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Optimization of Rehabilitation Measures in Children with Respiratory Diseases

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Abstract Pulmonary rehabilitation has established itself as a fundamental component in the treatment of chronic respiratory diseases. Patients shared intolerance to exercise, respiratory muscle dysfunction, nutritional alterations, problems of social adaptation, and psychological dysfunctions. They present with respiratory symptoms, impaired lung function, and poor quality of life. Children with chronic respiratory diseases should be evaluated by the respiratory rehabilitation team to decide best clinical management. To accomplish pulmonary rehabilitation, it is mandatory to perform a complete assessment, adequate treatment, and continuous education.

Keywords Psychological dysfunctions, Optimization, Rehabilitation measures, Children with respiratory diseases

1. Introduction

In the structure of diseases of children entering the Chertovitsky children's sanatorium for rehabilitation over the past 5 years, the leading place was occupied by respiratory diseases, while there was an upward trend in this group of diseases: 2001 - 24.42%, 2005 - 30.10%. Next, in descending order, were diseases of the nervous system (mainly disorders of the autonomic nervous system); diseases of the musculoskeletal system (posture disorders, scoliosis); pathology of the gastrointestinal tract. This allows you to plan a complex of sanatorium rehabilitation and optimally distribute the load on the structural divisions of the sanatorium. In children of all the studied groups, a reduced resistance to hypoxia was revealed (24-49%); adverse reaction from the cardiovascular system to physical activity (56-84%) with the highest frequency of occurrence in children with bronchial asthma.

The use of a complex, purposeful sanatorium treatment developed by us improves clinical and functional indicators: it significantly increases resistance to hypoxia by 2.3 times (recurrent bronchitis, bronchial asthma) and the functional state of the cardiovascular system by 1.9 times. Severe immunological disorders were detected in 46.87% of patients with bronchial asthma and 48.57% of patients with chronic tonsillitis. There were predominantly II degree of immunological disorders in the T-cell link in both clinical groups and an imbalance in the levels of immunoglobulins in children with chronic tonsillitis. Against the background of the developed rehabilitation complex, a significant decrease in the severity of immunological disorders was noted: in patients with bronchial asthma, the total number of T-lymphocytes was normalized, and the deficiency of Tchl-lymphocytes decreased; in patients with chronic tonsillitis - normalization of the levels of all immunoglobulins. In the control group, a trend towards improvement in immunological parameters was registered only in children with bronchial asthma. Published peer-reviewed literature informs us that anatomical lung resection offers the best prospect of long-term survival in patients with non-small cell lung cancer. In view of the dismal prognosis and long-term survival of un-resected bronchial cancer, surgical resection should be considered for every patient with anatomically resectable disease to improve prognosis and survival. However, the demographic of patients with resectable lung cancer is getting older and patients may have frailty and smoking related cardiopulmonary disease with reduced pulmonary function. Loss of lung tissue in such patients may grossly impair post-operative ventilatory function or diffusion capability predisposing them to dyspnoea, cardiopulmonary complications and death. Hence, some patients with significant dyspnoea, poor performance status, borderline or poor pulmonary function are considered in-operable and referred for radiotherapy, systemic anticancer treatment or palliative care instead. Respiratory diseases occupy a leading place in the structure of general morbidity in childhood. The most common of these are acute upper respiratory tract infections and influenza. It is noted that about 70% of all cases of acute respiratory diseases (ARI) in pediatric practice

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occur in children aged 1 to 7 years. It is noted that frequent acute respiratory infections can adversely affect the health of children, changing the functional activity of the body's compensatory mechanisms and contributing to the formation of chronic foci of infection, a decrease in physical and neuropsychic status. It has also been established that in some cases recurrent infections can contribute to the development of social maladaptation. In this regard, in pediatric practice, special attention is paid to the prevention of respiratory infections and the search for new, more effective ways to improve children's health. At the same time, a special place in the system of rehabilitation of sick children is occupied by the stage of sanatorium rehabilitation.

Restorative treatment should be carried out taking into account the etiological and pathogenetic mechanisms of the disease, the individual characteristics of the child. Improvement of children can be carried out in the conditions of rehabilitation centers, rehabilitation departments of polyclinics, specialized children's preschool institutions, sanatoriums (local and resort), sanatorium and general camps, dispensaries. At the same time, of course, the continuity of health-improving measures at all stages of medical care is important. Important importance in the rehabilitation of children with respiratory diseases is attached to sanatorium-and-spa treatment, which, as you know, is highly effective.

A promising modern form of organizing the rehabilitation of children is their recovery in the conditions of specialized children's sanatorium institutions, such as the Children's Sanatorium No. 3 "Alou" GKP with a pulmonological profile. The activity of the sanatorium is focused on the implementation of the State Program for the reform and development of healthcare in the Republic of Kazakhstan. The personnel potential of the sanatorium is improved every year in the direction of regular professional development in accordance with the approved plans.

The following units operate in the sanatorium: a physiotherapy room, a hydropathic clinic, a swimming pool, an exercise therapy room, an ENT room, a clinical laboratory, a dental room, a speleotherapy room, a heliotherapy room, and a psychological unloading room. In order to organize qualified sanatorium treatment of children, a program has been developed for the comprehensive rehabilitation of children with bronchopulmonary pathology, which reflects the stages of rehabilitation:

Stage 1 - adaptation; Stage 2 - sanatorium rehabilitation; Stage 3 - improving activities in dynamics with individual correction; Stage 4 - consolidation of health-improving skills; Stage 5 - recommendations for healing methods at home.

Work is underway to introduce new technologies, such as: speleotherapy with the Vulkan-1 ultrasonic inhaler, modified electrophoresis with Ca Cl and ascorbic acid longitudinally along the spine, electrophoresis with KI on the chest, light therapy using a stationary Bioptron lamp for diseases of the bronchopulmonary system, electrophoresis mineral water on the epigastric region with alternating electrophoresis with vitamins, new types of breathing exercises and various types of dynamic loads. For physical education of preschool children, new elements of ancient health technologies, such as tailing, qigong, have been introduced.

Pulmonary rehabilitation (PR) is an important therapy for patients with chronic and advanced lung diseases, providing benefits of improved physical conditioning and optimized psychological health. There is a clear role for adult patients with COPD. Furthermore, PR has been shown to have positive effects in adults with interstitial lung disease (ILD) and pulmonary hypertension (PH). While there is a paucity of evidence of formal PR in cystic fibrosis (CF), exercise programs in general provide benefit in CF and non-CF bronchiectasis.

Important components of successful PR have recently been described. Key features include an initial (pre-PR) assessment of physical fitness, respiratory symptoms, and nutritional status; structured exercise training that is individually prescribed and monitored to best achieve improvements, and close clinical follow-up. Participation in PR also provides important opportunities to optimize behavioral and psychological aspects of a patient’s care, improve adherence, and promote education. Therefore, PR programs are commonly utilized for patients with advanced lung disease undergoing evaluation for lung transplantation. Lung transplant candidates benefit from improving exercise capacity, endurance, muscle strength and overall physical functioning as they prepare for transplant. [5] A transplant team can also use the PR program to ensure proper patient adherence and commitment to therapy, while providing important education. Following lung transplant, PR is often an essential component of recovery.

The role of formal PR programs in pediatric patients is poorly understood. While adult PR programs are common in many communities, formal PR centers for children are few and referrals may be underutilized. Adolescents and older children may be able to participate in PR structured in a similar fashion to adult programs, but younger children are unlikely to be able to do the same types of exercises and interventions. Effective pediatric PR must be individually tailored to a child’s age, functional capacity, and psychological ability to engage. Our group and others have demonstrated that a structured pulmonary rehabilitation program has positive effects on children with asthma, particularly those with co-morbid obesity. Home based PH may also be utilized in this asthmatic population. [9] while there is very limited published data on the effectiveness of PR in children with advanced lung disease, we believe that there is benefit in those patients old enough and physically able to participate. We have utilized PR in children with advanced CF lung disease, ILD and PH, including those awaiting lung transplantation. While our experience has not been published, we believe that a pediatric-focused exercise program has improved physical function and endurance. It has also seemed to have benefit on the nutritional and psychological well-being of these chronically ill children. Our pediatric transplant center has utilized PR regularly in children old enough to participate in the pre-transplant

period, as well as following surgery. Choi, et al have recently published a case report of PR being a successful intervention in a 10 year-old following transplant for bronchiolitis obliterans. [10] We advocate for more children's hospitals to develop formal PR programs, and for further clinical investigation into the benefits it may provide.

Much attention in the rehabilitation of children with frequent respiratory diseases is given to a rational diet, which should be balanced in terms of the main food ingredients, taking into account age and individual characteristics. The daily diet necessarily includes fresh vegetables, fruits, berries, natural juices. A promising menu is being developed, the caloric content of dishes is calculated monthly, which, according to the results of the analysis of the GorSES, meets the standards. It should be noted that the cost of one bed-day for food increases annually (from 280% to 500% over the past 4 years).

Health education is one of the most important elements of preventive work. This is an important link in the work of a doctor of any specialty. The issues of health education are currently relevant for all countries of the world. People are becoming increasingly aware of the impact that lifestyle and behavioral habits have on health. According to the International Union for Health Education in all European countries, among the population groups that require special attention, expectant mothers, parents, schoolchildren and "located in recovery centers, health resorts, sanatoriums and rest homes" appear. And this is no coincidence. Sanatoriums are not only a medical and preventive and health institution, but in the full sense of the word a school of health.

The fastest recovery of health, the transition of the child to normal living conditions are facilitated by vigorous activity, classes. The proposed complex of therapeutic rehabilitation of children with respiratory pathology, including non-selective chromotherapy, exogenous electromagnetic field and quantum therapy, peloelectrophoresis, inhalations with "Tonus-plus", immunomodulation cycloferon, showed significant clinical efficacy in children with mild and moderate bronchial asthma degree in remission (efficiency ratio 1.8±0.4), with recurrent bronchitis (efficiency ratio 1.7±0.4), slightly lower in patients with chronic tonsillitis (efficiency ratio 1.5+0.2). The developed computer program allows for the selection and correction of rehabilitation procedures, increasing the efficiency and quality of rehabilitation. A decrease in acute respiratory morbidity by 2-2.2 times and a decrease in exacerbations of chronic diseases by 1.8-2 times in follow-up were registered.

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