

THE IMPORTANCE OF PULMONARY REHABILITATION AS THERAPEUTIC TOOL IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE¹

A IMPORTÂNCIA DA REABILITAÇÃO PULMONAR COMO FERRAMENTA TERAPÊUTICA NOS PACIENTES PORTADORES DE DOENÇA PULMONAR OBSTRUTIVA CRÔNICA

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SUMMARY

Objective: this study analyzed of the benefits of pulmonary rehabilitation (PR) and improvement in quality of life (QL) of patients with moderate or severe COPD, as it was very important to verify the impact that a chronic disease can cause the QL of these individuals. **Methods:** the sample included 10 patients with moderate or severe COPD. Initially these were submitted spirometric evaluation, evaluation of chest Physiotherapy and responded to the St George's Respiratory Questionnaire (SGRQ), then participating in the Protocol 1 of the modified pulmonary rehabilitation program at UNESP and distance traveled in walking test during 6 minutes (6-MWT) for 12 weeks, three times a week. **Results:** The results after three months of PR were statistically significant ($p < 0,05$), for all variables. **Conclusion:** the authors conclude that the PR program increased the physical capacity and the quality of life to the people of the research.

KEY-WORDS: Respiratory Physiotherapy. Quality of Life. COPD.

INTRODUCTION

The Chronic Obstructive Pulmonary Disease (COPD) affects about 5.5 million Brazilians, smokers and former smokers over 40 years, with a growth of 340% over the last 20 years. In 2006, the federal government spent \$ 87 million to infirmary because of COPD, with an average period of stay of 5 to 6 days, the patient may take up to 1 month to fully recover after a crisis.¹

COPD in recent years has been occupying the 4th to 7th position among the leading causes of death in Brazil, with 290 hospitalizations annually, bringing a huge expense to the health system in the country. This disease requires direct and indirect costs, the former being higher due to hospitalizations, medications and oxygen therapy. The indirect costs are represented by days lost from work, early retirement, premature death, family hardship and social.^{1,2,3}

According to the Platino study (Latin American Research Project Pulmonary Obstruction) (2005), in Brazil 18% of men and 14% women over 40 are suffering from COPD, with a mortality of four Brazilians per hour. Exacerbations are responsible for most of the costs of the disease, due to medical appointments, visits to emergency rooms and hospitalizations. In the United States, the burden of disease is about \$ 30 billion a year, according to World Health Organization (WHO), the common presence of depression, anxiety and hopelessness in patients of this pathology.¹

After optimizing the medication can produce improvements in severe COPD with pulmonary rehabilitation (PR). However, these patients for many years been stereotyped with inactivity and rest, becoming only recipients of drugs. The PR program emerged, in turn, to prove the opposite, that these patients are able to have a life almost normal.^{4,5}

So, are emerging new forms of therapy that may be beneficial for patients in PR programs, reflecting the increase of scientific knowledge, as well as acceptance of the application of such techniques in the recovery of patients.⁶

Through studies obtained on the cost-effectiveness of the rehabilitation program, there was a cost advantage in its implementation since the number of admissions showed reduced if for patients included in this program. Moreover, once considered unable to perform their professional activities, patients had to return to their activities facilitated after insertion in the PR program.^{2,5,7}

So it's worth mentioning that the assessment of quality of life (QL) is an important source of information, especially in chronic obstructive pulmonary diseases, because it has multiple factors, noting the severity of QL and the presence of declining health. St George's Respiratory Questionnaire (SGRQ), created in 1992 by Paul Jones and validated in Brazil by Sousa and Garden in 2000, is to elucidate the scope of the careful

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assessment, obtained through three domains: symptoms, daily activities and impacts psychosocial. This questionnaire is self-applied, determining the QL of patients in accordance with the score achieved.^{8,9}

This study analyzed of the benefits of pulmonary rehabilitation and the improvement of QL in patients with chronic obstructive pulmonary disease, since it was very important to verify the impact that a chronic disease can cause the QL of these individuals. Increasing knowledge about the disease in question, mainly on pulmonary rehabilitation was possible to add new statistics in the scientific community about this issue, and provide substantial input for an increasing rate in the treatment of COPD.

METHOD

This was a randomized test, conducted from data collection through field research associated with the application of evaluation protocol and closed questionnaire to patients with clinical diagnosis of moderate or severe COPD, classified according to values obtained by spirometry held in Pulmocenter Clinical, as a way of demonstrating pulmonary obstruction.

The research sample was composed of 10 patients. Being done at the Respiratory Therapy Unit Education and Assistance and Occupational Therapy (UEAFTO) State University of Pará (UEPA), from February to July 2009, three times a week.

The patients obeyed the inclusion criteria of the study: both sexes, aged 50 to 80 years, ex-smoker for at least three months, clinically stable, without exacerbation of the disease characterized by increased and / or a change in the appearance of respiratory secretions, cough, fatigue and increasing dyspnea not present musculoskeletal diseases or other diseases that prevent them from carrying out the proposed activities and have a clinical diagnosis of moderate to severe COPD, classified according to values obtained by spirometry.

After reading and signing of informed consent, patients underwent spirometric evaluation were submitted to chest physiotherapy assessment, and responded to the St George's Respiratory Questionnaire (SGRQ). After these steps these patients started the protocol I-Modified Program Pulmonary Rehabilitation (PR).

The assessment of respiratory therapy, the inspiratory and expiratory pressures peak, the walk test 6 'and the SGRQ were performed only in the first and last day of treatment.

During the study period were constantly held educational guidelines to provide more information about the pathophysiology of the disease, the importance of regular physical activity in

combination with appropriate use of medication, the best way to achieve activity of daily living (AVDs) and breathing exercises with the scope to save energy and facilitate the control of respiratory crisis, and the doubts of the patients regarding their disease.

At the beginning and after each session were recorded the following parameters: blood pressure (BP), auscultation (AP), respiratory rate (RR), heart rate (HR), oxygen saturation (SpO₂) and peak expiratory flow (PEF).

All procedures were recorded at each session in the form of development of each individual patient.

The physical therapy started with a session of stretching exercises for upper and lower limbs, proposed by Protocol I modified UNESP. The implementation of the protocol was done as a group, the exercises were previously taught in a demonstration to patients advising them to breathe diaphragmatic spray before starting the movement and exhale slowly between her lips (frenolabial) during the execution of the movement. After the stretching, began to walk 6 'training on a stationary bicycle, both of the following parameters measured: HR, SpO₂ and scale of perceived Borg in pre determined before, during and after their implementation. Then we initiated relaxation of accessory muscles of breathing, stretching the pectoral muscle, proprioceptive stimulation and re-diaphragmatic thoraco-abdominal.

To determine the maximum load of the training of the upper limbs was performed incremental test for upper limbs. This test consists of lifting weights progressively higher performing a diagonal motion primitive with both arms for two minutes.

The initial load was 0.5 kilograms (kg), which was progressively increased by 0.5 kg every sequence of two minutes to the tolerance of the patient, given the inability of performing the move in a coordinated manner, or the physical impossibility to complete the sequence started on schedule, with the maximum load determined by the last sequence. The parameters measured in pre determined before, during and after the test, were HR, SpO₂ and Borg scale. The data collected were stored in the database program Microsoft EXCEL 2007. According to the nature of the variables, there was a descriptive analysis, and informed the percentages of the results of categorical variables, and the taking of means, medians and standard deviations of numerical variables. To analyze the statistical significance of the results before and after the intervention study, we used the Student t test for paired samples, both with a level $\alpha = 0.05$ (5%).

These tests were carried out using the software BioEstat 5.0.

RESULTS

TABLE I - Assessment of the IP and MEP and PEF (1st session) and final (36th session) of the patients (n = 10) submitted to the Pulmonary Rehabilitation Program, UEAFTO, 2009.

DESCRIPTIVE STATISTICS	PI MÁX		PE MÁX		% PEF	
	Initial	End	Initial	End	Initial	End
Mínimum	45,0	74,0	45,0	120,0	25,0	44,0
Máximum	70,0	100,0	96,0	145,0	53,0	91,0
Whole Amplitude	25,0	26,0	51,0	25,0	28,0	47,0
Median	51,0	92,0	70,0	133,0	41,0	71,0
First Quartile (25%)	50,0	86,0	52,3	127,0	30,8	61,3
Third Quartile (75%)	60,0	96,0	89,8	143,5	45,8	74,0
Average Arithmetic *	55,2	90,0	70,9	134,2	39,4	68,1
Variance	87,1	76,7	375,0	134,2	105,4	220,8
Standard Deviation	9,3	8,8	19,4	9,0	10,3	14,9
Coefficient of Variation	16.90%	9.73%	27.31%	6.72%	26.05%	21.82%
p-value (t-Student)	< 0.00001*		< 0.00001*		< 0.00001*	

SOURCE: Field Survey, 2009.

TABLE II - Assessment of PEF and SpO₂ before and after each treatment session the patients (n = 10) submitted to the Pulmonary Rehabilitation Program, UEAFTO, 2009.

PEF	Before	After	SpO ₂	Before	After
Session 1	189,0	193,0	Session 1	92,1	94,6
Session 6	235,0	242,0	Session 6	93,1	95,4
Session 11	247,0	258,0	Session 11	95,8	97,1
Session 16	266,0	274,0	Session 16	96,4	97,5
Session 21	289,0	300,0	Session 21	97,1	97,7
Session 26	300,0	309,0	Session 26	97,6	97,8
Session 31	313,0	317,0	Session 31	97,9	98,0
Session 36	325,0	326,0	Session 36	97,8	98,0
ANOVA - Session: p - value = < 0.000001*			ANOVA - Session: p - value = < 0.000001*		
ANOVA - Moments: p - value = < 0.000001*			ANOVA - Moments: p - value = < 0.000001*		

SOURCE: Field Survey, 2009.

TABLE III - Evaluation of FR and HR before and after each treatment session the patients (n = 10) submitted to the Pulmonary Rehabilitation Program, UEAFTO, 2009.

Respiratory Rate	Before	After	Frequency Cardiac	Before	After
Session 1	22,8	18,4	Session 1	87,7	77,6
Session 6	18,7	16,3	Session 6	78,9	74,0
Session 11	18,5	16,0	Session 11	83,2	75,8
Session 16	17,8	15,7	Session 16	80,3	72,3
Session 21	17,0	15,7	Session 21	78,9	72,1
Session 26	16,9	15,8	Session 26	80,6	71,4
Session 31	16,5	15,4	Session 31	76,5	69,8
Session 36	16,2	15,1	Session 36	76,5	70,1
ANOVA - Session: p - value = < 0.000001*			ANOVA - Session: p - value = 0.005328*		
ANOVA - Moments: p - value = < 0.000001*			ANOVA - Moments: p - value = < 0.000001*		

SOURCE: Field Survey, 2009.

TABLE IV - Evaluation of Systolic BP and Diastolic BP before and after each treatment session the patients (n = 10) submitted to the Pulmonary Rehabilitation Program, UEAFTO, 2009.

BP Systolic	Before	After	BP Diastolic	Before	After
Session 1	127,0	124,0	Session 1	78,0	76,0
Session 6	126,0	123,0	Session 6	74,0	70,0
Session 11	126,0	117,0	Session 11	76,0	73,0
Session 16	126,0	120,0	Session 16	76,0	74,0
Session 21	131,0	118,0	Session 21	77,0	74,0
Session 26	121,0	115,0	Session 26	73,0	70,0
Session 31	117,0	113,0	Session 31	70,0	69,0
Session 36	115,0	112,0	Session 36	68,0	67,0
ANOVA -Session:p – value= 0.000026*			ANOVA - Session:p – value= 0.001074*		
ANOVA - Moments: p – value= < 0.000001*			ANOVA - Moments: p – value= < 0.000001*		

SOURCE: Field Survey, 2009.

TABLE V - Evaluation of the Walk of 6 'and aerobic-cycle (1 st and 36 th session) of the patients (n = 10) submitted to the Pulmonary Rehabilitation Program, UEAFTO, 2009.

<u>HIKING</u>	p-value (t-Student)			<u>BIKE</u>	p-value (t-Student)		
	SESSION 01	SESSION 36			SESSION 01	SESSION 36	
FC				FC			
Initial	82,3	80,2	0,2226	Initial	88,9	84,1	0,0538
3' Min	95,2	93,3	0,3246	5' Min	92,4	86,5	0,0675
End	89,7	84,1	0.0470*	End	90,7	81,7	0.0079*
SPO₂				SPO₂			
Initial	95,1	98,1	0.0013*	Initial	93,2	98,3	0.0048*
3' Min	93,1	98,3	< 0.00001*	5' Min	95,7	98,2	0.0003*
End	93,1	98,3	< 0.00001*	End	95,8	98,7	< 0.0001*
Borg				Borg			
Initial	12,2	9,2	< 0.00001*	Initial	12,8	9,2	< 0.0001*
3' Min	12,8	9,0	< 0.00001*	5' Min	12,4	9,0	< 0.0001*
End	13,2	9,0	< 0.00001*	End	12,6	9,0	< 0.0001*
Distance Traveled				Resistance			
Session 01	370,6		< .000001*	Session 01	1,0		best endurance
Session 36	544,0			Session 36	5,0		

SOURCE: Field Survey, 2009.

TABLE VI - Evaluation of the SGRQ questionnaire applied (1 st and 36 th session) to patients (n = 10) submitted to the Pulmonary Rehabilitation Program, UEAFTO, 2009.

SGRQ Domains	1 ^a Session - Initial			36 ^a Session - End			t – Student
	Average(DP)	Minimum	Maximum	Average(DP)	Minimum	Maximum	p - value
Symptoms	63.93% ± 22.3	25,0%	96,4%	8.21% ± 12.3	0,0%	39,3%	< 0.00001*
Activity	82.5% ± 14.37	56,3%	93,8%	9.4% ± 14.5	0,0%	43,8%	< 0.00001*
Impacts	72.58% ± 13.01	48,4%	90,3%	7.74% ± 5.1	0,0%	16,1%	< 0.00001*
Whole	71.46% ± 13.64	50,7%	93,3%	8.27% ± 6.43	0,0%	21,3%	< 0.00001*

SOURCE: Field Survey, 2009.

DISCUSSION

The II Brazilian Consensus on COPD (2004)¹ defined the distance (SD) of 54 meters achieved after the implementation of the RP, as an important clinical difference. The participants of this study showed a statistically significant improvement resulting in a p-value <0.00001 on the difference between the DP between the 1st session and 36 session, as well as other variables initial three minutes and the final (HR, SpO₂ and Borg scale) in 6-MWT.

Therefore, some authors suggest in their studies, the significant increase in DP in 6-MWT, is a better adaptation of the patient to the practical aspects of testing, such as anxiety management, recognition of the limits of proof and adaptation muscle in relation to the activity to be performed.^{10,11}

The main factors in increasing physical performance are verbal stimulation and follow up the patient during the 6-MWT, where both were performed in this study. They suggested the need for standardization of the test, achieving at least two tests (pre and post PR program) to evaluate the functional capacity of patients with COPD.¹²

Garrod e col.(2006)¹³ reported in their studies that muscle training improves lower limb muscle performance and endurance test of lower limb, regardless of prior pulmonary function, no correlation between maximal oxygen consumption, the distance covered and work rate during exercise on cycle ergometer.

In this study was observed a increased the maximum physical capacity, measured during the aerobic-ergometer for ten minutes, when patients showed better endurance to the end of the PR program, developed with an initial resistance (1.0) to end (5.0), as well as the other parameters assessed at baseline, at 5 min. and the end of training (HR, SpO₂ and Borg scale) that show statistically significant (p <0.05).

Carter e col. (1998)¹⁴, they say in a study of PEF increased after a PR program, reporting that this change may be a consequence of a reduction of airway obstruction of larger caliber, with improvement in respiratory muscle strength. In this study it was found the same results found in the study of Carter et.al., as participants showed statistically significant improvement in PEF measured on the 1st (initial) and 36th (final) session, where he found the end of PR a p-value <0, 00001, as well as pre-and post-treatment, each session, getting to a final p-value <0, 000001 to value / sessions, the same way to value / moments.

In the HR recorded in the pre-and post-treatment (each session), there were statistically significant with p-value = 0.005328 for value / sessions and p-value <0.000001 for value / moments.

The analyze of the results of the systolic and diastolic BP, recorded in the pre-and post-treatment (every session), it is observed that there was a statistically significant difference was found at the end of a p-value = 0.000026 (Systolic BP) and p -value = 0.001074 (Diastolic BP) for value / sessions and p-

value <0, 000001 to value / time also for the two variables.

The informations found in this study is in agreement with the literature, where the authors demonstrate a significant improvement in cardiovascular fitness, observing an improvement in CF and therefore the systolic and diastolic BP, and the SpO₂ of patients participating in your search.^{15,16}

Kunikoshita e col. (2006)¹⁷, in their study assert that some authors have found that in addition to dyspnea, peripheral muscle fatigue is also a determinant of exercise capacity in patients with COPD.

According to Brunetto e col. (2003)¹⁸, these findings can be clarified in their comments that the speed developed during the 6-MWT correlated with oxygen saturation during the application of the test in a population of patients with COPD.

In agreement with the study reported above, initially some patients in this study, had lower O₂ saturation, but according to that acquired physical conditioning, with a better level of cardiorespiratory fitness showed statistically significant improvement in SPO₂ found during pre-and post-treatment (each session) was found at the end of a p-value <0.000001 for value / sessions, as well as value / moments.

The dyspnea, which agrees with other authors, which show in their research, which is a reduction of dyspnea in COPD patients after participation in the PR program, it was found in this study a statistically significant reduction in respect of evaluation of dyspnea at the beginning, during and after the practice of the 6-min walk. p-value <0.00001 and aerobic training, cycle for 10 min. p-value <0.0001, which we used the Borg scale as evaluative instrument.^{10,13}

With respect to respiratory pressures, evaluated at the beginning (1st session) and final (36th session) of PR, not using the muscle training with linear load, but opting for the use of re thoraco-abdominal diaphragm proprioceptive stimulation and muscle relaxation accessory. There is a statistically significant difference was found at the end of a p-value <0.00001 for the MIP and MEP. Suggesting that the proposed program increased muscle strength (FMR), may be found in patients in this study, occurring even without being an employee specific training of respiratory muscles with linear load.

These results agree with some authors that demonstrate improvement after a PR program with muscle training and respiratory rehabilitation in their research. It is reported that the improvement in the respiratory rehabilitation may have occurred because of an expected improvement in respiratory mechanics, which accounts for the function of respiratory muscles, or as a result of improved conditioning of the patient.^{19,20,21}

According Porszasz e col. (2005)²², after physical training, there is a reeducation of ventilation and respiratory rate (RR) for the same level of exercise, with an increase in inspiratory capacity. This improvement that normally occurs with both

inspiratory and expiratory muscles, suggesting a reduction in hyperinflation, one factor behind the improvement in the mechanics of the diaphragm and, consequently, FMR.

Agreeing with the above author, this study showed benefits for patients, with regard to rehabilitation of RF, evidenced by the statistically significant observed before and after treatment, each session, it was the end of a p -value $< 0, 000001$ to value / sessions, as well as value / moments.

The present study showed that patients submitted to the PR program had improved quality of life (QL), assessed by questionnaire St. George's Respiratory Questionnaire (SGRQ) which is a questionnaire validated for the Portuguese language, which is why chose to use it in this study.

It consists of 76 items and comprises three domains: symptoms (24 items), activity (16 items) and psychosocial impact that the respiratory disease on the patient (36 items). The scores from each of the three domains, when closer to 0 (zero) the better the QL, and the closer to 100 shows a worse QL. Values up to 10% indicate a QV considered normal. A change in four units represents a significant change.^{23,24,25}

For the interpretation, each field has its maximum possible score (symptoms, 662.5 points; activities, 1209.1 points and impacts, 2117.8 points) points for each answer are added and the total is referred to as a percentage this maximum (0-100%). A total score is also calculated based on the results of the three areas (0-3.989,4 points).^{23,24,25}

For fields, the symptom assess the level of symptoms, including frequency and duration of cough, sputum production, breathlessness and wheezing, through all the questions in Part 1 of the questionnaire (from 1.1 to 1.8). The field activity assesses the causes and limitations related to the shortness of breath during activities, including the part 2, sections 2 and 6 of the questionnaire. The policy impacts psychosocial assess factors related to employment, state control of the disease, panic, need for medication and its effects, the expectation of health and disturbances of daily life, through Part 2, sections 1, 3, 4.5 and 7 questionnaire.²³

According to Rodrigues (2003)²⁶, the effectiveness of PR, should not be seen only by measurements obtained by testing physical capacity or sub, but also from the development of symptoms and health status translated in QL of patients submitted to the PR program.

As asserts Zuwallack (2000)²⁷, provided that the cure for COPD is not possible, and drug treatment is partially effective, improve quality of life related to health (HRQOL) is an important goal to be sought in PR programs and therefore an important parameter to be evaluated when determining the effects and effectiveness of a PR program. The effectiveness of

PR on the HRQOL of these patients could be observed a significant improvement, both statistically and in the clinical picture, noting that the PR program is effective in treating COPD patients with moderate or severe.

Coinciding with the authors mentioned above, the assessment of the effects of PR on the HRQOL of patients participating as measured by SGRQ questionnaire, checked in early (1st session) and final (36 session) treatment, it is observed that there was a statistically significant between the three areas assessed, it was found for the domains symptoms, activity and psychosocial impacts, the final program a p -value = <0.00001 .

It should be noted also that the 1st session the patients had minimum values above 10% which means impairment in QL and the 36th session presented minimum values equal to 0 (zero), showing a significant improvement in QL.

A survey similar to this study, but lasted only 6 weeks and 2 weekly meetings, the authors observed an average reduction of the whole field, being statistically significant, they concluded that QL achieved clinically significant increase maintained for a period of 6 months after the start of PR.²⁸

Some authors have shown that patients with COPD, when subjected to a PR program, show significant improvements in both the 6-MWT and in HRQOL, as assessed using the questionnaire scores. These patients are able to maintain the ability to exercise and improvement in QOL for up to 12 months after the onset of the RP, thereby reducing public spending on hospital.²⁹

So the authors ensure that the RP, has beneficial effects on long-term HRQOL in patients with COPD, showing a significant improvement in QOL.³⁰

CONCLUSION

This study demonstrated that individuals with a clinical diagnosis of moderate or severe COPD, when subjected to the PR program at the end of the program presented:

- Improvement in HRQOL.
- Optimization of functional independence, with the development of techniques for carrying out activities of daily living.
- Reduction of dyspnea for small and large efforts, in addition to obtaining a greater motivation to perform exercises.
- Improvement in physical fitness, cardiorespiratory capacity, increasing the functional capacity.
- Reduction of respiratory symptoms and levels of anxiety and depression significantly.
- Improves the level of perception and awareness about their disease.

RESUMO

A IMPORTÂNCIA DA REABILITAÇÃO PULMONAR COMO FERRAMENTA TERAPÊUTICA NOS PACIENTES PORTADORES DE DOENÇA PULMONAR OBSTRUTIVA CRÔNICA

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Objetivo: por meio deste estudo realizou-se a análise dos benefícios proporcionados pela Reabilitação Pulmonar (RP) e a melhora da Qualidade de Vida (QV) dos pacientes portadores de DPOC moderada ou grave, visto que foi de grande importância verificar a repercussão que uma doença crônica pode causar na QV desses indivíduos. **Método:** a casuística foi composta por 10 pacientes portadores de DPOC moderada ou grave. Inicialmente foram submetidos à avaliação espirométrica, avaliação fisioterapêutica pneumofuncional e responderam ao St George's Respiratory Questionnaire (SGRQ), participando em seguida do protocolo I modificado do programa de reabilitação pulmonar da UNESP e teste de caminhada de 6 minutos (TC6'), durante 12 semanas, três vezes por semana. **Resultados:** os resultados após três meses do programa de RP mostraram-se estatisticamente significante ($p < 0,05$), para todas as variáveis estudadas. **Conclusão:** o programa de RP aumentou a capacidade física e a qualidade de vida dos sujeitos da pesquisa.

DESCRITORES: Fisioterapia respiratória. Qualidade de Vida. DPOC.

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