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THE ROLE OF PHYSICAL THERAPY IN THE SYSTEM OF PULMONARY REHABILITATION IN THE CASE OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (THE ANALYSIS OF CLINICAL GUIDELINES)

Kateryna Tymruk-Skoropad[1], Svitlana Stupnytska[2], Iuliia Pavlova[1]

[1]Lviv State University of Physical Culture, Lviv, Ukraine, tymruk_k@ukr.net
[2]International University of Economics and Humanities Academician Stepan Demianchuk, Rivne, Ukraine, svitstup@ukr.net

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Abstracts

Topicality. Currently, pulmonary rehabilitation is an intervention recommended to all chronic obstructive pulmonary disease patients, regardless of the disease severity, and physical therapy is an integral part of effective pulmonary rehabilitation programs. Although there is a sheer number of studies on the impact of pulmonary rehabilitation programs (both in its general context and individual components), as well as on the physical, functional and psycho-emotional state of patients, the number of the detailed clinical guidelines on PR inthe case of chronic obstructive pulmonary disease is limited. ***The purpose of the study*** is to analyse clinical guidelines for management and pulmonary rehabilitation and to evaluate the role of physical therapy in the system of pulmonary rehabilitation in the case of chronic obstructive pulmonary disease. Clinical guidelines selected on the basis of the research conducted on databases of PubMed (data over the past 5 years), PEDro, Cochrane (January, 2018), dedicated to clinical guidelines on treatment, management, pulmonary rehabilitation and physical therapy of chronic obstructive pulmonary disease patients, were chosen as the subject of the analysis. It has been established that physical therapy is an integral part of pulmonary rehabilitation programs for COPD patients. The main means of physical therapy recommended by the clinical guidelines for COPD patients are the following: physical training, respiratory exercises, training of respiratory muscles, chest physical therapy and electrostimulation of peripheral muscles. Methods of the use of physical training for chronic obstructive pulmonary disease patients are the most extensively described. Recommendations regarding special features of physical therapy in the case of exacerbation and under conditions of inpatient treatment are either absent or insufficient; the amount of information on the role and specifics of the use of respiratory exercises and chest physical therapy for COPD patients at different stages of treatment is inadequate.

Key words: physical therapy, pulmonary rehabilitation, chronic obstructive pulmonary disease, clinical guidelines.

Катерина Тимрук-Скоропад, Світлана Ступницька, Юлія Павлова. Місце фізичної терапії в системі легеневої реабілітації при хронічному обструктивному захворюванні легень (аналіз клінічних настанов). ***Актуальність.*** На сьогодні легенева реабілітація – це втручання, яке рекомендоване всім пацієнтам із хронічними обструктивними захворюваннями легенів, незалежно від важкості перебігу захворювання, а засоби фізичної терапії є невід'ємною складовою частиною ефективних програм легеневої реабілітації. Поряд із великою кількістю досліджень про вплив програм ЛР загалом та окремих її компонентів на фізичний, функціональний та психоемоційний стан пацієнтів, детальних клінічних настанов із легеневої реабілітації при хронічних обструктивних захворюваннях легенів є обмежена кількість. ***Мета дослідження*** – проаналізувати клінічні настанови щодо менеджменту й легеневої реабілітації та оцінити місце фізичної терапії в системі легеневої реабілітації при хронічних обструктивних захворюваннях легенів. Проаналізовано клінічні настанови, відібрані на основі пошуку, здійсненого в базах даних PubMed (за останні п'ять років), PEDro, Cochrane в січні 2018 р., які стосуються клінічних настанов щодо лікування, менеджменту, легеневої реабілітації та фізичної терапії пацієнтів із хронічними обструктивними захворюваннями легенів. Установлено, що фізична терапія є невід'ємною складовою частиною програм легеневої реабілітації пацієнтів із хронічними обструктивними захворюваннями легенів. Головними засобами фізичної терапії, які рекомендовані клінічними настановами для пацієнтів із хронічними обструктивними захворюваннями легенів, є фізичне тренування, дихальні вправи, тренування дихальних м'язів, фізична терапія грудної клітки, електростимуляція периферичних м'язів. Найбільш повно описано методики застосування фізичного тренування в пацієнтів із хронічними обструктивними захворюваннями легенів. Відсутні або недостатні рекомендації щодо особливостей фізичної терапії при

загострenні та в умовах стаціонарного лікування; недостатньо інформації стосовно місця й особливостей застосування дихальних вправ і фізичної терапії грудної клітки в пацієнтів із хронічними обструктивними захворюваннями легенів на різних етапах лікування.

Ключові слова: фізична терапія, легенева реабілітація, хронічні обструктивні захворювання легенів, клінічна настанова.

Катерина Тимрук-Скоропад, Светлана Ступницкая, Юлия Павлова. Место физической терапии в системе легочной реабилитации пациентов с хронической обструктивной болезнью легких (анализ клинических руководств). ***Актуальность.*** На сегодня легочная реабилитация – это вмешательство, которое рекомендуется всем пациентам с хроническими обструктивными заболеваниями легких, независимо от тяжести течения заболевания, а средства физической терапии являются неотъемлемой составляющей эффективных программ легочной реабилитации. Наряду с большим количеством исследований о влиянии программ легочной реабилитации и отдельных ее компонентов, на физическое, функциональное и психоэмоциональное состояние пациентов есть ограниченное количество детальных клинических руководств по легочной реабилитации при хронических обструктивных заболеваниях легких. ***Цель исследования*** – проанализировать клинические руководства по менеджменту и легочной реабилитации и оценить место физической терапии в системе легочной реабилитации при хронических обструктивных заболеваниях легких. Анализируются клинические руководства, которые отобраны на основе поиска, совершенного по базам данных PubMed (за последние пять лет), PEDro, Cochrane в январе 2018 г., которые касаются клинических руководств по лечению, менеджменту, легочной реабилитации и физической терапии пациентов с хроническими обструктивными заболеваниями легких. Установлено, что физическая терапия является неотъемлемой составляющей программ легочной реабилитации пациентов с хроническими обструктивными заболеваниями легких. Основными средствами физической терапии, рекомендуемыми клиническими рекомендациями для пациентов с хроническими обструктивными заболеваниями легких, являются физическая тренировка, дыхательные упражнения, тренировки дыхательных мышц, физическая терапия грудной клетки, электростимуляция периферических мышц. Наиболее полно описаны методики применения физической тренировки у пациентов с хроническими обструктивными заболеваниями легких. Отсутствуют или недостаточны рекомендации по особенностям физической терапии при обострении и в условиях стационарного лечения; недостаточно информации о месте и применении дыхательных упражнений и физической терапии грудной клетки у пациентов с ХОБЛ на разных этапах лечения.

Ключевые слова: физическая терапия, легочная реабилитация, хронические обструктивные заболевания легких, клиническое руководство.

Introduction. Statistics on the incidence of chronic obstructive pulmonary disease (COPD) are disappointing, and forecasts are extremely threatening. WHO predicts that by 2020 COPD will be ranked the 3rd place among the causes of mortality of the planet population [1].

The practice of effective use of various medical, educational and rehabilitation measures to improve the functional state of people with respiratory disorders (including chronic ones) has long existed. However, given the prevalence of COPD, typical systemic disturbances going far beyond the respiratory system, and a significant number of comorbid diseases, the development of a well-designed rehabilitation system for COPD with scientifically proven efficacy was necessary.

And respectively, pulmonary rehabilitation has become such practice of the COPD patients' management. The official statement of the American Thoracic Society and the European Respiratory Society (ATS/ERS, 2013) claims that pulmonary rehabilitation (PR) is a complex intervention based on a careful patient assessment, according to which therapy should be applied including (but not limited to) physical training, education, and behavioural changes designed to improve both physical and psychological state of people with chronic respiratory diseases as well as to contribute to their long-term adherence to healthy behaviours [15].

Currently, pulmonary rehabilitation is an intervention recommended to all COPD patients, regardless of the disease severity, and physical therapy (PT) is an integral part of effective PR programs.

Along with a large number of studies on the impact of PR programs (both in general and of its individual components) on the physical, functional and psycho-emotional state of patients, the detailed clinical guidelines for PR in the case of COPD are limited.

The purpose of the study is to analyse clinical guidelines for management and pulmonary rehabilitation and to evaluate the role of physical therapy in the system of pulmonary rehabilitation in the case of COPD.

Materials and methods. This review covered the clinical guidelines selected on the basis of the search conducted in PubMed, PEDro, and Cochrane databases in January 2018.

Publications selected by the keywords «Chronic obstructive pulmonary disease» (ukr. *хронічне обструктивне захворювання легень*) served as the search criteria. PubMed's search was restricted to publications over the past 5 years focused on clinical guidelines for treatment and management, pulmonary rehabilitation and physical therapy for COPD patients.

Inclusion criteria. The studies included in the review met the following criteria: 1) Chronic Obstructive Pulmonary Disease, 2) Review, recommendations or practical guidelines for general principles of treatment, management, rehabilitation or physical therapy in the case of COPD.

Exclusion criteria: 1) Systematic reviews; 2) Conferences reports without full-text review; 3) Incomplete text articles; 4) Books; 5) Registered protocols of clinical researchers; 6) National adaptations of WHO GOLD recommendations [7].

In addition, the review did not include publications lacking general guidelines for treatment, management, rehabilitation and physical therapy for COPD patients. In particular, the review did not take into account the publications dedicated to surgical intervention; researches on the effects of medicines and medical interventions (in particular, artificial respiration); researches of other pathologies connected with COPD; study of structural and functional changes in the case of COPD. Among the publications excluded from the analysis were those unavailable in electronic format.

The selected clinical guidelines analysed: the components of pulmonary rehabilitation, program duration, the criteria for selection for the PR program and the criteria of the program effectiveness, the main and optional means of physical rehabilitation.

Results of the research. The review was based on 15 clinical guidelines selected out of 16 clinical guidelines that met the selection criteria. One clinical guideline was not included since it did not contain information analysed in the study [7].

8 guidelines (53.3%) do not provide recommendations on the PR components (Chart 1); one guidance sets the list of the recommended PR components while it does not contain components from the PT category [17]. 6 clinical guidelines (40%) provide a list of components including means of PT.

Chart 1

Basic recommendations for filling the pulmonary rehabilitation program in the case of chronic obstructive pulmonary disease (based on the analysis of clinical guidelines, n = 16)

Author, year	PR components	Duration of the PR program	Criteria for selection for the PR program
Ian Yang, 2017 [17]	1) patient assessment, 2) education, 3) behaviour change, 4) nutrition, 5) psychosocial support	on average, 8 weeks	Individuals/Patients: 1) with dyspnoea under physical activity, 2) with prolonged respiratory distress, characterized by dyspnoea, 3) with dyspnoea of all levels according to mMRC; 4) who experienced exacerbation.
Kankaanranta H., 2015 [9]	-	-	-
Hyoung Kyu Yoon, 2014 [18]	-	-	All patients with dyspnoea while walking at their own pace on flat areas.
2014 p. [10]	-	-	Stable patients with reduced physical endurance, regardless of pharmacological treatment, and patients who have recently been hospitalized after exacerbation.

End of the Chart 1

María Rosa Güell Rous, 2014 [8]	Compulsory components: 1) muscle training, 2) education, 3) chest physiotherapy. Optional components: 1) ergotherapy, 2) psychosocial support, 3) correction of nutrition.	8 weeks/20 sessions	Patients with dyspnoea at/above 2 points on the mMRC scale. All patients without contraindications.
Blair Anderson, 2013 [2]	-	-	Patients who: 1) have limited ability to exercise due to dyspnoea, despite medication, 2) were hospitalized after exacerbation.
Bolton CE, 2013 [4]	-	6–12 weeks	Patients who: 1) experience dyspnoea at/above 2 points on the mMRC scale and are functionally limited by dyspnoea. 2) were hospitalized after exacerbation.
Russi E.W., 2013 [13]	1) education, 2) self-control, 3) nutrition, 4) training, 5) psychological support.	-	-
Qaseem A., 2011 [11]	-	-	Patients: 1) with present symptoms of the disease, 2) with disabilities and FEV_1<50% of the eligible level.
Rudolf M. 2010 [6]	1) training of upper and lower limbs, 2) psychosocial support, 3) behaviour change, 4) education, 5) training of respiratory muscles.	minimum 6 weeks, maximum 12 weeks.	-
Davoren A Chick, 2010 [5]	1) patient assessment, 2) aerobic training, 3) strength training, 4) education, 5) psychosocial support.	-	1) patients with functional limitations, 2) PR is considered for all COPD patients with dyspnoea or limited physical activity, regardless of the air flow limitation.
Andrew L. Ries 2007 [12]	1) patient assessment, 2) training, 3) education, 4) nutrition, 5) psychosocial support.	6 to 12 weeks	Any COPD patient with respiratory symptoms of the disease.
Jadwiga A. Wedzicha, 2017 [16]	-	-	It is suggested to initiate the PR program within 3 weeks after the hospital discharge.

End of the Chart 1

Barreiro E., 2015 [3]	-	optimal duration -12 weeks ; minimum - 8 weeks	-
Sliwiński P., 2014 [14]	1) physical rehabilitation, 2) physical training (endurance and strength) 3) respiratory muscles training, 4) breathing exercises, 5) nutrition, 6) psychotherapy, 7) education, 8) psychosocial support.	minimum 6 weeks	All COPD patients, regardless of the disease severity.

Remarks:
mMRC - Modified British Medical Research Council Questionnaire.
FEV_1 - capacity of the air expired in the first second of forced expiration.

The following PR components are recommended in the majority of clinical guidelines as the main ones:

1) physical therapy;
2) education;
3) behaviour change - smoking;
4) patient assessment (survey).

In some guidelines, it is recommended to consider the possibility of changing dietary behaviour [8; 12; 13; 14; 17] and psychosocial support [5; 6; 12; 13; 14; 17]. There are recommendations for applying ergotherapy [8; 12; 17]. Consultations of the speech therapist are recommended for evaluation and management of repeated aspiration, swallowing and nutrition disorders arising as a result of dyspnoea of COPD patients [17].

The educational component involves discussing certain topics with patients in order to provide people with the understanding of the disease features, the functioning principles of the respiratory system under normal and pathological conditions, their behaviour in everyday life and during exacerbation period. In addition, practical study sessions on the use of inhalation devices and development of self-control skills (medication, assessment, and response to exacerbation) are provided [17].

It has been established that in accordance with the clinical guidelines, the duration of the PR programs, on average, constitutes 8 weeks with a recommended minimum 6 weeks' duration and maximum –12 weeks.

The selecting criteria for the PR program are similar:

1) individuals who suffer from dyspnoea during physical activity.
2) individuals with prolonged respiratory distress characterized by dyspnoea.
3) patients with dyspnoea at all levels of the mMRC scale.
4) patients experiencing exacerbation.

The criterion for the PR appointment for patients who experienced exacerbation was specified in the protocol of Bolton Ts. E. (2013) [4], which recommends starting PR during the first month after the hospital discharge. Jadwiga A. Wiedzicha (2017) [16] suggests initiating medical rehabilitation within 3 weeks after the discharge (conditional recommendation due to very poor quality of evidence).

Only María Rosa Güell Rous (2014) [8] provides a list of conditions and diseases being contraindicative to the patient inclusion in the PR program:

1) mental or behavioural disorders impairing collaboration with a therapist;

2) acute or unstable cardiovascular diseases limiting the patient's ability to exercise;

3) disorders of the musculoskeletal system, incompatible with physical activity.

In 11 clinical guidelines (73.3%) among the analysed, recommendations for the use of PT in the PR programs are made (Chart 2).

In the analysed clinical guidelines, the following means of PT are recommended as the principal:

1) physical training (physical exercises), in particular, aerobic (including interval training), strength training or their combination.

2) breathing exercises.

3) training of the respiratory muscles.

4) chest physical therapy.

5) electromyostimulation and electromagnetic stimulation of peripheral muscles.

In some of the protocols, such means as training respiratory muscles [8; 13; 17] and electro-myostimulation of peripheral muscles [4; 8] are classified as optional and are not recommended as the usual PR component. In addition, Blare Anderson (2013) [2] included respiratory cleansing techniques with the use of positive expiratory pressure (PEP) as an optional means of PT.

The use of physical training is recommended to train endurance, to increase physical activity and strength. In its turn, strength training can increase the strength of peripheral muscles, as well as help maintain or increase the bone mineral density [8]. According to Ian Yang (2017), physical training involves the accumulation of medium intensity exercises for large muscle groups ≥150 minutes per week for 5 days. Mostly it is walking outdoors or on a treadmill, and riding a bicycle. In addition, it is necessary to include strength training 2 times a week. [17].

Recommendations of María Rosa Güell Rous (2014) concerning aerobic or strength training include at least three 20-30 minutes' sessions per week. These sessions should be carried out continuously or at intervals in the case of more severe symptoms. The intensity of work constitutes 60-80% of the possible maximum. It includes walking on a treadmill or outdoors, swimming, dancing, and Nordic walking. Strength training for upper and lower limbs is recommended to be carried out at 70–85 % intensity of the possible maximum. 1–3 sets with 8–12 repetitions in each, 2–3 times a week are recommended; using external encumbrance in the form of trainers or dumbbells, and rubber loop bands [8].

According to Russi E.W. (2013), physical training includes such components as climbing, walking, treadmill training, and cycling, which can be used at intervals [13].

Slivinski P. (Sliwiński P., 2014) indicates that physical exercises should be carried out with intensity exceeding 50% of maximal oxygen consumption or at 70% of the maximum heart rate according to the patient's age. Exercises on a stationary bicycle, a treadmill or a 20-minute walk are recommended. Interval training can be used as well [14].

Chart 2

Means of physical therapy in the system of pulmonary rehabilitation in the case of chronic obstructive pulmonary disease (based on the analysis of clinical guidelines, n = 13)

Author, year, reference	Means of PT	Additional means of PT
Ian Yang, 2017 [17]	1) physical training, 2) breathing exercises, 3) chest physiotherapy.	1) training of inspiratory muscles.
Kankaanranta H., 2015 [9]	1) exercises	-
Hyoung Kyu Yoon, 2014 [18]	-	-
2014 p. [10]	1) breathing exercises.	-
María Rosa Güell Rous, 2014 [8]	1) muscle training, 2) aerobic or strength training, 3) interval training, 4) chest physiotherapy.	1) electromagnetic stimulation, 2) training of the respiratory muscles.

End of the Chart 2

Blair Anderson, 2013 [2]	1) breathing exercises.	1) respiratory tract cleansing techniques using positive expiratory pressure (PEP).
Bolton C.E, 2013 [4]	1) aerobic training.	1) neuromuscular electrical stimulation.
Russi E.W., 2013 [13]	1) physical training.	1) training of respiratory muscles.
Qaseem A., 2011 [11]	-	-
Rudolf M. 2010 [6]	1) strength training, endurance training or their combination.	-
Davoren A Chick, 2010 [5]	-	-
Andrew L. Ries 2007 [12]	1) physical training, 2) components of strength training, 3) endurance training of the upper limbs.	-
Jadwiga A. Wedzicha, 2017 [16]	-	-
Barreiro E., 2015 [3]	1) aerobic training, 2) interval training, 3) strength training, 4) electromyostimulation and electromagnetic stimulation of peripheral muscles, 5) training of respiratory muscles.	-
Sliwiński P., 2014 [14]	1) physical exercise, 2) endurance training, 3) training of the respiratory muscles.	-

Breathing exercises are recommended to reduce dyspnoea due to decreased hyperinflation of the lungs, to normalize respiratory muscles functioning and to optimize thoracoabdominal movements. The focus is on breathing through the uplifted lips and diaphragmatic breathing [2; 10; 17], as well as on yoga elements [2; 10].

The training of the respiratory muscles involves the use of small, accessible additional equipment for the training of respiratory inspiratory muscles whilst the inspiration reduction [8].

The purpose of chest physical therapy and respiratory tract cleansing is to improve sputum drainage, to increase tolerance to physical activity, and to reduce the need for a long-term antibiotics administration. Respiratory tract cleansing techniques are used in the case of sputum present in the respiratory tract [17]. Chest physiotherapy can include such elements as bronchial drainage methods, training of proper breathing, relaxation methods [8; 17].

The focus of the analysed clinical guidelines is on recommendations for physical training of COPD patients. Along with the fact that they provided detailed information on the methodology of aerobic and strength training, recommendations for the use of other physical therapy (respiratory exercises, chest physical therapy) are absent or insufficient. The role of breathing exercises and chest physical therapy in the PR program framework and the use of out-of-hospital physical training remains unclear. Unfortunately, there are no selection criteria and recommendations for the use of physical therapy in the case of exacerbation as well as under conditions of inpatient treatment.

Conclusions. Physical therapy is an integral part of pulmonary rehabilitation programs for COPD patients. The main means of physical therapy recommended in clinical guidelines for COPD patients are physical training, respiratory exercises, training of respiratory muscles, chest physical therapy, electrostimulation of peripheral muscles. In the analysed clinical guidelines, methods of the physical training used for COPD patients are the most extensively described. Recommendations regarding the features of

physical therapy in the case of exacerbation and under conditions of inpatient treatment are absent or insufficient; information on the role and specifics of the use of respiratory exercises and chest physical therapy for COPD patients at different stages of treatment is also insufficient.

Prospects for further research. It is necessary to study the peculiarities of the physical therapy effects (in particular, respiratory exercises and chest physical therapy) on the physical and functional state of COPD patients during the exacerbation period and inpatient treatment. It is important to improve the methods of physical therapy used at all stages of COPD patients' treatment.

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