Quality Assessment and Medical Rehabilitation Efficiency in the Kyrgyz Research Institute of Balneal Therapy and Rehabilitation Treatment

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Abstract: The use of physical factors of treatment in the complex of sanatorium-resort rehabilitation made it possible to statistically significantly improve the results of the sanatorium-resort stage of treatment. The analysis of the data obtained confirms that the proposed by us rehabilitation programs of medical rehabilitation in a sanatorium-resort institution turned out to be 91.4% effective.

Key words: efficiency, physical factors, sanatorium-resort stage, rehabilitation, result.

INTRODUCTION

In terms of patients' morbidity who received rehabilitation treatment at the Kyrgyz Scientific Research Institute of Balneology and Rehabilitation (or KSRI of BR), over the past 5 years, the leading position was made up of osteoarticular diseases 56.2%, cardiovascular diseases 17.3%, andpulmonological 8,3% of the disease in patients who received rehabilitation treatment (table 1).

The material of a descriptive retrospective study was the case histories of 1,500 patients who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2017.

RESEARCH METHODS

*Clinical research methods:*The study of patients began right at the moment of admission to the clinical units of the Kyrgyz Scientific Research Institute of Balneology and Rehabilitation (or

KSRI of BR). All patients underwent a general clinical examination, which included a collection of complaints, life history, medical history, with the determination of anthropometric parameters (such as height, weight, waist and hips, BMI calculation and measurement of SBP and DBP. and comorbidities and their risk factors.

In patients with a neurological profile, the neurological status was additionally assessed, in patients with pathologies of the musculoskeletal system, the condition of the affected joints was assessed using a pain analysis using a visual analog scale (VAS), in pulmonary patients, spirometry and peak flowmetry were included.

*Instrumental research methods:*Instrumental methods in cardiac patients included tonometry, electrocardiography (BIOSET-5000 apparatus, Switzerland), 24-hour ECG and BP monitoring (Inkart 24-hour monitoring system, Russia), and a six-minute walk test. The morphometric parameters of the heart, indicators of intracardiac hemodynamics, contractile and diastolic activity of the myocardium were assessed by echocardiographic examination (ALOKA ultrasound scanner, Japan). These studies, performed in all patients before and after treatment, were carried out according to standard methods (Mukharlyamov, N.M. Ultrasound diagnostics in cardiology. / N.M. Mukharlyamov, Yu.N. Belenkov. - Moscow: Medicine, 1981. - 158 p.; Roitberg, G.E. Laboratory and instrumental diagnostics of diseases of internal organs / G.E. Roitberg, A.V. Strutynsky. - Moscow: Binom, 1999. - 621 p. 169). An ECG was recorded using an apparatus in 12 conventional leads according to the standard technique at admission, if necessary, during a stay in the department for dynamic observation and at discharge from the hospital to assess the effectiveness of medical rehabilitation.

The 6-minute walk test was performed in the morning on an empty stomach in patients after discontinuation of concomitant therapy for 24 hours. The patient was explained that they needed to walk at an acceptably fast pace the maximum distance along the marked corridor (1 meter each) for 6 minutes. If the patient stopped to rest, the time spent on this was included in the overall test (ATS Statement: Guidelines for the Six-Minute Walk Test. 2002).

Physical activity parameters according to the New York Heart Association Guidelines (NYHA, 1994)

(NYHA)	Distance traveled in 6 minutes
0	>551 meters
I	From 426 to 550 meters
II	From 301 to 425 meters
III	From 151 to 300 meters
IV	<150 meters

ECG monitoring

It should be especially noted that this method makes it possible to identify episodes of ischemia in a severe contingent of patients with the threat of complications such as the development of ischemia. ECG monitoring is also used to assess the effectiveness of antianginal therapy in patients with painless myocardial ischemia (or PMI). ECG monitoring was performed in patients to detect cardiac arrhythmias and painless ischemia on the device. The number and total duration

of recorded episodes of myocardial ischemia, the ratio of the number of painful and painless episodes of ischemia, the number of rhythm and conduction disturbances occurring during the day, as well as daily heart rate fluctuations and other signs (Ambulatory ECG Monitoring. Holter Monitor and Patient - Activated Event Recorder. 2007; De Backer G. et al., 2003; Hense WH, 2003).

The ECG monitoring method (according to the Holter method) allows you to register ST-segment depression, its duration, relationship with human activity during the day, the dependence of ischemic episodes on heart rate and their circadian status. The criterion for myocardial ischemia during ECG monitoring in asymptomatic patients is ST-segment depression by 2 mm, while its duration should be at least 1 min, and the interval between ischemic episodes should be more than 1 min. Physical training was carried out on a cardiac rehabilitation complex, 'Schiller' with computer control of ECG and blood pressure.

In patients, the list of instrumental methods with pathologies of the musculoskeletal system included X-ray joints examination with the osteoarthritis stage assessment according to Kellgren-Lawrence, (Rheumatology. National guidelines. - Moscow: Geotar Media. - 2008. - 746 p.).

Instrumental methods of examining neurological patients included an assessment of the neurological status with the study of basic reflexes, muscle tone, impaired sensitivity and pain syndrome profile, indicators study of spine biomechanical mobility (i.e. lateral flexion in the lumbar spine, supportability, flexion in the lumbar spine (modified Schober test), measuring the distance from the tragus to the wall, assessing the rotation of the spine in the cervical spine), as well as analyzing indicators of limitation of vital functions and functional activity of the patient (Oswestry index, Roland-Morris index, motor test) (Doherty, M. Clinical diagnosis of joint diseases / M. Doherty, J. Doherty / Translated from English by A.G. Matveykov. - Minsk: Tivali, 1993. - 144 p.; Neurology. National leadership. - Moscow: Geotar Media. - 2012. - 1040 p.).

Laboratory studies included: The minimum required when transferring a patient from the previous stage of rehabilitation to the next one:

- bloodtest, including leukocyte count and platelet count;
- INR (International Normalized Ratio), fibrinogen in people taking oral anticoagulants;
- fasting plasma glucose and, if possible, glycosylated hemoglobin (HbA1c);
- plasma electrolytes; sodium, potassium, magnesium, calcium, blood chlorides;
- blood lipid spectrum; total cholesterol, triglycerides, LDL or Low density lipoproteins, LLD or Lipoproteins of very low density, HDL or High density lipoproteins, atherogenic coefficient.
- liver function tests (Aspartate aminotransferase, Alanine aminotransferase in statin therapy);
- indicators of renal function (creatinine, urea in blood plasma in patients with Chronic renal failure).

and other biochemical parameters (total bilirubin, C-reactive protein, thymol test, Aspartate aminotransferase, Alanine aminotransferase).

Laboratory studies are designed to identify those conditions that can be assessed as a risk factor and may affect the prognosis (Horne B.D. et al., 2005; Guclu F. et al., 2004).

*Psychophysiological research methods:*studies, the assessment of the psychophysiological status of patients was carried out before and after treatment using the methodology for assessing their

well-being, activity and mood, as well as personal and situational anxiety according to Spielberger-Khanin (Psychophysiology: Textbook for universities. 4th ed. / Ed. by Y. I. Alexandrova. - St. Petersburg: Peter, 2014. - 464 p.).

STUDY RESULTS

Table 1. Nosological forms of patients who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2017.

№	Nosological forms of diseases	2013	2014	2015	2016	2017
1	Cardiovascular diseases	1699 14.6%	2599 22.7%	1728 17.1%	1920 18.5%	2049 17.5%
2	Cerebrovascular disease	661 5.6%	932 8.2%	646 6.4%	942 9.1%	971 8.3%
3	Pulmonary diseases	641 5.5%	670 5.9%	636 6.3%	582 5.6%	965 8,3%
4	Diseases of the gastrointestinal tract	478 4.1%	421 3.7%	426 4.2%	461 4.4%	479 4.1%
5	Diseases of the genitourinary system	711 6.1%	798 6.9%	754 7.5%	886 8.5%	564 4,8%
6	Osteoarticular diseases	6709 57.7%	6567 57.5%	5543 54.8%	5462 52.6%	6551 56.2%
7	**TOTAL**	**11633**	**11413**	**10101**	**10371**	**11653**

As the results of the study showed, out of 500 patients (average age 57.1 ± 10.0 years), there were 371 men (74.2%), and 129 women (25.8%). The average age of men was 56.2 ± 10.7 years, women 60.0 ± 8.9 years (table 2).

Table 2. Age characteristics of patients who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2017.

Age	Number of patients (%)	Male (%)	Female (%)
≤40	19 (3,8%)	12 (2,4%)*	7 (1,4%)*
41-50	75 (15,,0%)	55 (11,0%)*	20 (4,0%)
51-60	190 (36,2%)	146 (37,1%)*	44 (33,1%)
61-70	137 (27,4%)	92 (18,4%)*	45 (9,0%)
71-80	65 (13,0%)	21 (4,2%)*	44 (8,8%)*
> 81	14 (2,8%)	4 (0,8%)	10 (2,0%)*

Note: *$p<0,05$ – reliability of differences between groups (men and women)

The results of the statistical analysis showed that in the age categories up to 40 years old and from 41 to 70 years of age, males were significantly more likely to receive rehabilitation

treatment, and in the age category over 71 years old women predominated (p <0.05), and in the age category under the age of 55 years for men and up to 75 years for women, the use of rehabilitation treatment increases by 146 (37.1%) and 45 (9.0%) people, respectively. Depending on employment, the main contingent was working patients were 267 (53.4%), of whom 194 (38.8%) were engaged in mental work, 73 (14.6%), pensioners were 233 (46.6 %) men.

According to clinical symptoms in patients who received rehabilitation treatment from 2013 to 2018. Showed the following analysis results (table 3)

Table 3. Clinical indicators of patients with coronary heart disease who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2018.

Indicators	Observation group N=500		Comparison group N=250	
	Before rehabilitation	After rehabilitation	Before treatment	After treatment
Duration of anginal attack	0,87±0,06	0,16±0,02*	0,85±0,07	0,51±0,08
Pain intensity	0,45±0,02	0,07±0,01*	0,44±0,03	0,20±0,04
Frequency of anginal attack	0,59±0,06	0,23±0,05	0,53±0,05	0,37±0,04
Dyspnea	0,71±0,04	0,37±0,02*	0,69±0,04	0,47±0,05
Heart palpitations	0,57±0,03	0,27±0,03*	0,61±0,04	0,45±0,06*
Fast fatiguability	0,85±0,04	0,23±0,02*	0,81±0,03	0,36±0,04*

Note: * - $p<0,05$ - reliability of differences in the average values of indicators compared with the initial data.

In terms of such indicators as the duration of anginal attacks and discomfort in the chest, the intensity of pain in the chest, the frequency of pain attacks, the severity of shortness of breath and fatigue, according to our clinical observations in the observation group at the end of rehabilitation treatment were 2-3 times lower. than in the comparison group, which is due to the positive influence of rehabilitation programs developed based on the pathogenesis of coronary (ischemic) syndrome in the examined patients in the cardiology department of the Kyrgyz Research Institute of Balneology and Rehabilitation. Also, exercise tolerance improved in cardiac patients after receiving a rehabilitation complex of treatment in a hospital (table 4).

Table4. Dynamics of indicators of exercise tolerance in patients with coronary heart disease according to the results of a 6-minute walk test.

Indicators	Observation group n= 500		Comparison group n = 250	
	Before rehabilitation	After rehabilitation	Before treatment	After treatment

Systolic blood pressure at load altitude	203,72±1,33	192,13±1,60	197,14±2,02	195,94±1,94
Heart rate at load height Beats per minute	144,45±0,99	121,42±0,91	140,11±1,32	139,02±1,22
Heart rate after 5 minutes of rest	89,23±0,84	78,98±0,74	92,13±1,15	90,62±1,12

Note: p<0,05 - reliability of differences in the average values of indicators compared with the initial data.

The analysis of exercise tolerance indices according to the 6-minute walking test showed that in the observation group after treatment the Systolic blood pressure indices at the load height, heart rate after 5 minutes of the recovery period significantly decreased, as well as the parameters of the threshold heart rate passed by the patient during the 6-minute walk test, which characterizes the increased tolerance of the patients of the observation group to physical activity. From instrumental examinations, ECG monitoring was performed (table 5).

Table 5. Study of 24-hour ECG monitoring parameters in patients who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2018

Indicators	Observation group n=125		Comparison group n=65	
	Before rehabilitation	After rehabilitation	Before rehabilitation	After rehabilitation
Ischemia episodes	1,15±0,08	0,95±0,04	1,18±0,10	1,13±0,08
Duration of ischemia	2,95±0,12	2,07±0,06	3,14±0,12	2,98±0,10
Threshold heart rate beats / min	115,01±2,13	117,09±2,08	113,02±3,11	115,04±3,41
Rhythm disturbances	1,93±0, 05	1,32±0,05	1,87±0,08	1,75±0,09

Note: p<0,05 - reliability of differences in the average values of indicators compared with the initial data.

The study of the parameters of 24-hour ECG monitoring showed that in the observation group after treatment the duration and number of ischemic episodes significantly decreased over the last day, the rate of cardiac arrhythmias decreased and the threshold heart rate of ischemia increased, which characterizes the significant anti-ischemic and antiarrhythmic effect of rehabilitation programs in this group. The comparison group also significantly decreased the number and duration of ischemia, as well as the number of ventricular extrasystoles, which, however, did not reach the values identified after treatment in the observation group.

Analysis of patients with musculoskeletal diseases who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2017.

272 patients (i.e. men – 102 and women - 170) with different articular localization (knee - 178, hip - 34 patients, shoulder joints - 60) were under observation. The patients were divided into 2 groups: the observation group - 140 patients and the comparison group - 132 patients. The examination carried out before the start of treatment confirmed the clinical homogeneity of the main group and the comparison group (table 6).

Table 6. Characteristics of patients with musculoskeletal diseases who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2017

Indicators	Observation group n=140		Comparison group n=132	
	Females 90 (64,2%)	Males 50 (35,7%)	Females 82 (62,1%)	Males 50 (37,9%)
Hip	10 (11,1%)	10 (20,0%)	8 (9,7%)	6 (12,0%)
Shoulder	15 (16,6%)	15 (10,7%)	15 (18,3%)	15 (30,0%)
Knee	60 (66,6%)	42 (69,3%)	40 (48,7%)	36 (58,0%)

In terms of such indicators as pain on the visual analog scale pain, the dosage and frequency of administration of Non-steroidal anti-inflammatory drugs, joint stiffness, the average indicators in the observation group at the end of treatment were 1.5-2.5 times or lower than in the comparison group, which is probably due to the stronger pathogenetic influence of rehabilitation programs developed based on clinical protocols on the main links of the pathogenesis of osteoarthritis in the examined patients (table 6).

Table 6. The clinical status indicators of patients with osteoarthritis who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2017

Indicators	Observation group n= 140		Comparison group n=132	
	Before rehabilitation	After rehabilitation	Before treatment	After treatment
Visual analogue scale pain (points)	3,42±0,27	1,21±0,23	3,18±0,34	2,68±0,31
Taking Non-steroidal anti-inflammatory drugs	0,38±0,09	0,09±0,02	0,39±0,07	0,29±0,06
Pain	21,04+2,23	13,02+2,21	25,62±3,13	19,92±3,74
Stiffness	15,07±1,92	9,07±1,56	8,86±2,71	6,06±2,53
Dysfunction	49,12±6,35	31,15±5,62	45,64±9,23	40,71±8,92

Note: $p < 0,05$ - reliability of differences in the average values of indicators compared with the initial data.

During the implementation of rehabilitation programs based on the clinical protocols developed by us, a pronounced psycho-corrective therapeutic effect is formed in patients with osteoarthritis, characterized by an increase in such psychophysiological parameters as improved well-being, increased physical activity, improved mood, and accompanied by a decrease in the patient's anxiety level, improved sleep, etc.

Analysis of indicators characterizing the degree of joint damage and the severity of degenerative-dystrophic processes showed that in the observation group after treatment, the volume of intra-articular fluid and joint circumference significantly decreased, which characterizes a decrease in the activity of degenerative-dystrophic processes (table 7).

Table 7. Dynamics of instrumental parameters in patients with osteoarthritis who received treatment from 2013 to 2017

Indicators	Observation group n=140		Comparison group n=132	
	Before rehabilitation	After rehabilitation	Before treatment	After treatment
X-ray stage according to Kellgren-Lawrence	1,93±0,12	2,51±0,08	1,44±0,11	1,52±0,23
Knee circumference, cm	21,52±0,34	19,12±0,31*	20,68±0,30	20,62±0,30*
Intra-articular fluid volume, ml	1,08±0,06	0,67±0,05*	1,14±0,12	0,97±0,08*

Thus, medical rehabilitation based on rehabilitation programs makes it possible to increase the overall effectiveness of treatment at the sanatorium stage.

Analysis of patients with bronchopulmonary diseases who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2018.

Currently, chronic obstructive pulmonary disease (chronic obstructive pulmonary disease is a widespread disease, especially among the population of industrialized countries of the world, with a tendency to increase in the coming decades (Schwartz G.Y., Tsoi A.N. Anticholinergics in the treatment of patients with chronic obstructive pulmonary disease). Shchegolkov A. age (table 8).

Table 8. Age characteristics of patients who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2018

Age	Number of patients n (%) - 500	Males n (%) - 140	Females n (%) - 360
≤40	30 (6,0%)	2 (1,4%)*	28 (7,7%)*
41-50	75 (15,0%)	35 (25,0%)*	120 (33,3%)
51-60	190 (38,0%)	49 (35,0%)*	134 (37,2%)
61-70	167 (33,4%)	52 (37,1%)*	43 (11,9%)

| 71-80 | 34 (6,8%) | 2 (1,4%)* | 30 (8,3%)* |
| > 81 | 4 (0,8%) | 0 (%) | 5 (1,3%)* |

Note: *p<0,05 – reliability of differences between groups (men and women). The clinical manifestations of chronic obstructive pulmonary disease were also analyzed (table 9).

Table 9. Indicators of the clinical status of patients with chronic obstructive pulmonary disease who received rehabilitation treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2018

Complaints of patients with chronic obstructive pulmonary disease	Before rehabilitation n=500 (100%)	After rehabilitation n=500 (100%)
Cough	445 (89,0%)	78 (15,6%)
Dyspnea	323 (64,6%)	204 (40,8%)
Choking attacks	49 (9,8%)	7 (1,4%)
Chest pain	67 (13,4%)	31 (6,2%)
Weakness	219 (43,8%)	63 (12,6%)
Sweating	39 (7,8%)	5 (1,0%)
Fever	42 (8,4%)	-

To assess the severity of dyspnea for medical examination, the Medical Research Council (MRC) scale was published, published in 1952, and after modification was named MRC. It allows you to determine to what extent shortness of breath limits the patient's activity.

Modified dyspnea scale
(Modified British Medical Research Council Questionnaire)

Dyspnea severity	Patient complaints	Number of patients n= 500
0	I only get shortness of breath on very intense exertion	32 (6,4%)
1	I have shortness of breath when walking fast, getting up slightly	112 (22,4%)
2	Shortness of breath makes me walk slower when climbing than people of my age or makes me need to stop when climbing at a normal pace	240 (48,0)
3	I stop because of shortness of breath when walking about every 100 meters or climbing after a few minutes	93 (18,6%)
4	Shortness of breath prevents me from leaving the house or appears when changing clothes	23 (4,6%)

Gender plays an important role in respiratory diseases. At the same time, environmental factors have a significant impact on the development and course of respiratory diseases, since the largest peak of hospitalization coincided with the seasonality of the exacerbation of chronic diseases in the autumn-spring period.

Therefore, the gender and seasonality of the exacerbation of respiratory diseases should be taken into account both in the treatment of these diseases and in the development of measures for the prevention and rehabilitation of patients with this nosology.

The dynamics of clinical symptoms of chronic obstructive pulmonary disease were analyzed. The state of respiratory functions was assessed according to the results of spirography and daily 3-fold recording of peak flowmetry (table 10).

Table10. Indicators of spirography and peak flowmetry in patients with chronic obstructive pulmonary disease who received treatment at the Kyrgyz Research Institute of Balneology and Rehabilitation from 2013 to 2018

Indicators	Before rehabilitation n=250			After rehabilitation n=250		
	47 (18,8%)	183 (73,2%)	20 (8,0%)	152 (60,8%)	96 (38,5%)	2 (0,8%)
Vital capacity of the lungs, %	73-81	51-69	46-50	72-79	51-54	48-49
Maximum lung ventilation, %	55-73	39-54	31-35	73-81	49-54	35-36
Body Index	55-64	40-54	38-40	72-64	49-54	39-40
Forced expiratory volume, l/sec males	2,6-2,1	1,3-2,0	1,1-1,3	2,7-2,1	1,7-2,0	1,1
Forced expiratory volume, l/sec females	1,4-1,8	0,8-1,2	0,6-0,8	2,0-1	1,0-1,3	0,7-0,8
Forced expiratory volume1, %	55-74	36-54	33-35	85-73	55-75	35
Forced vital capacity of the lungs, %	70-84	51-69	47-50	89-73	69-74	49-50

The patients performed the 6-minute walk test without major complications. In one case, after the end of the test (after 3 minutes), there was a reaction in the form of a paroxysm of tachycardia up to 170 beats/min, which was stopped within 5 minutes without the use of medication, at rest. The minimum distance covered by the subjects in 6 minutes was 225 meters, the maximum was 529 meters.

The analysis of the test results showed a significant relationship between the distance traveled and age (Spearman's rho = 0.339, Sig <0.01); nevertheless, we did not find significant

differences in the indicator in comparative analysis with a step. The gradual accumulation of differences allowed us to group the subjects into the following age subgroups from 40 to 50 years old, from 51 to 60, and from 61 to 70 years of age. The differences between them reached the level of statistical significance (table 1). The table shows that the relationship with age is not linear, the test result increases from 40 to 50 years old but then decreases from the 61 to 70-year old subgroup.

CONCLUSION

1.The results of a study of 375 patients who received rehabilitation treatment over the past 5 years in the conditions of the (mid-mountain hospital) of the Kyrgyz Research Institute of Balneology and Rehabilitation showed that target blood pressure levels were achieved in 63% of patients, 42.3% stopped smoking, normalized cholesterol 61, 4%, impaired glucose tolerance normalized 100%, blood sugar 63.6%. Weight normalization reached 26% of the patient.

2. In patients with osteoarthritis, the effectiveness of treatment was shown by 75.5%, increasing the proportion of patients who achieved the criteria for high treatment efficacy, as well as reducing the risk of adverse outcomes by 1.8%.

3. When studying the results of the use of a complex (medication and non-medication) method of treatment in a mid-mountain hospital, its significant efficiency was found by 86% in patients with chronic obstructive pulmonary disease.

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