PHTHISIOLOGY

ORGANIZATIONAL ASPECTS OF MEDICAL REHABILITATION OF PATIENTS WITH RESPIRATORY TUBERCULOSIS

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ABSTRACT

Background. *Despite the visible successes of domestic phthisiology at the present time, the problem of medical rehabilitation of patients with tuberculosis remains relevant. In recent years, approaches to medical rehabilitation of patients with various diseases have changed significantly, which entail the need to consider a complex of rehabilitation measures for patients with tuberculosis from the perspective of the Procedures for organizing medical rehabilitation in adults and children and their integration into phthisiatric practice.*

The aim of the study. *To study the organizational aspects of medical rehabilitation of patients with respiratory tuberculosis in the world and the Russian Federation.*

Materials and methods. *We carried out an analysis of domestic and foreign literature, regulatory documents on the organization of rehabilitation for tuberculosis patients for 2018–2023 in electronic databases PubMed/Medline, Google Scholar using terms "tuberculosis, pulmonary/rehabilitation" in English and Russian languages.*

The results *show a growing amount of factual information demonstrating the positive effect of pulmonary rehabilitation in patients with respiratory diseases, including tuberculosis. The analysis revealed defects in the organization of the medical rehabilitation system in the structure of medical care for tuberculosis patients in the Russian Federation. This concerns problems of routing, phasing, organizational models, human and material resources, standardization of the main components of the rehabilitation process, the significance and effectiveness of certain rehabilitation measures, which leads to low availability of rehabilitation care for tuberculosis patients. Deficiencies in the regulatory framework prevent the integration of medical rehabilitation into the practice of TB services.*

Conclusion. *Modern issues of organizing rehabilitation care for patients with tuberculosis require further study and improvement. The development of a system of medical rehabilitation of patients with tuberculosis helps to increase the effectiveness of treatment, to reduce the number of complications, disability, mortality due to tuberculosis, and to increase the duration and quality of life of patients.*

Key words: *tuberculosis, post-tuberculosis pulmonary disease, rehabilitation, pulmonary rehabilitation, physical and rehabilitation medicine*

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ОРГАНИЗАЦИОННЫЕ АСПЕКТЫ МЕДИЦИНСКОЙ РЕАБИЛИТАЦИИ БОЛЬНЫХ ТУБЕРКУЛЁЗОМ ОРГАНОВ ДЫХАНИЯ

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РЕЗЮМЕ

Обоснование. *Несмотря на видимые успехи отечественной фтизиатрии в настоящее время, проблема медицинской реабилитации больных туберкулёзом остаётся актуальной. В последние годы значительно изменились подходы к медицинской реабилитации пациентов при различных заболеваниях, которые влекут за собой необходимость рассмотрения комплекса реабилитационных мероприятий у больных туберкулёзом с позиций Порядков организации медицинской реабилитации взрослых и детей и интеграцию их во фтизиатрическую практику.*

Цель исследования. *Изучить организационные аспекты медицинской реабилитации больных туберкулёзом органов дыхания в мире и Российской Федерации.*

Методы. *Выполнен анализ отечественной и зарубежной литературы, нормативно-правовых документов по вопросам организации реабилитационной помощи больным туберкулёзом за период 2018–2023 гг. в электронных базах PubMed/Medline, Google Scholar по терминам «tuberculosis, pulmonary/rehabilitation», «туберкулёз/лёгочная реабилитация».*

Результаты *показывают растущий объём фактических данных, свидетельствующих о положительном эффекте лёгочной реабилитации у пациентов с респираторной патологией, в том числе при туберкулёзе. Проведённый анализ выявил дефекты организации системы медицинской реабилитации в структуре медицинской помощи больным туберкулёзом в Российской Федерации. Это касается вопросов маршрутизации, этапности, организационных моделей, кадровых и материальных ресурсов, стандартизации основных составляющих реабилитационного процесса, значимости и эффективности тех или иных реабилитационных мероприятий, что ведёт к низкой доступности реабилитационной помощи для больных туберкулёзом. Недостатки нормативно-правовой базы препятствуют встраиванию медицинской реабилитации в практику фтизиатрической службы.*

Заключение. *Современные вопросы организации реабилитационной помощи больным туберкулёзом требуют дальнейшего изучения и совершенствования. Развитие системы медицинской реабилитации больных туберкулёзом способствует повышению эффективности лечения, снижению количества осложнений, инвалидизации, смертности по причине туберкулёза, увеличению продолжительности и качества жизни больных.*

Ключевые слова: *туберкулёз, посттуберкулёзное лёгочное заболевание, реабилитация, пульмореабилитация, физическая и реабилитационная медицина*

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INTRODUCTION

In the early 1990s, the World Health Organization (WHO) designated tuberculosis as a global health problem. Since then, efforts to confront the disease have increased and the statistics of tuberculosis cases have decreased [1].

The epidemic situation with TB in the Russian Federation (RF) in 2022 remains stable. The tuberculosis incidence rate remains at 31.0 per 100,000 population. The TB mortality rate in 2021 was 4.3 per 100,000 population. The prevalence of tuberculosis in the civilian population fell to a historic low (58.5 per 100,000 population). The prevalence of tuberculosis with bacterial excretion is 26.6 %; among patients discharging bacteria, 56.9 % are patients with multidrug-resistant tuberculosis. More than a quarter (26.1 %) of TB patients have concomitant HIV infection [2].

I.A. Vasilieva et al. revealed that «despite a significant decrease in the TB incidence rate in 2020, in 2021, the decline continued simultaneously with a heavier clinical structure of tuberculosis: an increase in the proportion of newly diagnosed tuberculosis patients with pulmonary tissue destruction, massive bacterial excretion and fibrotic cavernous tuberculosis' [3], which plays one of the leading roles in the causes of TB-related disability in Russia [4].

Thanks to new and constantly improving diagnostic and treatment methods, there are currently about 155 million individuals successfully treated from TB worldwide [5, 6]. However, both TB itself and chemotherapy can lead to irreversible effects in the body. Tuberculosis patients report a transition from an acute state to a life with multiple chronic conditions affecting post-tuberculosis pulmonary changes, neurological impairments, cardiac and psychiatric disorders leading to poor quality of life and increased risk of death [7-9].

Pulmonary rehabilitation is an important component of the recovery of patients with chronic lung disease. The official statement of the American Thoracic Society (ATS) and the European Respiratory Society (ERS) defines pulmonary rehabilitation as «a comprehensive intervention based on a thorough patient assessment, followed by individualised therapy, including but not limited to exercise, education and behaviour change, designed to improve the physical and psychological well-being of people with chronic respiratory disease and to promote long-term adherence» [10].

There is strong evidence that pulmonary rehabilitation improves health status, physical performance, social functioning and is recommended in international guidelines [11]. Much of the evidence supporting the benefits of pulmonary rehabilitation comes from studies in groups of patients with chronic lung disease, predominantly chronic obstructive pulmonary disease and bronchiectatic disease [12]. There is emerging evidence on post-tuberculosis pulmonary disease rehabilitation, but more data are required to determine its effectiveness [13].

Despite the visible successes demonstrated by domestic phthisiatry currently, the problem of medical rehabilitation (MR) of tuberculosis patients remains highly relevant. Over recent years, approaches to the implementation of MR in patients with various diseases have changed significantly, which entails the need to consider the complex of rehabilitation measures in tuberculosis patients from the perspective of the Procedures for Organising Medical Rehabilitation of Adults and Children, approved by the orders of the Ministry of Health of Russia No. 788n dated July 31, 2020 and No. 878n dated October 23, 2019 [14, 15], and their integration into phthisiatric practice. Therefore, in this article, we would like to address the problems of MR in TB patients, considering the new concept of the development of a comprehensive rehabilitation system in the Russian Federation.

THE AIM OF THE STUDY

To study the organizational aspects of medical rehabilitation of patients with respiratory tuberculosis in the world and the Russian Federation.

MATERIALS AND METHODS

The analysis of domestic and foreign literature, regulatory and legal documents related to the organisation of comprehensive rehabilitation care for tuberculosis patients over the period 2018–2023 in the electronic databases PubMed/Medline, Google Scholar by the terms «tuberculosis, pulmonary/rehabilitation», «tuberculosis/pulmonary rehabilitation» was performed.

RESULTS

Rehabilitation is an integral part of the health care system along with health promotion, disease prevention, treatment and palliative care. As health systems have grown in many countries around the world, the survival rate of patients after serious illness and severe injury has increased, but the number of people with residual complex functional impairment leading to disability has also increased. According to WHO estimates, about 2.4 billion people in the world currently suffer from diseases for which rehabilitation is indicated [16]. The prevalence of disability in most European countries is about 10 %, which leads to a certain burden of care for both individuals and society as a whole, increasing the costs of medical and social care [17].

Rehabilitation is an effective way to reduce disability as well as increase opportunities for people with impaired function. The structure, funding and accessibility of rehabilitation services vary from state to state and depend on health systems. In order to create common basic principles for the organisation of rehabilitation care, the European Union of Medical Specialists (EUMS) has published

a White Paper on Physical and Rehabilitation Medicine (PRM), which outlines its main positions in Europe, defining the specialisation, functioning, competencies and professional qualities of PRM specialists, based on advanced standards of care in accordance with the evidence base and in the context of various national recommendations and practices [17].

A new definition of «medical rehabilitation» is introduced by the Federal Law «About the Fundamentals of Citizens` Health Protection in the Russian Federation» No. 323-FZ dated November 21, 2011 [18]. Follow-up care and rehabilitation of tuberculosis patients in the Russian Federation are guaranteed by Federal Law No. 77-FZ dated June 18, 2001 «About prevention of tuberculosis spread in the Russian Federation» [19]. The procedure for follow-up care of tuberculosis patients, persons who are or have been in contact with the source of tuberculosis, as well as persons suspected of tuberculosis and those cured of tuberculosis, regulates the examination of patients, treatment, and medical rehabilitation of these persons. Follow-up care is implemented by TB specialists on the basis of clinical recommendations and in accordance with the standards of medical care, whose functions include rehabilitation measures in addition to dispensary appointments (examinations, consultations) [20].

Procedures for the organisation of medical rehabilitation of adults and children [14, 15] also prescribe adherence to clinical recommendations and standards of care as one of the basic conditions for MR activities. Tuberculosis clinical guidelines for both adult and children's tuberculosis state that rehabilitation of patients with tuberculosis should start from the very beginning of the patient's treatment and is mainly limited to the use of movement regimen and high-protein diet as pathogenetic treatment methods aimed at restoring the patients' health. In addition, rehabilitation measures include other drug and non-drug components of pathogenetic treatment, the main objective of which is to restore specific and non-specific reactivity of the patient's organism. Psychological and/or social support to build adherence to treatment is also categorized as rehabilitative [21, 22].

The above-mentioned clinical guidelines for patients with tuberculosis receiving treatment in the continuation phase, in the absence of contraindications, recommend the sanatorium phase of treatment [21, 22]. The Procedure for the provision of medical care to patients with tuberculosis defines the «Rules for organising the activities of a sanatorium for the treatment of tuberculosis of all forms», in which MR of persons placed on the TB dispensary register is declared as one of the main functions of a phthisiatric sanatorium [23].

The procedures for organizing medical rehabilitation for both adults and children specify a stage of MR implementation. The first stage of MR is recommended to be implemented in structural subdivisions of a medical organisation providing specialised, including high-tech, medical care in an *inpatient facility under the profile 'TB'*, where rehabilitation measures should be initiated in the acute (up to 72 hours) and peracute periods of the disease course in emergency conditions, conditions after surgical interventions (in the early postoperative period), chronic critical conditions and should be carried out daily for at least 1 hour, but not more than 3 hours.

The second stage of MR is implemented at the *inpatient medical rehabilitation departments created in the health care organisations*, including medical rehabilitation centres, sanatorium-resort organisations (SRIs) [14, 15]. However, the current Procedure for the Provision of Medical Care to Patients with Tuberculosis does not provide for the organisation of medical rehabilitation departments in the structure of TB institutions; accordingly, there are no staffing and equipment standards [23]. Nowadays, in fact, the second stage of MR of tuberculosis patients is partially implemented in tuberculosis sanatoria as part of the provision of sanatorium-resort care. MR activities in the second stage should be conducted in the early recovery period of the disease course and during the residual effects of the disease course and should be performed daily for at least 3 hours [14, 15].

The third stage of MR is implemented when providing primary medical and sanitary care in an outpatient basis and (or) in a day hospital (*outpatient medical rehabilitation department, medical rehabilitation department of a day hospital*), including in MR centres, SRIs. MR activities in the third stage are implemented at least once every 48 hours, lasting at least 3 hours [14, 15].

Sanatorium-resort treatment has been and remains an important link in the MR of TB patients at the second and third stages of TB treatment. The preamble of one of the current orders of the Ministry of Health of the Russian Federation regulating the organisation of sanatorium-resort care for patients in tuberculosis sanatoria states that «the use of natural and pre-formed therapeutic factors, kumiss therapy, therapeutic nutrition and active motor regimen makes it possible to increase the effectiveness of treatment and accelerate the rehabilitation process» [24]. The Russian Federation has preserved a network of TB sanatoria, which have vast scientific and practical experience and potential in the rehabilitation of TB patients [25-27].

Unfortunately, the role of rehabilitation measures and sanatorium-resort treatment as a tool to improve the effectiveness of TB patients' treatment from the perspective of evidence-based medicine is currently underestimated. According to the latest available official statistics from 2019, there is a reduction in the number of sanatoria and the number of sanatorium beds in the Russian Federation for adults and children diagnosed with tuberculosis, where only 3.2 % of newly diagnosed patients with tuberculosis and 7.0 % of the contingents on dispensary registration at the end of the year were hospitalised, which indicates the low availability of rehabilitation measures for patients in the second and third stages of MR [28]. For this reason, the position of G.S. Balasanyants, who believes that the modern concept of organising sanatorium treatment should provide for the expansion of the role and importance of tuberculosis sanatoriums, which is determined by the principles of the national phthisiatric doctrine, has not lost its significance [29].

Indications towards the organizational model that allows solving the tasks of providing comprehensive medical, social and rehabilitation care at the third stage of MR are presented on the example of an outpatient phthisiatric institution of St. Petersburg «TB Dispensary No. 5», where a department of medical and social care and rehabilitation was formed. N.V. Korneva et al. point out the exclusivity of the existing department, which required the development of all regulatory documentation, including the department's regulations, functional responsibilities of employees, algorithms of work and routing, and rehabilitation programmes [30].

To determine individual patient routing when implementing MR measures at different stages, the Procedure for Organising Medical Rehabilitation proposes the Rehabilitation Routing Scale (RRS) [14].

If the RRS score is 0-1, the patient does not need rehabilitation (only secondary prophylaxis is indicated), if the score is 2-3, a course of treatment in a stage 3 MR unit (day hospital) is indicated, and if the score is 4-6, a course of treatment in a specialised stage 2 MR unit (round-the-clock unit/on-site home rehabilitation course/telemedicine consultation) is indicated (Fig. 1).

We found no sources in the available literature that assessed the status of TB patients by RRS, which is necessary to clarify the need for rehabilitation care for TB patients at all stages of MR.

Rehabilitation measures are implemented by a multidisciplinary rehabilitation team (MDRT), which is a structural and functional unit of a structural subdivision of a health care organisation or other organisation, established on a functional basis from the employees of the specified departments [14, 15]. The MDRT is led by a doctor of physical and rehabilitation medicine, a specialist who meets the requirements of the professional standard "Specialist in Medical Rehabilitation" [32].

The MDRT may include: physical and rehabilitation medicine doctor/medical rehabilitation doctor, physical rehabilitation specialist, ergorehabilitation specialist, medical psychologist/psychotherapist, medical speech therapist, medical rehabilitation nurse, ward nurse, exercise therapist, physiotherapist, reflexologist, physical therapy instructor, physical therapy instructor, physiotherapy nurse, massage nurse, reflexology nurse, physical therapy instructor [14, 15].

One can't but agree with the opinion of N.V. Korneva et al. [30], that despite the fact that one of the tasks of a TB dispensary, according to the Procedure for the Provision of Medical Care to Patients with Tuberculosis, is the implementation of rehabilitation measures for patients with tuberculosis [23] and the professional standard of a doctor-phthisiatrist contains the labour function – "conducting and monitoring the effectiveness of inpatient medical rehabilitation of tuberculosis

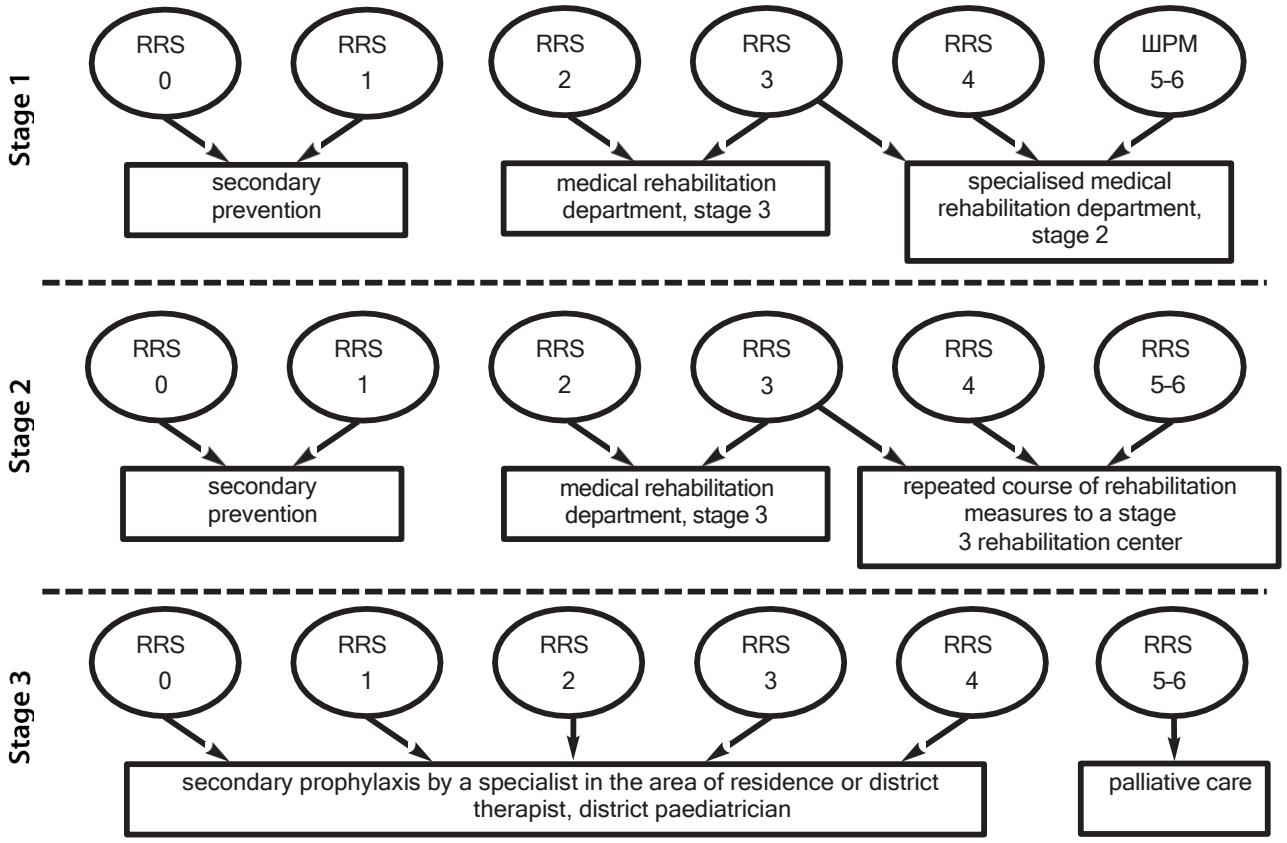

FIG. 1.
Patient routing at the stages of medical rehabilitation [31]

patients and persons with post-tuberculosis residual changes during the provision of specialised medical care, including the implementation of individual rehabilitation or habilitation programmes for disabled persons" [33], the recommended staffing standards of phthisiatric institutions, including sanatoriums providing treatment of tuberculosis of all forms, do not include specialists required for organisation and implementation of MR, in accordance with the Procedure for Organisation of Rehabilitation Care. According to Order No. 932n, TB dispensaries should have a medical and social assistance room only in the structure of an outpatient counselling department, the staff of which includes a head, a medical methodologist, a medical psychologist, a social worker, and a medical and social assistance nurse [23]. This staffing is clearly insufficient to form the MDRT.

When implementing MR activities at all stages of MDRT, a rehabilitation diagnosis is established, including the characterisation of the state of functioning and disability (function, body structure, activity and participation of the patient), the influence of environmental and personal factors based on the International Classification of Functioning, Disability and Health (ICF) and its changes in the course of MR activities [14, 15].

In 2001, the International Classification of Functioning, Disability and Health was published, belonging to the «family» of international classifications developed by WHO, applicable to various aspects of health, providing common rules for coding a wide range of health-related information, and using a standardised common language to enable communication on health and health-related issues worldwide in different disciplines and branches of science [34].

E.V. Melnikova et al. in their published instruction concerning the use of ICF in outpatient and inpatient medical rehabilitation (2017) emphasised the main aspect of rehabilitation, which before the creation of ICF was focused around disorders of functions and structures, which led to active medical care, but other, non-medical problems of the patient were not considered. ICF implementation has shifted the focus of the professional's attention to functioning rather than function, manifested by a better perception of the impairments present from the categories of activity and participation, as well as personal and environmental factors, which allows a broader view of the patient's problems in order to make a rehabilitation diagnosis, determine the goal and objectives of rehabilitation, and make better use of available resources [35].

The ICF today includes more than 1.6 thousand different categories [34], which significantly complicates its practical application, and in this regard, reduced versions of classification for specific nosological forms of diseases, the so-called basic sets of ICF, the formation of which is based on the results of scientific studies based on many thousands of samples, in which specialists of the relevant profile, related specialties, with the participation of a group of international experts of WHO [36]. There are currently more than 50 ICF core sets developed and published for the most common diseases such as stroke, ischaemic heart disease, traumatic brain injury, etc. [37]. Unfortunately, tuberculosis is not one of them.

The basic set of ICFs simplifies the development of a rehabilitation programme for a specific pathology in a specific patient, allows to make it, on the one hand, comprehensive, on the other – as individual as possible. There is a large number of works in the public domain showing the practical application of ICF for health assessment and rehabilitation measures in various diseases, resulting in the formation of effective rehabilitation programmes, the implementation of which leads to the solution of the set tasks and achievement of the MR goal of the described patients [38, 39].

In order to adequately assess the various ICF categories and identify the actual problems of the examined patient, a number of special examination methods are widely used in medical rehabilitation: laboratory and instrumental studies, various international scales, tests and questionnaires according to the pathology for objectification of which they were created. Different variations of their use in specific clinical examples were demonstrated by G.E. Ivanova et al. The authors believe that the creation of a unified tool for assessing a patient's general condition based on the ICF principles using modern methods of patient examination, clinical tests and scales accepted by the professional community will help MDRT in making a rehabilitation diagnosis and in determining a more accurate rehabilitation potential, which will ensure higher efficiency of medical rehabilitation in general [36].

In phthisiatric practice, the «Scale for assessing functional deficit in tuberculosis patients» that was developed using the ICF was proposed by T.V. Pyaznova et al. (2018); it was used to assess clinical and laboratory signs of internal organ failure, impaired communication, mobility and self-care in tuberculosis patients with HIV infection [40, 41].

In summary, the development and validation of a basic set of ICF domains in TB patients, selection of laboratory and instrumental research methods, special tests and scales to describe ICF categories, development of criteria for assessing the severity of disability, distribution of domains of the basic set of ICF domains among MDRT specialists for assessment procedures, and determination of the relationship between ICF categories and certain rehabilitation measures should become one of the directions of further studies.

One of the main principles of MR is the early initiation of rehabilitation measures, which is important in terms of preventing degenerative changes in tissues and provides a more favourable course and outcome of the disease, serves as one of the moments of disability prevention [42]. However, foreign literature sources most often cover the issues of pulmonary rehabilitation of patients after tuberculosis [13].

Studies have shown that up to 50 % of TB patients report disease-related health problems after completing treatment [43-45], which negatively affect quality of life with negative consequences for psychological, social and economic components and reduce overall life expectancy [46-48]. Post-tuberculosis pulmonary changes

in the form of bronchiectasis, bronchial stenosis, cavitation, fibrotic nodular scarring and pleural thickening lead to changes in the elasticity of lung tissue, gas exchange, functional lung volumes and airflow with consequent impairment of lung ventilation [13, 49]. A significant proportion of patients who have completed TB treatment therefore report residual cough, weakness, dyspnoea, difficulty climbing stairs or with activities of daily living, at work. The true burden of post-tuberculosis conditions is not fully known due to the lack of epidemiological data, but some authors estimate that they affect 18–87 % of patients cured of tuberculosis [50].

In 2019, the first International Symposium on Post-Tuberculosis Disease was held in Stellenbosch, South Africa, where the definition of post-tuberculosis pulmonary disease (PTPD) was adopted as features of chronic respiratory pathology with or without symptoms that can be at least partially attributed to prior (pulmonary) tuberculosis [51, 52]. There is an urgent need to acknowledge PTPD as a leading cause of chronic lung disease and to conduct more research into its diagnosis, pathophysiology, and optimal person-centred management to reduce morbidity and achieve better treatment outcomes in clinically cured TB patients [53, 54].

The International Union Against Tuberculosis and Pulmonary Disease has published Guidelines for Post-Tuberculosis Pulmonary Disease [13], based on the Global Plan to End Tuberculosis [55], and Clinical Standards for the Assessment, Management and Rehabilitation of Post-Tuberculosis Pulmonary Disease [51], which represent the first formal attempt to develop a consensus approach to this important global problem by international experts. The document contains general principles that need to be adapted to specific circumstances and situations for the subsequent implementation of rehabilitation programmes. Five standards are proposed, including: a basic set of examinations to detect PTPD, an identification of indications in patients with PTPD for pulmonary rehabilitation, a statement of the main components of the rehabilitation programme, methods for assessing the effectiveness of rehabilitation measures and a scheme for patient assessment during TB treatment and follow-up, and a summary of the components of educational programmes [51].

Preliminary data from studies in TB survivors suggest that pulmonary rehabilitation programmes may be beneficial for people with PTPD dyspnoea and pulmonary dysfunction. Access to pulmonary rehabilitation programmes in high TB burden settings is currently limited, and more data are needed to understand the best combination of tools and techniques that could be both useful and widely available to health care providers and recipients [56]. Studies examining pulmonary rehabilitation in individuals with PTPD have mainly used a holistic approach including methods such as 6-minute walk test, breath-hold tests, breathing exercises, drainage breathing techniques, nutritional advice and psychological support [13].

Studies from both high- and low-income countries suggest that pulmonary rehabilitation programmes for people with PTPD are viable and are associated with improved quality of life, physical performance and respiratory outcomes [13]. Evidence of specific pulmonary rehabilitation programmes tailored to patients with PTPD also exists in institutions with adequate resources, logistics and qualified staff; and these have generally been found to be effective [57-59].

There are reports of successful use of simplified programmes that do not require significant material inputs and equipment. The ability to modulate pulmonary rehabilitation programmes by adapting them to patient personality factors and available resources makes pulmonary rehabilitation potentially accessible to individuals (including children and adolescents) in a variety of settings [13, 51, 58].

An increasing body of evidence thus demonstrates the positive effects of pulmonary rehabilitation in patients with chronic pulmonary disease. Despite these important benefits, however, pulmonary rehabilitation is universally underutilised and referral, coverage and completion rates are alarmingly low. Worldwide, less than 3 % of patients with chronic pulmonary disease benefit from pulmonary rehabilitation [60]. One of the key impediments for pulmonary rehabilitation referrals is the poor recognition of its benefits by health care organisations, due in part to the limited resources and funding available for pulmonary rehabilitation services. The two most common barriers for patients to be referred to pulmonary rehabilitation are related to a lack of knowledge among health care providers about the content of pulmonary rehabilitation programmes and its benefits [61].

CONCLUSION

The analysis of publications and current regulatory and legal regulatory background in the field of rehabilitation in the Russian Federation and publications in domestic and foreign sources testifies to the imperfection of the organisation with regard to the medical rehabilitation system in the structure of medical care for tuberculosis patients. This concerns issues of routing, phasing, organisational models, human and material resources, standardisation of the rehabilitation process's main components, and the significance and effectiveness of certain rehabilitation measures, which leads to low accessibility of rehabilitation care for TB patients.

Shortcomings in the legal and regulatory framework hinder the integration of MR into the practice of the phthisiatric service. To organise an effective system of rehabilitation care for tuberculosis patients, it is necessary to form rehabilitation units within the structure of TB institutions in compliance with the staffing norms for MDRT formation and equipment standards recommended by the Procedure for Organising Medical Rehabilitation, for which it is necessary to make appropriate additions to the Procedure for Providing Medical Care to Tuberculosis Patients.

Nowadays, the issues related to the organisation of rehabilitation care for tuberculosis patients require further study and improvement. It is crucial to determine the indications for rehabilitation measures, comprehensive

examination of the patient using diagnostic tools, assessment tools, scales and questionnaires to establish the rehabilitation diagnosis, and the patient's priority problems from the ICF perspective, in order to personalise pulmonary rehabilitation programmes to achieve the rehabilitation goal and effectively address the patient's individual needs.

Medical rehabilitation development as part of medical care for tuberculosis patients will ultimately contribute to improving the effectiveness of tuberculosis treatment, reducing the number of complications, disability, mortality associated with tuberculosis, and increasing the life expectancy and quality of life of patients.

Conflict of interest

The authors declare the absence of apparent and potential conflicts of interest related to the publication of this article.

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REFERENCES

1. *Statistics of tuberculosis diseases. Open base.* (In Russ.). [*Статистика заболеваний туберкулёзом. Открытая база.*]. URL: https://openbase.online/statistika-zabolevaniya-tuberkulezom-v-mire [date of access: May 17, 2023].

2. *Epidemic situation for tuberculosis in 2022.* (In Russ.). [*Эпидемическая ситуация по туберкулёзу в 2022 г.*]. URL**:** https://nmrc.ru/for_specialists/main-directions/tuberculosis/ [date of access: May 17, 2023].

3. Vasilyeva IA, Testov VV, Sterlikov SA. Tuberculosis situation in the years of the COVID-19 pandemic – 2020–2021. *Tuberculosis and Lung Diseases.* 2022; 100(3): 6-12. (In Russ.). [Васильева И.А., Тестов В.В., Стерликов С.А. Эпидемическая ситуация по туберкулёзу в годы пандемии COVID-19 – 2020–2021 гг. *Туберкулёз и болезни лёгких*. 2022; 100(3): 6-12]. doi: 10.21292/2075-1230-2022-100-3-6-12

4. Tyarasova KG, Morozov AM, Pototskaya LA, Zhukov SV. Clinical aspects of medical-social examination of tuberculosis in adults. *Manager zdravoohranenia.* 2022; 5: 20-27. (In Russ.). [Тярасова К.Г., Алтунина М.М., Морозов А.М. Жуков С.М. Клинические аспекты медико-социальной экспертизы при туберкулёзе у взрослых. *Менеджер здравоохранения*. 2022; (5): 20-27]. doi: 10.37690/1811-0185-2022-5-20-27

5. World Health Organization. *Global tuberculosis report 2020.* Geneva: World Health Organization; 2020. URL: https://apps.who.int/iris/bitstream/handle/10665/336069/9789240013131-eng.pdf [date of access: May 17, 2023].

6. Dodd PJ, Yuen CM, Jayasooriya SM, van der Zalm MM, Seddon JA. Quantifying the global number of tuberculosis survivors: A modelling study. *Lancet Infect Dis.* 2021; 21(7): 984-992. doi: 10.1016/S1473-3099(20)30919-1

7. Ranzani OT, Rodrigues LC, Bombarda S, Minto CM, Waldman EA, Carvalho CRR. Long-term survival and cause-specific mortality of patients newly diagnosed with tuberculosis in São Paulo state, Brazil, 2010-15: A population-based, longitudinal study. *Lancet Infect Dis.* 2020; 20(1): 123-132. doi: 10.1016/S1473-3099(19)30518-3

8. Schultink MP, Kerstjens HAM, Ter Beek L, Zondag H, Brijan R, de Lange WCM, et al. Assessment of TB treatment on patient well-being. *Int J Tuberc Lung Dis.* 2021; 25(4): 315-317. doi: 10.5588/ijtld.21.0816

9. Kawahara K, Tabusadani M, Yamane K, Takao S, Kuroyama Y, Matsumura Y, et al. Health-related quality of life associates with clinical parameters in patients with NTM pulmonary disease. *Int J Tuberc Lung Dis.* 2021; 25(4): 299-304. doi: 10.5588/ijtld.20.0790

10. Holland AE, Cox NS, Houchen-Wolloff L, Rochester CL, Garvey C, ZuWallack R, et al. Defining modern pulmonary rehabilitation. An official American Thoracic Society workshop report. *Ann Am Thorac Soc.* 2021; 18(5): 12-29. doi: 10.1513/AnnalsATS.202102-146ST

11. Global Initiative for Chronic Obstructive Lung Disease. The Global Strategy for Diagnosis, Management and Prevention of COPD. 2021. URL: https://goldcopd.org/2021-gold-reports/ [date of access: 17.05.2023].

12. Nahid P, Mase SR, Migliori GB, Sotgiu G, Bothamley GH, Brozek JL, et al. Treatment of drug-resistant tuberculosis. An official ATS/CDC/ERS/IDSA clinical practice guideline. *Am J Respir Crit Care Med.* 2019; 200(10): 93-142. doi: 10.1164/rccm.201909-1874ST

13. Nightingale R, Carlin F, Meghji J, McMullen K, Evans D, van der Zalm MM, et al. Post-TB health and wellbeing. *Int J Tuberc Lung Dis.* 2023; 27(4): 248-283. doi: 10.5588/ijtld.22.0514

14. *On approval of the procedure for organizing medical rehabilitation of adults: Order of the Ministry of Health of the Russian Federation d.d. July 31, 2020 No. 788n.* 2020. (In Russ.). [*Об утверждении Порядка организации медицинской реабилитации взрослых: Приказ Министерства здравоохранения РФ от 31.07.2020 No 788н. 2020*]. URL: https://www.garant.ru/products/ipo/prime/doc/74581688/#review [date of access: May 17, 2023].

15. *On approval of the Procedure for organizing medical rehabilitation of children: Order of the Ministry of Health of the Russian Federation d.d. October 23, 2019 No. 878n. 2019.* (In Russ.)**. [***Об утверждении Порядка организации медицинской реабилитации детей: Приказ Министерства здравоохранения РФ от 23.10.2019 No 878н***].** URL: https://base.garant.ru/73325898/ [date of access: May 17, 2023].

16. *Rehabilitation.* URL: https://www.who.int/ru/news-room/fact-sheets/detail/rehabilitation. [date of access: May 17, 2023].

17. European Physical and Rehabilitation Medicine Bodies Alliance. White book on physical and rehabilitation medicine (PRM) in Europe. Chapter 5. The PRM or-

ganizations in Europe: structure and activities. *Eur J Phys Rehabil Med.* 2018; 54(2): 198-213. doi: 10.23736/S1973-9087.18.05149-3

18. *On the fundamentals of protecting the health of citizens in the Russian Federation: Federal Law d.d. November 21, 2011 No. 323-FZ (latest edition)*. 2011. (In Russ.). [*Об основах охраны здоровья граждан в Российской Федерации: Федеральный закон от 21.11.2011 No 323-ФЗ (последняя редакция). 2011*]. URL: https://www.consultant.ru/document/cons_doc_LAW_121895 [date of access: May 17, 2023].

19. *On preventing the spread of tuberculosis in the Russian Federation (with amendments and additions): Federal Law d.d. June 18, 2001 No. 77-FZ*. 2001. (In Russ.). [*О предупреждении распространения туберкулёза в Российской Федерации (с изменениями и дополнениями): Федеральный закон от 18.06.2001 No 77-ФЗ. 2001*]. URL: https://base.garant.ru/12123352 [date of access: May 17, 2023].

20. *On approval of the procedure for dispensary observation of patients with tuberculosis, persons who are or have been in contact with a source of tuberculosis, as well as persons with suspected tuberculosis and cured of tuberculosis and recognition as no longer in force paragraphs 16–17 of the Procedure for providing medical care to patients with tuberculosis, approved by order of the Ministry of Health of the Russian Federation dated November 15, 2012 No. 932n: Order of the Ministry of Health of the Russian Federation d.d. March 13, 2019 No. 127n*. 2019. (In Russ.). [*Об утверждении порядка диспансерного наблюдения за больными туберкулёзом, лицами, находящимися или находившимися в контакте с источником туберкулёза, а также лицами с подозрением на туберкулёз и излеченными от туберкулёза и признании утратившими силу пунктов 16–17 Порядка оказания медицинской помощи больным туберкулёзом, утвержденного приказом Министерства здравоохранения Российской Федерации от 15 ноября 2012 г. No 932н: Приказ Министерства здравоохранения РФ от 13.03.2019 N 127н. 2019*]. URL: https://base.garant.ru/72275106 [date of access: May 17, 2023].

21. *Clinical guidelines "Tuberculosis in adults", ICD 10: A15–A19*. 2022. (In Russ.). [*Клинические рекомендации «Туберкулёз у взрослых», МКБ 10: А15–А19. 2022*]. URL: https://cr.minzdrav.gov.ru/recomend/16_2 [date of access: May 17, 2023].

22. *Clinical guidelines "Tuberculosis in children", ICD 10: A15–A19*. 2022. (In Russ.). [*Клинические рекомендации «Туберкулёз у детей», МКБ 10: А15–А19. 2022*]. URL: https://cr.minzdrav.gov.ru/schema/507_2 [date of access: May 17, 2023].

23. *On approval of the Procedure for providing medical care to patients with tuberculosis (with amendments and additions): Order of the Ministry of Health of the Russian Federation d.d. November 15, 2012 No. 932n.* 2012. (In Russ.). [*Об утверждении Порядка оказания медицинской помощи больным туберкулёзом (с изменениями и дополнениями): Приказ Министерства здравоохранения РФ от 15.11.2012 No 932н. 2012*]. URL: https://base.garant.ru/70340750 [date of access: May 17, 2023].

24. *On improving the organization of sanatorium and resort care for patients in tuberculosis sanatoriums: Order of the Ministry of Health of the Russian Federation d.d. 17.03.2004 No. 124*. 2004. (In Russ.). [*О совершенствовании организации санаторно-курортной помощи больным в туберкулёзных санаториях: Приказ Министерства здравоохранения РФ от 17.03.2004 No 124. 2004*]. URL: https://base.garant.ru/4179969 [date of access: May 17, 2023].

25. Zakirova ZM. Experience in organizing the treatment of patients with active drug-resistant tuberculosis on sanatorium stage. *Medical Alliance.* 2020; (2): 40-45. (In Russ.). [Закирова З.М. Опыт организации лечения больных активным туберкулёзом с лекарственной устойчивостью на санаторном этапе. *Медицинский альянс*. 2020; (2): 40-45]. doi: 10.36422/23076348-2020-8-2-40-46

26. Grishin MN, Aukhadiev NN, Korchagina EO, Zaitsev YuA. The importance of the sanatorium stage of treatment in the rehabilitation of patients with tuberculosis. *Herald of Physiotherapy and Health Resort Therapy.* 2018; 24(3): 178-178. (In Russ.). [Гришин М.Н., Аухадиев Н.Н., Корчагина Е.О., Зайцев Ю.А. Значение санаторного этапа лечения в реабилитации больных туберкулёзом. *Вестник физиотерапии и курортологии*. 2018; 24(3): 178-178].

27. Lozovskaya ME, Osipova MA, Suslova GA, Karasev GG, Vlasova EY. Relation between sanatorium rehabilitation and qualiti of life in adolescents with tuberculosis. *Bulletin of Rehabilitation Medicine.* 2019; 4(92): 2-7. (In Russ.). [Лозовская М.Э., Осипова М.А., Суслова Г.А., Карасев Г.Г., Власова Е.Ю. Связь санаторной реабилитации и качества жизни у подростков с туберкулёзом. *Вестник восстановительной медицины*. 2019; 4(92): 2-7].

28. *Main indicators on tuberculosis in Russia for 2019.* (In Russ.). [*Основные показатели по туберкулёзу в России за 2019 год.]*. URL: https://mednet.ru/images/materials/CMT/tuberkulez-2019.pdf [date of access: May 17, 2023].

29. Balasaniantc GS. Concept of TB sanatorium services development in the Russian Federation. Medical Alliance. 2013; (4): 79-83. (In Russ.). [Баласанянц Г.С. Концепция развития фтизиатрической санаторной помощи в Российской Федерации. *Медицинский альянс*. 2013; (4): 79-83].

30. Korneva NV, Bozhkov IA, Vladimirova ON, Sevastyanov MA, Silidi IYu. Important issues of rehabilitation care in outpatient phthisiology. *Tavricheskiy mediko-biologicheskiy vestnik*. 2022; 1(25): 83-96. (In Russ.). [Корнева Н.В., Божков И.А., Владимирова О.Н., Севастьянов М.А., Силиди И.Ю. Актуальные вопросы реабилитационной помощи в амбулаторной фтизиатрии. *Таврический медико-биологический вестник*. 2022; 1(25): 83-96]. doi: 10.29039/2070-8092-2022-25-1-83-96

31. Sarana AM. *Organization of rehabilitation for patients in St. Petersburg.* (In Russ.). [*Сарана А.М. Организация реабилитации для пациентов Санкт-Петербурга*]. URL: http://zdrav.spb.ru/media/filebrowser/организация_реабилитации_для_пациентов_спб.pdf [date of access: May 17, 2023].

32. *On approval of the professional standard "Medical Rehabilitation Specialist": Order of the Ministry of Labor of Russia d.d. September 3, 2018 No. 572n.* 2018. (In Russ.). [*Об утверждении профессионального стандарта «Специалист по медицинской реабилитации»: Приказ Минтруда России от 03.09.2018 No 572н. 2018*]. URL: https://www.consultant.ru/document/cons_doc_LAW_307256/b2de419a7e7f272948f501f63d52f9802f8aa8c4/#dst100009 [date of access: May 17, 2023].

33. *On approval of the professional standard "Phthisiatrician" Order of the Ministry of Labor of Russia d.d. October 31, 2018 No. 684n.* 2018. (In Russ.). [*Об утверждении профессионального стандарта «Врач-фтизиатр»: Приказ Минтруда России от 31.10.2018 No 684н. 2018*]. URL: https://www.consultant.ru/document/cons_doc_LAW_311651/ [date of access: 17.05.2023].

34. *International Classification of Functioning, Disability and Health (ICF).* (In Russ.). [*Международная классификация функционирования, ограничений жизнедеятельности и здоровья (МКФ).*]. URL: http://who-fic.ru/ifc [date of access: May 17, 2023].

35. Melnikova EV, Builova TV, Bodrova RA, Shmonin AA, Maltseva MN, Ivanova GE. Use of the International Classification of Functioning (ICF) in outpatient and inpatient medical rehabilitation: Instructions for specialists. *Bulletin of Rehabilitation Medicine.* 2017; 6(82): 7. (In Russ.). [Мельникова Е.В., Буйлова Т.В., Бодрова Р.А., Шмонин А.А., Мальцева М.Н., Иванова Г.Е. Использование международной классификации функционирования (МКФ) в амбулаторной и стационарной медицинской реабилитации: инструкция для специалистов. *Вестник восстановительной медицины*. 2017; 6(82): 7].

36. Ivanova GE, Melnikova EV, Shamalov NA, Bodrova RA, Shmonin AA, Suvorov AYu, et al. The use of the ICF and rating scales in medical rehabilitation. *Bulletin of Rehabilitation Medicine.* 2018; 3(85): 14-20. (In Russ.). [Иванова Г.Е., Мельникова Е.В., Шамалов Н.А., Бодрова Р.А., Шмонин А.А., Суворов А.Ю., и др. Использование МКФ и оценочных шкал в медицинской реабилитации. *Вестник восстановительной медицины*. 2018; 3(85): 14-20].

37. ICF core sets. URL: https://www.icf-core-sets.org [date of access: 18.05.2023].

38. Saketkoo LA, Escorpizo R, Varga J, Keen KJ, Fligelstone K, Birring SS, et al. World Health Organization (WHO) International Classification of Functioning, Disability and Health (ICF) core set development for interstitial lung disease. *Front Pharmacol.* 2022; 13: 979788. doi: 10.3389/fphar.2022.979788

39. Afanasyeva VV, Potapchuk AA. Application of categories of the international classification of functioning in the organization of medical rehabilitation of patients with chronic obstructive pulmonary disease. *The Scientific Notes of the Pavlov University.* 2020; 27(1): 26-36. (In Russ.). [Афанасьева В.В., Потапчук А.А. Применение категорий Международной классификации функционирования при организации медицинской реабилитации больных хронической обструктивной болезнью легких. *Ученые записки СПбГМУ им. И.П. Павлова*. 2020; 1(27): 26-36.]. doi: 10.24884/1607-4181-2020-27-1-26-36

40. Pyanzova TV, Vasilyeva IA, Dzhangildin YuT. Evaluation of functional disorders in tuberculosis patients with the severe course of the disease. *Tuberculosis and Lung Diseases.* 2020; 98(3): 37-44. (In Russ.). [Пьянзова Т.В., Васильева И.А., Джангильдин Ю.Т. Оценка функциональных ограничений у пациентов фтизиатрического профиля при тяжелом течении заболевания. *Туберкулёз и болезни легких.* 2020; 3(98): 37-44]. doi: 10.21292/2075-1230-2020-98-3-37-44

41. Pyanzova TV, Luzina NV, Belousova NS. *Assessment of functional disorders in patients of a phthisiological hospital: guidelines for doctors.* Kemerovo: In-folio; 2018. (In Russ.). [Пьянзова Т.В., Лузина Н.В., Белоусова Н.С. *Оценка функциональных нарушений у пациентов фтизиатрического стационара: методические рекомендации для врачей*. Кемерово: Ин-фолио; 2018].

42. Vladimirova ON, Afonina KP, Ponomarenko GN, Shoshmin AV. Organization of the comprehensive rehabilitation system based on studying needs of persons with disabilities in the Russian Federation. Medicine in Kuzbass. 2018; 4: 20-27. (In Russ.). [Владимирова О.Н., Афонина К.П., Пономаренко Г.Н., Шошмин А.В. Организация системы комплексной реабилитации в Российской Федерации на основе изучения потребностей инвалидов. *Медицина в Кузбассе*. 2018; 4: 20-27].

43. Nuwagira E, Stadelman A, Baluku JB, Rhein J, Byakika-Kibwika P, Mayanja H, et al. Obstructive lung disease and quality of life after cure of multi-drug-resistant tuberculosis in Uganda: A cross-sectional study. *Trop Med Health*. 2020; 48: 34. doi: 10.1186/s41182-020-00221-y

44. Loveday M, Hlangu S, Larkan LM, Cox H, Daniels J, Mohr-Holland E, et al. "This is not my body": Therapeutic experiences and post-treatment health of people with rifampicin-resistant tuberculosis. *PLoS One*. 2021; 16(10): 0251482. doi: 10.1371/journal.pone.0251482

45. Alene KA, Wangdi K, Colquhoun S, Chani K, Islam T, Rahevar K, et al. Tuberculosis related disability: A systematic review and meta-analysis. *BMC Med.* 2021; 19(1): 203. doi: 10.1186/s12916-021-02063-9

46. Romanowski K, Baumann B, Basham CA, Ahmad Khan F, Fox GJ, Johnston JC. Long-term all-cause mortality in people treated for tuberculosis: A systematic review and meta-analysis. *Lancet Infect Dis.* 2019; 19(10): 1129-1137. doi: 10.1016/S1473-3099(19)30309-3

47. Allwood BW, Byrne A, Meghji J, Rachow A, van der Zalm MM, Schoch OD. Post-tuberculosis lung disease: Clinical review of an under-recognised global challenge. *Respiration.* 2021; 100(8): 751-763. doi: 10.1159/000512531

48. Chushkin MI, Popova LA, Shergina EA, Karpina NA. Ventilation function of lung and quality of life after cured pulmonary tuberculosis. *Medical Alliance.* 2021; (4): 37-44. (In Russ.). [Чушкин М.И., Попова Л.А., Шергина Е.А., Карпина Н.А. Вентиляционная функция легких и качество жизни пациентов после перенесенного туберкулёза легких. *Медицинский альянс*. 2021; (4): 37-44]. doi: 10.36422/23076348-2021-9-4-37-44

49. Ravimohan S, Kornfeld H, Weissman D, Bisson GP. Tuberculosis and lung damage: From epidemiology

to pathophysiology. *Eur Respir Rev.* 2018; 27(147): 170077. doi: 10.1183/16000617.0077-2017

50. Allwood BW, Van Der Zalm MM, Amaral AFS, Byrne A, Datta S, et al. Post-tuberculosis lung health: Perspectives from the First International Symposium. *Int J Tuberc Lung Dis*. 2020; 24(8): 820-828. doi: 10.5588/ijtld.20.0067

51. Migliori GB, Marx FM, Ambrosino N, Zampogna E, Schaaf HS, van der Zalm MM, et al. Clinical standards for the assessment, management and rehabilitation of post-TB lung disease. *Int J Tuberc Lung Dis.* 2021; 25(10): 797-813. doi: 10.5588/ijtld.21.0425

52. Osman M, Welte A, Dunbar R, Brown R, Hoddinott G, Hesseling AC, et al. Morbidity and mortality up to 5 years post tuberculosis treatment in South Africa: A pilot study. *Int J Infect Dis.* 2019; 85: 57-63. doi: 10.1016/j.ijid.2019.05.024

53. Mpagama SG, Msaji KS, Kaswaga O, Zurba LJ, Mbelele PM, Allwood BW, et al. The burden and determinants of post-TB lung disease. *Int J Tuberc Lung Dis.* 2021; 10(25): 846-853. doi: 10.5588 /ijtld.21.0278

54. Günther G, Ithete S. Clinical care for patients with post-TB lung disease. *Int J Tuberc Lung Dis.* 2021; 25(3): 252-253. doi: 10.5588/ijtld.20.0824

55. Stop TB Partnership. *The global plan to end TB, 2023–2030.* URL: https://www.stoptb.org/global-plan-to-end-tb/global-plan-to-end-tb-2023-2030 [date of access: May 18, 2023].

56. Singh SK, Naaraayan A, Acharya P, Menon B, Bansal V, Jesmajian S. Pulmonary rehabilitation in patients with chronic lung impairment from pulmonary tuberculosis. *Cureus.* 2018; 10(11): 3664. doi: 10.7759/cureus.3664

57. Visca D, Zampogna E, Sotgiu G, Centis R, Saderi L, D'Ambrosio L, et al. Pulmonary rehabilitation is effective in patients with tuberculosis pulmonary sequelae. *Eur Respir J.* 2019; 53(3): 1802184. doi: 10.1183/13993003.02184-2018

58. Tiberi S, Torrico MM, Rahman A, Krutikov M, Visca D, Silva DR, et al. Managing severe tuberculosis and its sequelae: From intensive care to surgery and rehabilitation. *J Bras Pneumol.* 2019; 45(2): 20180324. doi: 10.1590/1806-3713/e20180324

59. Chushkin MI, Struchkov PV, Ots ON, Karpina NL. Rehabilitation of the patients with pulmonary tuberculosis and tuberculosis sequelae. *Clinical Medicine (Russian Journal).* 2022; 100(2-3): 91-96. (In Russ.). [Чушкин М.И., Стручков П.В., Отс О.Н., Карпина Н.Л. Реабилитация больных с туберкулёзом легких и посттуберкулёзными изменениями. *Клиническая медицина*. 2022; 100(2-3): 91-96]. doi: 10.30629/0023-2149-2022-100-2-3-91-96

60. Rochester CL, Spruit MA, Holland AE. Pulmonary rehabilitation in 2021. *JAMA.* 2021; 326(10): 969-970. doi: 10.1001/jama.2021.6560

61. Lahham A, Holland AE. The need for expanding pulmonary rehabilitation services. *Life (Basel)*. 2021; 11(11): 1236. doi: 10.3390/life11111236

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