Modern Trends in the Architectural and Planning Organization of Rehabilitation Centers for People with Pathology of the Musculoskeletal System

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Abstract. The purpose of the article is to reveal modern directions of architectural and planning organization of rehabilitation centers for people with locomotor apparatus pathology. The research is based on the study of world experience in the design and construction of rehabilitation centers in order to identify the functional composition of the premises and the planning organization. The attention is focused on the demand for the mentioned objects. The conclusion about the necessity of complex approach with attention to landscape organization and socialization is made which will increase comfort and quality of medical services. The results of the study have been tested in an experimental project of the rehabilitation center in Samara. As a result of the study the necessity of building such facilities in Russia is emphasized. The experience of foreign countries needs adaptation to Russian conditions.

1. Introduction

Diseases of the musculoskeletal system are the most common among the elderly people, whose number is increasing every year around the world. According to demographic forecasts, the proportion of the population over 65 years in economically developed countries will increase to 22.5% by 2030. This makes musculoskeletal system diseases not only a medical and social problem, but also an economic problem for the society as a whole. That is why the World Health Organization declared the first decade of the 21st century the “Bone and Joint Decade” (Bone and Joint Decade, 2000-2010), specifically highlighting such diseases as osteoarthritis, osteoporosis, low back pain, rheumatoid arthritis and traumatic injuries. The growth of these diseases contributes to an increase of disability and the number of disabled people [1].

Often the progressive increase in the population that has been disabled is not related to the severity of the pathology, but to the untimely provision of medical care and the lack of rehabilitation quality. Since Russia does not have enough places and centers for the rehabilitation of such diseases, “medical tourism” is now developed. The most popular destinations are Israel and Germany. These countries have achieved the highest level of medical care, using the most modern technologies and methods. They also apply a complex approach to rehabilitation with a team of specialists working in various fields, developing a special diet for patients, selecting a particular treatment method for each individual. In addition, rehabilitation includes a variety of therapies, organizes sanatorium treatment and various types of recreational activities.
According to the study “Global Disease Burden” musculoskeletal diseases are on the second place causing disability around the world. The diseases are the consequence of incapacity for work. The productivity in the workplace falls. According to Rosstat the number of disabled people in Russia is 12,26 million, 600 thousand of them have musculoskeletal system pathologies. Despite 4% decrease in the figures since 2010, the actual data are different: a significant number of people with impaired motor functions are not officially registered as disabled [2-4].

The above information shows the relevance of the problem under consideration, as well as the need to search for architectural and planning solutions that meet the requirements of modern consumers in the quality medical services. That is why it is necessary to pay attention to the study of functional composition of premises and organization of planning solutions, to identify new trends in the design and construction of such facilities, which will take into account the complex treatment with the organization of leisure and recreation, holding public events [5, 6].

2. Materials and methods
The theoretical basis of the study was the fundamental work and research of Tsvetkova L. Yu., who developed scientifically-based recommendations for the design of training and rehabilitation centers for children with disorders of the musculoskeletal system. Gaiduk A. R. reveals the architectural principles of space-planning organization. Gagarina L. G. reveals the structure for creating an accessible and informative environment. Fidanyan L. R. concludes that it is necessary to create a natural environment with a complex of buildings. Bardina N. V. studies the problem from an ecological point of view and the introduction of a properly organized landscape into the architectural environment. Nurgabylov U. U., Isakov O. A. propose the creation of flexible planning solutions that can be transformed under new functions.

This study solves the following tasks: analysis and summary the foreign experience of designing rehabilitation centers and identification of the functional composition and modern approaches to the architectural and planning organization of rehabilitation centers.

3. Results
International experience in the design and construction of rehabilitation centers shows a variety of original architectural and planning solutions, with attention to green standards. For example, at the Bridgepoint Active Healthcare Rehabilitation Center (Canada, Toronto, Stantec Architecture + KPMB Architects + HDR Architecture + Diamond Schmitt Architects, 2003), socialization and the role of landscape are parts of therapy, so the building has been designed with many spaces and for patients, staff, such as a terrace on the ground floor with a cafeteria, a therapeutic pool with panoramic windows to the garden, an extensive green roof terrace. The center offers a beautiful view of the surrounding park and cityscape [7] (figure 1a). Vandhalla Egmont Rehabilitation Center (Denmark, Odder, arch. Bureau CUBO Arkitekter + Force4 Architects, 2013), created for people with disabilities. The functional center is formed around the changing room and surrounded by various leisure functions. The main feature is the swimming pools and water slides, which are fully accessible for wheelchair users via lifts and ramps. Also, this center is equipped with a multifunctional hall [8] (figure 1b). The Rehabilitation Center Groot Klimmendaal (Netherlands, architect bureau Koen van Velsen, 2011), despite its size, is in harmony with the natural environment. Glazing along the entire perimeter of the first floor provides a connection between the exterior and the interior. In addition to the medical department, there are building houses a swimming pool, fitness, restaurant and a theater. The concept of treatment is based on the fact that the environment has a beneficial effect on the patient condition [9] (figure 1c).

Generalization of the best world experience in the design and construction of rehabilitation centers for people with disabilities showed that in many facilities, in addition to the admission department, the department of medical and social rehabilitation, the medical engineering service, and so on, the emphasis is placed on various methods of socialization of personnel and patients with the help of atrium spaces, terraces, recreational spaces. Also, special attention is paid to the sports block with swimming pools, adapted for the use of wheelchair users, multifunctional halls, fitness and leisure functions. Surely, in
almost all the projects, special attention is paid to energy efficient technologies and the role of landscape organization of the site.

**Figure 1.** Foreign experience in the design of rehabilitation centers: a) Bridgepoint Active Healthcare, Canada, Toronto, arch. bureau Stantec Architecture + KPMB Architects + HDR Architecture + Diamond Schmitt Architects, 2003 [7]; b) Vandhalla Egmont Rehabilitation Center, Denmark, Odder, arch. Bureau CUBO Arkitekter + Force4 Architects, 2013 [8]; c) Rehabilitation Center Groot Klimmendaal, Netherlands, arch. bureau Koen van Velsen, 2011 [9].
4. Discussion
As a result of the study, it is possible to identify the functional composition of rehabilitation centers for people with disabilities: an admission department, a control unit, a department with wards and staff rooms, a catering unit with a dining room, a medical and engineering service, a department of psychological and pedagogical assistance, a medical department, social rehabilitation with units of rehabilitation treatment and physical methods of treatment, which are introduced with a developed block of thermohydro therapy with a swimming pool, as well as a social and cultural center with a sports block and leisure facilities. Also, communication between the blocks is carried out using recreational spaces, recreation areas and terraces. It should be noted that it is necessary to consider the problem of designing rehabilitation centers in a comprehensive manner, combining the planning techniques with the organization of the landscape, which will undoubtedly affect the quality of receiving and providing rehabilitation and medical services.

The identified trend of the architectural and planning organization of rehabilitation centers for people with pathology of the musculoskeletal system were tested on an experimental project (figure 2). The pilot project was carried out in Samara in the Kirovsky district, in close proximity to the clinical hospital “Mother and Child”. The center consists of several functional blocks: an admission department, a department of medical and social rehabilitation, a medical and engineering service, a department of psychological and pedagogical assistance, an accommodation unit and a control unit. All blocks are located in the same building, but are separated by recreational areas, spacious corridors, public spaces. There is a separate block of premises for the pool, sports and gym, premises for social rehabilitation, such as music therapy, art studio, art studio, etc. On the territory of the center there is a parking lot for visitors, a large walking area with sports grounds and places for recreation. The architectural and planning solution of such a center was created taking into account the functions necessary for rehabilitation, so that a person can carry out all the required medical recommendations.

![Figure 2. An experimental project of a rehabilitation center with pathology of the musculoskeletal system in Samara. Student Podkovyrova Daria, teacher Zhdanova I.V. Samara State Technical university.](image)

5. Conclusions
As a result, it should be emphasized that in world practice, the design and construction of rehabilitation centers for people with pathology of the musculoskeletal system is a relevant direction. For Russia, the design of such centers is relevant and requires the introduction of modern directions of the architectural and planning organization of these facilities. Therefore, it is necessary to introduce comprehensive
approaches, relying on the experience of foreign countries. At the same time, the must experience of foreign countries should be adapted to Russian conditions.

Foreign experience shows the need to pay particular attention to socialization, as an important therapy part, as well as the influence of landscape organization in the design and construction of rehabilitation centers. The introduction of recreational spaces and recreation areas with a developed block of rehabilitation facilities will contribute to more comfortable and faster recovery [10].

6. References

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