parameters of heart rate (HR) at rest (Fig. 1).

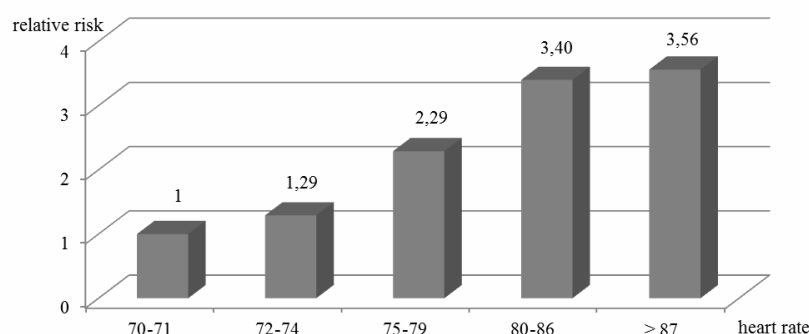


Fig. 1. Effect of heart rate on the risk of death from progressive heart failure (Voronkov L.H., 2014)

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As physical rehabilitation is recommended all patients with I-IV FC of CHF (Mareev, V.Y., Ageev, F.T., & Arutyunov, H.P., 2013; Association of children's cardiologists of Russia, 2013) so it is not recommended to keep patients on bed rest for a long period even in severe forms of circulatory failure (Association of children's cardiologists of Russia, 2010, 2013). The only requirement is a stable course of CHF. During carrying exercise training patients react better to conducted treatment (Mareev, V.Y., Ageev, F.T., & Arutyunov, H.P., 2013; Association of children's cardiologists of Russia, 2013).

According to the recommendations of experts from different countries we can form the main goals of treatment patients with chronic heart failure (Table 1, Table 2).

Table 1. Goals of treatment patients with chronic heart failure

Ukrainian recommendations for the diagnosis and treatment of chronic heart failure (Voronkov, L.H., 2012)	National Russian Federation recommendations for the diagnosis and treatment of chronic heart failure (Mareev, V.Y., Ageev, F.T., & Arutyunov, H.P., 2013)	ACCF/AHA Guideline for the Management of Heart Failure, 2013	Researchers' recommendations for children, Miami, USA (Miller T., Horgan S., & Lipshults S., 2005)
eliminate or correct etiological factor of CHF	prevent developing HF symptoms (for stage I of CHF)	prevent thromboembolism	augment the functional capacity of the child
eliminate or reduce the clinical symptoms of HF	eliminate of HF symptoms (for stage II-III)	monitor (control) symptoms	improve the child's quality of life
prevent hospitalization of decompensated heart failure and other cardiovascular causes	slow disease progression by protecting the heart and other target organs (brain, kidneys, blood vessels) (for stage I-III)	improve the quality of care	improve body composition (to increase the percent of lean body mass over fat mass)
increase lifetime	reduce the number of hospitalization (and expenses) (for stage I-III)		increase overall physical activity outside of the program
improve quality of life	improve quality of life (for stage IIA-III)		educate the child and family to adopt a healthy lifestyle
	improve prediction (for stage I-III)		reduce the risk of future cardiovascular disease

Table 2. Goals of treatment patients with chronic heart failure in Europe (ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure, 2012)

Immediate (ED/ICU/CCU)
<ul style="list-style-type: none"> • Treat symptoms • Restore oxygenation • Improve haemodynamics and organ perfusion • Limit cardiac and renal damage • Prevent thromboembolism • Minimize ICU length of stay
Intermediate (in hospital)
<ul style="list-style-type: none"> • Stabilize patient and optimize treatment strategy • Initiate and up-titrate disease-modifying pharmacological therapy • Consider device therapy in appropriate patients • Identify aetiology and relevant co-morbidities
Pre-discharge and long-term management
<ul style="list-style-type: none"> • Plan follow-up strategy • Enrol in disease management programme, educate, and initiate appropriate lifestyle adjustments • Plan to up-titrate/optimize dose of disease-modifying drugs • Ensure assessed for appropriate device therapy • Prevent early readmission • Improve symptoms, quality of life, and survival

ED - emergency department; ICU - intensive care unit; CCU - coronary care unit.

As we can see the main goals of treatment patients with heart failure are similar in different countries. Recommended rules of daily life in all areas we can find in the clinical guideline of Scotland (Scottish Intercollegiate Guidelines Network, 2002), the USA (Miller T., Horgan S., & Lipshults S., 2005), Europe (ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure, 2012) and Russian Federation (Mareev, V.Y., Ageev, F.T., & Arutyunov, H.P., 2013). Ukrainian recommendations for the diagnosis and treatment of CHF do not illuminate enough the motor mode of these patients (Voronkov, L.H., 2012). Despite international experience in Ukraine about exercise training there are only some recommendations of some authors (Lysenko, H.I., Yashchenko, O.B., & Oliynyk, M.V., 2002; Besaha, E.M., 2011) which is not enough in our opinion. Therefore in Ukraine reaching the goals of treatment in most cases is reached by pharmacological means.

Specialists of Russian Federation named six ways to achieve the goals of decompensation treatment:

- diet
- mode of physical activity,
- psychological rehabilitation, organization of medical monitoring, school for CHF patients,
- drug therapy (medication),
- electrophysiological therapy,
- surgical, mechanical treatments.

As we can see medication is though very important part but in this list is on the fourth position. Ignoring non-drug methods to combat heart failure complicates achieving final success and reduces the effectiveness of treatment (medication) influences. Obviously nowadays, rest is not indicated for patients with CHF regardless of the stage of the disease (Mareev, V.Y., Ageev, F.T., & Arutyunov, H.P., 2013).

According to the recommendations of Russian Federation experts introducing physical activity into a long-term (lifelong) program of patients' management with heart failure is a necessary standard (Mareev, V.Y., Ageev, F.T., & Arutyunov, H.P., 2013).

As we know a number of scientists one of components in treatment of heart failure patients considers physical activity (Okoronkov, A.N., 2008; Connuck, D. M., 2005; A statement for health professionals from the American Heart Association, 1990; Gibbons, R.J., Balady, G.J., & Beasley J.W. et al., 1997) and the Scots (UK) provide the core element to exercise training in cardiac rehabilitation of CHF (Scottish Intercollegiate Guidelines Network, 2002). Because physical activity helps to achieve the goals of CHF treatment.

Physical activity can augment the function of virtually all organs. The benefits of exercise programs in children include improved strength, cardiovascular and pulmonary function, functional status and quality of life. Children with cardiovascular disease, either congenital or acquired, can benefit from exercise with better cardiac function and minimizing risk factors associated with progressive heart dysfunction (Miller T., Horgan S., & Lipshults S., 2005).

Exercise training leads to changes of main parameters of cardiovascular and respiratory system (Amosov, N.M., & Bendet, Ya.A., 1990), it is increased exercise tolerance, improved quality of life, slowed progression of cachexia, improved flow of CHF, significantly slowed disease progression and decreased the frequency of hospitalizations of patients with heart failure (ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure, 2012; A statement for health professionals from the American Heart Association, 1990; Gibbons, R.J., Balady, G.J., & Beasley J.W. et al., 1997).

The benefits of exercise in chronically ill children are multidimensional. The long-term effects of a pediatric rehabilitation program can potentially impact on the lives of these patients. If preventive and therapeutic strategies (such as exercise) can be applied early, they can help prevent progressive left ventricular dysfunction (Miller T., Horgan S., & Lipshults S., 2005).

Moderate physical exercise helps to reduce the level of neurohormones, increase sensitivity to drug treatment and ability to tolerate physical exercise, improve the quality of life (Association of children's cardiologists of Russia, 2013).

Association of children's cardiologists considers walking at a moderate-intensity as the most appropriate type of exercise, and isometric load considers contraindicated (Association of children's cardiologists of Russia, 2010).

According to the recommendations of the Association of Cardiologists of Ukraine for the diagnosis, treatment and prevention of chronic heart failure (2012) and European recommendations (2012) physical exercise to patients with heart failure should be prescribed individually, depending on the initial level of physical activity and monitored by the HR reaction. Exercise should be dynamic and aerobic. To monitor the effectiveness of treatment there necessarily must be used a 6-minute walk test that is affordable and adequate for these patients (Tashchuk, V.K., Polyanska, & O.S., Gulaga, O.I., 2014; Shchegelnik Y., Bogach K., Lunevski Y., 2015; ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure, 2008).

Physical activity has positive effect not only on functional capacity and physical development of the patient but also helps to stabilize and improve mood (Amosov, N.M., & Bendet, Ya.A., 1990). Specialists in Cleveland Clinic mention a lot of reasons why patients with heart failure should be physically engaged. Regular exercise has many benefits. Exercise, especially aerobic exercise, can:

- Strengthen the heart and cardiovascular system
- Reduce heart disease risk factors, such as high blood pressure and being overweight
- Improve circulation and help the body use oxygen better
- Improve heart failure symptoms
- Help increase energy levels so you can do more activities without becoming tired or short of breath
- Improve muscle tone and strength
- Improve balance and joint flexibility
- Strengthen bones
- Help reduce body fat and help you reach a healthy weight
- Help reduce stress, tension, anxiety and depression
- Boost self-image and self-esteem
- Improve sleep
- Help to feel more relaxed and rested
- Help to look fit and feel healthy (Cleveland Clinic, 2016).

Structured exercise as a therapeutic intervention is central to cardiac rehabilitation. Daily exercise should also be encouraged as part of an 'active living' philosophy (Scottish Intercollegiate Guidelines Network, 2002).

Conclusions

Exercise is safe, as well as beneficial in the majority of patients with heart failure. Physical activity has positive effect not only on functional capacity and physical development of the patient but also helps to stabilize and improve mood and permits activities at normal or near-normal levels.

Despite international experience on the treatment of chronic heart failure where is used exercise training as an integral and core component in achieving the goals of treatment for patients with heart failure, in Ukraine there is no exercise training program (exercise cardiac rehabilitation program) for patients with heart failure to maintain or improve their functionality and therefore quality and length of the life.

It is established the necessity to develop the program of exercise training for children with heart failure that must be included in a comprehensive rehabilitation program. Structured physical rehabilitation program should be accessible to all children with heart failure that can safely take part in it.

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