Journal of Clinical and Nursing Research, 2025, Volume 9, Issue 10
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

Study on the Effects of Respiratory Exercise Rehabilitation Nursing on Self-care Ability, Lung Function, and Quality of Life in Patients with COPD

Yaran Li[1], Xinyi Ye[1], Hao Zhang[1], Wei Yuan[1], Jing Wang[2], Kunqian Liu[3]

[1]Ward 3, Department of Respiratory and Critical Care Medicine, Affiliated Hospital of Hebei University, Baoding 071000, Hebei, China
[2]Tuberculosis Ward 3, Affiliated Hospital of Hebei University, Baoding, Hebei, 071000, China
[3]Department of Emergency Medicine, Tang County People's Hospital, Baoding, Hebei, 072350, China

Abstract: *Objective*: To explore the effects of respiratory exercise rehabilitation nursing on self-care ability, lung function, and quality of life in patients with chronic obstructive pulmonary disease (COPD). *Methods*: A total of 88 patients with COPD admitted from February 2024 to February 2025 were selected and randomly divided into an experimental group and a control group, with 44 patients in each group. The control group received routine nursing, while the experimental group received respiratory exercise rehabilitation nursing on the basis of routine nursing. After 12 weeks of intervention, the self-care ability, lung function, and quality of life of the two groups were compared. *Results*: After the intervention, the scores of each dimension and the total score of self-care ability in the experimental group were significantly higher than those in the control group ($p < 0.001$). The improvement of lung function indicators such as FEV_1, FVC, and FEV_1/FVC in the experimental group was better than that in the control group ($p < 0.001$). The scores of each dimension and the total score of quality of life in the experimental group were significantly lower than those in the control group ($p < 0.001$). *Conclusion*: Respiratory exercise rehabilitation nursing can effectively improve the self-care ability, lung function, and quality of life of patients with COPD, which is worthy of clinical promotion and application.

Keywords: Chronic obstructive pulmonary disease; Respiratory exercise rehabilitation nursing; Self-care ability; Lung function; Quality of life

Online publication: Nov 3, 2025

1. Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory disease characterized by persistent airflow limitation, featuring high incidence, high disability rate, and high recurrence. The emergence of the disease not only causes severe damage to patients' lung function but also leads to repeated acute exacerbations, reducing patients' self-protection ability and severely affecting their quality of life, thus imposing a heavy economic burden

on families and society [1,2]. In recent years, with the development of rehabilitation medicine, the therapeutic value of respiratory exercise rehabilitation nursing for chronic respiratory diseases has gradually attracted people's attention. Simultaneously, systematic rehabilitation intervention can improve patients' understanding of the disease, promote the formation of active self-protection behaviors, relieve clinical symptoms, and enhance the quality of life. Based on this, this article analyzes the effects of respiratory exercise rehabilitation nursing on self-care ability, lung function, and quality of life of COPD patients, as follows.

2. Materials and methods

2.1. Baseline information

Eighty-eight COPD patients admitted to the respiratory medicine department of our hospital from February 2024 to February 2025 were selected as the research subjects. The patients were divided into an experimental group and a control group using a random number table method, with 44 patients in each group.

In the experimental group, there were 26 males and 18 females, with an age range of 45 to 78 years and an average age of (62.35 ± 8.42) years. The disease duration ranged from 3 to 15 years, with an average duration of (8.65 ± 3.24) years. In the control group, there were 24 males and 20 females, aged between 48 and 75 years, with an average age of (60.87 ± 7.91) years. The disease duration ranged from 2 to 14 years, with an average of (8.23 ± 2.97) years.

2.1.1. Inclusion criteria

Meet the diagnostic criteria for COPD in the "Guidelines for the Diagnosis and Treatment of Chronic Obstructive Pulmonary Disease (2023 Revision)" developed by the Chinese Medical Association Respiratory Disease Branch, and be in a stable phase of the disease.

(1) Aged between 40 and 80, able to understand and cooperate with various assessments and rehabilitation training.
(2) Patients are willing to participate in this study and sign an informed consent form voluntarily.

2.1.2. Exclusion criteria

Combined with severe dysfunction of important organs such as heart, liver, and kidney, or the presence of malignant tumors, autoimmune diseases, and other diseases that seriously affect the study results.

(1) Acute exacerbation of COPD has occurred in the past 3 months, or there is uncontrolled severe lung infection.
(2) Presence of cognitive impairment, mental illness, unable to cooperate with respiratory exercise rehabilitation training.
(3) Participation in other clinical trials that affect the results of this study in the near future.
(4) There was no statistically significant difference in general information such as gender, age, and disease duration between the two groups ($p > 0.05$), and they were comparable.

2.2. Methods

Patients in the control group received routine nursing intervention for 12 weeks. The nursing content includes: Condition monitoring, regular measurement of body temperature, pulse, respiratory rate, and blood pressure

every day, recording 24-hour sputum volume and sputum properties; providing oxygen inhalation guidance, controlling oxygen flow at 1–2 L/min, and daily oxygen inhalation time of not less than 15 hours; conducting health education, with 1 collective lecture per week covering the causes, precipitating factors, and medication precautions of COPD, each lecture lasting 40 minutes; guiding patients to have a reasonable diet, ensuring a daily protein intake of 1.2–1.5 g/kg body weight and a daily water intake of 1500–2000 mL; nurses assisting patients in positional sputum excretion, twice a day (morning and evening), 15 minutes each time, assisting patients to lie on their sides, gently tapping the back from bottom to top and from outside to inside [3].

The observation group received respiratory rehabilitation nursing care based on routine nursing for 12 weeks.

2.2.1. Abdominal breathing training

The patient lies on their back with knees bent, placing one hand on the chest and the other on the abdomen. They slowly inhale through the nose, allowing the abdomen to rise for 4 seconds, then slowly exhale through the mouth with lips pursed as if blowing a whistle, allowing the abdomen to fall for 6 seconds. This exercise is performed 3 times a day, with each session lasting 15 minutes.

2.2.2. Pursed-lip breathing training

The patient sits in a relaxed position, inhales through the nose for 2 seconds, then purses their lips and exhales slowly for 4–6 seconds, trying to expel as much air from the lungs as possible. This training is done 3 times a day, with each session lasting 10 minutes.

2.2.3. Respiratory exercise training

This specifically includes chest expansion, bending, and turning movements. For chest expansion, the patient extends their arms to shoulder height, inhales while straightening their back, and exhales while bringing their arms back, repeating 10 times. For bending, the patient stands with feet shoulder-width apart, bends slowly at the waist with hands touching the ground and exhales, then inhales while returning to the upright position, repeating 8 times. For turning, the patient stands with feet shoulder-width apart, turns left and right while exhaling, and inhales while returning to the center, repeating 8 times on each side. This training is performed 2 times a day, with each session lasting 20 minutes.

2.2.4. Endurance training

The nurse develops a walking plan based on the patient's physical condition, starting with walking 300 meters at a pace of 60 steps/minute. The distance and pace are gradually increased by 100 meters and 5 steps per week, respectively, until reaching 1000 meters at a pace of 80 steps/minute. This training is performed once a day.

All respiratory rehabilitation training sessions are conducted under the guidance of a nurse. During the training, the nurse closely monitors the patient's breathing and heart rate to ensure that their blood oxygen saturation remains above 90% [4].

2.3. Observation indicators

2.3.1. Self-care ability

Evaluated using the Chronic Obstructive Pulmonary Disease Self-care Ability Scale, which includes four dimensions, includes the self-care knowledge, self-care skills, self-care responsibility, and self-care confidence.

The scale consists of 28 items, with each item scored from 1 to 5. The total score ranges from 28 to 140, and a higher score indicates stronger self-care ability.

2.3.2. Lung function

Patients forced expiratory volume in one second (FEV1), forced vital capacity (FVC), and FEV1/FVC ratio were measured using a lung function monitor. Before testing, patients were required to rest quietly for 15 minutes in a seated position. The test was repeated three times, and the maximum value was taken as the final result.

2.3.3. Quality of life

Evaluated using the St. George's Respiratory Questionnaire (SGRQ), which includes three dimensions, includes the symptoms, activity level, and impact of disease. The questionnaire consists of 50 items, with each item scored from 0 to 4 based on severity. A higher score indicates poorer quality of life for the patient. The total score and scores for each dimension were calculated using a formula, with the total score ranging from 0 to 100.

2.4. Statistical analysis

Data analysis was performed using SPSS 25.0 statistical software. Measurement data were expressed as mean ± standard deviation ($\bar{x} \pm s$) and analyzed using the *t*-test. Count data were expressed as percentages (%) and analyzed using the chi-square test. A p-value < 0.05 was considered statistically significant.

3. Results

3.1. Self-care ability indicators for both groups of patients

Post-intervention, the experimental group demonstrated significantly greater improvement in all domains of self-care ability compared to the control group (all between-group p-values < 0.001). While both groups showed significant improvements from their own baselines, the increases in scores for self-care knowledge, skills, responsibility, confidence, and the total score were markedly higher in the experimental group. See **Table 1** for details.

Table 1. Comparison of self-care ability between the two groups of patients ($\bar{x} \pm s$)

Group	n	Time	Knowledge	Skills	Responsibility	Confidence	Total score
Experimental group	44	Pre	18.25 ± 3.12	16.89 ± 2.78	15.63 ± 2.45	14.92 ± 2.31	65.69 ± 8.24
		Post	25.68 ± 3.56	23.45 ± 3.02	21.87 ± 2.89	20.76 ± 2.65	91.76 ± 9.32
	t-value		10.256	11.362	9.875	10.543	12.689
	p-value		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Control group	44	Pre	17.98 ± 3.05	17.02 ± 2.81	15.87 ± 2.51	15.13 ± 2.28	66.00 ± 8.17
		Post	20.32 ± 3.21	19.23 ± 2.95	18.12 ± 2.67	17.54 ± 2.43	75.21 ± 8.56
	t-value		3.872	3.561	3.214	3.678	4.125
	p-value		< 0.001	0.001	0.002	< 0.001	< 0.001
Comparison between groups after intervention	*t*-value		6.892	5.987	5.231	6.542	8.251
	p-value		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

3.2. Lung function indicators of two patient groups

Post-intervention comparisons revealed statistically significant differences between the experimental and control groups across all measured lung function parameters, including FEV1, FVC, and FEV1/FVC ratio (all $p < 0.001$), favoring the experimental group. Intragroup analysis indicated that both groups experienced significant improvements from baseline (all $p < 0.05$ for the control group; all $p < 0.001$ for the experimental group). However, the magnitude of improvement was markedly superior in the experimental group. See **Table 2** for details.

Table 2. Comparison of lung function indicators between two patient groups ($\bar{x} \pm s$)

Group	n	Time	FEV_1 (L)	FVC (L)	FEV_1/FVC (%)
Experimental group	44	Pre	1.42 ± 0.35	2.35 ± 0.42	58.63 ± 4.25
		Post	1.86 ± 0.41	2.89 ± 0.48	65.32 ± 4.68
	t-value		5.632	5.987	6.215
	p-value		< 0.001	< 0.001	< 0.001
Control group	44	Pre	1.39 ± 0.32	2.31 ± 0.39	57.98 ± 4.12
		Post	1.53 ± 0.36	2.52 ± 0.43	60.15 ± 4.32
	t-value		2.156	2.321	2.563
	p-value		0.035	0.023	0.012
Comparison between groups after intervention	*t*-value		4.021	3.876	4.521
	p-value		< 0.001	< 0.001	< 0.001

3.3. Quality of life indicators of two patient groups

Both the experimental and control groups exhibited statistically significant improvements from baseline to post-intervention in all quality-of-life domains, symptoms, activity, impact, and total score, with all *p*-values < 0.001. Following the intervention, the experimental group showed markedly lower, indicating better outcomes scores than the control group in all corresponding measures. These between-group differences were all statistically significant (all $p < 0.001$). See **Table 3** for details.

Table 3. Comparison of quality-of-life indicators between two patient groups ($\bar{x} \pm s$)

Group	n	Time	Symptom domain	Activity domain	Disease impact	Total score
Experimental group	44	Pre	28.65 ± 4.32	32.18 ± 5.16	26.43 ± 3.87	87.26 ± 10.53
		Post	16.23 ± 3.15	20.56 ± 4.21	15.87 ± 2.96	52.66 ± 7.82
	t-value		15.326	13.875	14.652	16.893
	p-value		< 0.001	< 0.001	< 0.001	< 0.001
Control group	44	Pre	27.98 ± 4.15	31.87 ± 4.98	25.96 ± 3.72	85.81 ± 10.25
		Post	23.56 ± 3.87	27.65 ± 4.53	21.34 ± 3.25	72.55 ± 9.36
	t-value		5.632	4.987	5.214	6.325
	p-value		< 0.001	< 0.001	< 0.001	< 0.001
Comparison	*t*-value		9.215	7.863	8.542	10.652
	p-value		<0.001	<0.001	<0.001	<0.001

4. Discussion

4.1. Positive impact of respiratory rehabilitation nursing on self-care ability of COPD patients

This study indicates that after intervention, the scores and total scores of various dimensions of self-protection ability in the experimental group were higher than those in the control group, and the evaluation results before and after intervention within the group were also statistically significant ($p < 0.05$). This confirms the important value of respiratory rehabilitation in enhancing the self-protection ability of COPD patients. Although the traditional nursing model can transmit basic disease knowledge to patients, it lacks specialized skill training and behavior supervision, making it difficult to translate theoretical knowledge into daily self-protection behaviors [5]. Respiratory rehabilitation nursing, based on a systematic training plan, allows patients to gradually master key disease management skills and deepen their control and cognition of their own physical health status through repeated practice of abdominal breathing, pursed-lip breathing, and other movements.

Nurses continuously provide guidance and timely feedback during the training process, which can enhance patients' self-protection awareness and prompt them to shift from passively cooperating with nursing to actively participating in disease management, ultimately achieving a comprehensive improvement in self-protection ability. Relevant studies have confirmed that enhancing self-protection ability can significantly reduce the probability of acute exacerbations in patients with chronic obstructive pulmonary disease.

4.2. Improvement effect of respiratory rehabilitation nursing on lung function of COPD patients

In this study, after intervention, the improvement of FEV1, FVC, and FEV1/FVC in the experimental group was significantly greater than that in the control group ($p < 0.05$), indicating a strong correlation with the physiological effect mechanism inherent in respiratory rehabilitation therapy. Due to long-term airway obstruction, the respiratory muscles of COPD patients are chronically loaded, leading to changes in muscle fiber structure and decreased function, which ultimately results in decreased lung ventilation function. Performing abdominal breathing training on patients can enhance the contractility of their diaphragm and other respiratory muscles, improve respiratory efficiency, and increase tidal volume. Pursed-lip breathing can prolong exhalation time, reduce intra-airway pressure, decrease airway obstruction, and improve gas exchange in the lungs. Endurance training can also enhance patients' cardiopulmonary reserve, improve their tolerance to hypoxic environments, and actively promote the recovery of lung function [6].

Although traditional nursing can alleviate hypoxic symptoms through methods such as oxygen inhalation, it cannot fundamentally improve respiratory muscle function and airway dynamic characteristics, thus its effect on improving lung function is limited. Long-term adherence to respiratory rehabilitation training by patients can delay the progressive decline in lung function associated with COPD.

4.3. Enhancing effect of respiratory rehabilitation nursing on the quality of life of COPD patients

The results of this study demonstrate that respiratory rehabilitation is of great significance in improving the quality of life of COPD patients. Implementing this intervention can enhance patients' quality of life. The reason for such results lies in the fact that respiratory rehabilitation can improve patients' self-protection abilities and lung function. Improving lung function can alleviate core symptoms such as dyspnea, reduce the constraints of

symptoms on daily life, enhance patients' self-care abilities in daily life, and improve symptoms and activity levels. Simultaneously, enhancing self-protection abilities can improve patients' coping effectiveness against the disease, reduce the psychological burden caused by disease recurrence, decrease limitations on social participation, and enhance their performance in various dimensions. Although routine nursing can alleviate patients' discomfort symptoms, it cannot fundamentally address the issue of decreased quality of life, thus the efficacy of the control group is not as good as that of the experimental group.

5. Conclusion

In summary, respiratory exercise rehabilitation nursing can effectively improve the self-care ability, lung function, and quality of life of patients with COPD, and is worthy of clinical promotion and application.

Funding

Baoding Science and Technology Plan (Project No.: 2541ZF096)

Disclosure statement

The authors declare no conflict of interest.

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