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The Effect of Empowerment Education-Based Pulmonary Rehabilitation Exercise on Pulmonary Rehabilitation in Elderly Hospitalized Patients with Chronic Obstructive Pulmonary Disease (COPD)

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Abstract: *Objective*: To explore the application effect of lung rehabilitation exercise based on empowerment education on lung rehabilitation of elderly patients with chronic obstructive pulmonary disease (COPD) during hospitalization. *Methods*: Elderly patients with COPD admitted to the First Hospital of Hohhot from June 2024 to December 2024 were selected and divided into an intervention group (50 cases, receiving conventional treatment and nursing + lung rehabilitation exercise based on empowerment education) and a control group (50 cases, receiving conventional treatment and nursing) using the random number table method. The lung function, exercise endurance, and dyspnea scores of the two groups were compared and analyzed. *Results*: After 14 days of nursing, the lung function of the intervention group was higher than that of the control group ($P < 0.05$). There was no difference in exercise endurance between the intervention group and the control group ($P > 0.05$). The dyspnea score of the intervention group was lower than that of the control group ($P < 0.05$). *Conclusion*: Lung rehabilitation exercise based on empowerment education has a definite therapeutic effect, which can improve lung function, exercise endurance, and dyspnea symptoms in elderly patients with COPD.

Keywords: Lung rehabilitation exercise based on empowerment education; Chronic obstructive pulmonary disease; Research effect

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1. Introduction

Chronic obstructive pulmonary disease (COPD) is a common respiratory disease, referring to a type of obstructive lung disease related to emphysema and chronic bronchitis [1]. Elderly people are at high risk of developing this disease, and they are more prone to lung function impairment. The decline in lung function is significantly higher in elderly patients compared to other age groups with the same disease duration [2]. Studies have pointed out that the prevalence of COPD in China is increasing, with rates of 21.2% for those aged 60–69

and 35.5% for those aged 70 and above [3]. Medication is a commonly used treatment for COPD patients. Selecting medications based on the patient's condition can quickly control the symptoms and signs caused by COPD and delay disease progression. However, COPD has a long course and is difficult to cure. Even during stable periods, there is a risk of recurrent episodes and acute exacerbations. To improve the treatment effect of COPD, it is necessary not only to provide treatment based on the patient's condition but also to supplement it with high-quality nursing services to enhance disease control, improve lung function, and prevent complications. Lung rehabilitation exercise is an economical, sustainable, practical, and scientific intervention method. Following the doctor's advice and exercising accurately and on time can continuously improve respiratory function. However, most patients lack accurate knowledge about COPD and lung rehabilitation exercises. Therefore, it is essential to provide health education as a foundation for lung rehabilitation exercises to ensure patient compliance. Empowerment education, based on the patient-centered principle, can scientifically empower patients, mobilize their potential, increase their interest, and motivate them to actively exercise. This can help patients develop long-term habits that promote healthy behaviors and improve their prognosis. Based on this, our study analyzes the effects of lung rehabilitation exercises based on empowerment education, focusing on their application value to provide some guidance for clinical practice.

2. Materials and methods

2.1. General information

In this study, 100 elderly patients with COPD admitted to the First Hospital of Hohhot from June 2024 to December 2024 were selected. They were divided into a control group and an intervention group using the random number table method, with 50 patients in each group. Continuous variables were compared using the *t*-test, and categorical variables were assessed using the chi-square test to evaluate differences between groups. The data showed that there were no statistically significant differences between the two groups in baseline characteristics such as age, BMI, gender, and smoking history, with $P > 0.05$, indicating comparability. Details are shown in **Table 1**. This study was approved by the Medical Ethics Committee of the First Hospital of Hohhot.

Table 1. General information of the two groups [*n*=50 cases, n/(Mean ± SD)]

Group	Gender (Male/Female, *n*)	Age (years)	BMI (kg/m^2)	Smoking History (Yes/No, *n*)
Intervention	38/12	69.08 ± 6.53	21.72 ± 3.65	15/35
Control	33/17	71.58 ± 7.11	22.11 ± 4.42	14/36
t/x^2 value	1.214	1.831	0.481	0.048
P-value	0.271	0.070	0.632	0.830

Inclusion criteria: (1) Meet the diagnostic criteria for elderly COPD in the "Guidelines for the Diagnosis and Treatment of Chronic Obstructive Pulmonary Disease (2021 Revision)" [4]; (2) Age ≥60 years old; (3) Stable condition and in remission phase; (4) Voluntary participation in this study and signed informed consent.

Exclusion criteria: (1) Combined with severe cardiac, liver, kidney, and other organ dysfunction; (2) Suffering from mental illness or cognitive impairment; (3) Recent acute exacerbation or history of lung surgery; (4) Severe motor dysfunction.

2.2. Methods

The control group received routine treatment and nursing care: Routine treatment included anti-asthmatic drugs, oxygen inhalation, cough relief, and anti-infection measures. Routine nursing care encompassed condition assessment, health education, dietary management, and psychological counseling.

The intervention group, on the basis of the control group, underwent lung rehabilitation exercises based on empowerment education: (1) Empowerment education: a. Identifying problems through one-on-one communication between nurses and patients, three times a week, 20 minutes each time, conducted by responsible nurses who had undergone empowerment education and communication skills training. Open-ended questions were used to understand health needs, lifestyle, and habits, analyze factors affecting disease recovery, and guide patients to accurately express their problems and negative emotions, and actively participate in rehabilitation. b. Setting goals to improve patients' accurate understanding of disease treatment and lung rehabilitation exercises through empowerment education, guiding patients to recognize the impact of unhealthy behaviors on rehabilitation effects, stimulating subjective initiative and interest in lung rehabilitation, and changing rehabilitation plan behaviors. One-on-one communication with patients was used to investigate patients' cognition of the disease, lifestyle after illness, whether they performed lung rehabilitation exercises, and compliance with lung rehabilitation. The patients' willingness to perform lung rehabilitation exercises and current behavior development status were evaluated. If patients achieved the expected goals, lung rehabilitation exercises were initiated. Lung rehabilitation exercises consisted of respiratory training, exercise training, and exercise rehabilitation guidance. (2) Respiratory training included pursed-lip breathing and abdominal breathing training. For pursed-lip breathing, patients were instructed to close their mouths, inhale through their noses, purse their lips as if blowing a whistle, and exhale slowly. The exhalation: inhalation ratio was 1:2 or 1:3, with each session lasting 10–15 minutes and performed 2–3 times a day. Abdominal breathing training required patients to lie in a supine or semi-reclining position, relax all muscles, place their hands on their abdomen and chest, and inhale slowly while allowing their abdomen to rise without moving their chest. They were then instructed to exhale slowly while allowing their abdomen to fall without moving their chest. Each session lasted 10–15 minutes and was performed 2–3 times a day. (3) Exercise training involved assessing the patient's overall condition and exercise function, and developing a rehabilitation plan based on the assessment results. Patients were guided to perform upper body resistance exercises in the rehabilitation area of the hospital room, using 1–2 kg dumbbells to complete resistance movements such as front raises and lateral raises. The exercise intensity was adjusted to achieve a heart rate of 60%–80% of the maximum heart rate, which was calculated as 220 minus the patient's age. Each exercise session lasted 10–15 minutes and was performed once a day. (4) Exercise rehabilitation guidance: A rehabilitation nurse provided one-on-one guidance, including warm-up before rehabilitation exercises, precautions during exercises, and full-body relaxation after exercises. The nurse also urged patients to complete various activities according to the doctor's advice to ensure the safety of exercise rehabilitation.

The two groups received continuous care for 14 days.

2.3. Observation indicators

2.3.1. Lung function

The forced expiratory volume in the first second (FEV1) and forced vital capacity (FVC) were detected by a lung function tester, and FEV1/FVC was calculated.

2.3.2. Exercise endurance

Evaluated through a 6-minute walk test, recording the patient's straight-line (walking) distance within 6 minutes.

2.3.3. Dyspnea

The degree of dyspnea was evaluated using the modified Borg scale, which has 0–4 grades with a total score of 0–10 [5]. The lower the score, the less severe the dyspnea.

2.4. Statistical methods

SPSS 26.0 software was used to process the data. Count data were expressed as percentages (%) and tested using χ^2. Measurement data followed a normal distribution and were expressed as Mean ± standard deviation, tested using *t*-test (or F-test); $P < 0.05$ indicated a statistically significant difference.

3. Results

3.1. Comparison of lung function between the two groups.

The comparison of lung function between the two groups is shown in **Table 2**.

Table 2. Comparison of lung function between two groups (n=50 cases, mean ± SD)

Group	FEV_1 (L)		FVC (L)		FEV_1/FVC (%)	
	Pre-intervention	Post-14d	Pre-intervention	Post-14d	Pre-intervention	Post-14d
Intervention	2.98 ± 1.14	4.56 ± 0.89[a]	3.08 ± 1.45	4.89 ± 0.94[a]	0.71 ± 0.14	0.85 ± 0.10[a]
Control	2.95 ± 1.21	4.02 ± 0.97[a]	3.01 ± 1.57	4.27 ± 0.79[a]	0.69 ± 0.21	0.79 ± 0.12[a]
t-value	0.128	2.901	0.232	3.570	0.560	2.716
P-value	0.899	0.005	0.817	0.001	0.577	0.007

Note: Compared with the same group before nursing, [a]$P < 0.05$; the control group received routine exercise nursing, while the intervention group received pulmonary rehabilitation exercise nursing; FVC refers to forced vital capacity, FEV1 refers to forced expiratory volume in the first second, and FEV1/FVC refers to the ratio of forced expiratory volume in the first second to forced vital capacity; compared with before nursing, $P < 0.05$

3.2. Comparison of exercise endurance and dyspnea between the two groups

The comparison of exercise endurance and dyspnea between the two groups is shown in **Table 3**.

Table 3. Comparison of exercise endurance and exercise intensity between the two groups (n=50 cases, mean ± SD)

Group	Exercise tolerance (m)		Dyspnea score (points)	
	Pre-intervention	Post-14d	Pre-intervention	Post-14d
Intervention	207.47 ± 89.63	265.79 ± 63.52[a]	6.55 ± 2.38	3.54 ± 1.62[a]
Control	205.21 ± 95.05	250.65 ± 92.59[a]	6.46 ± 1.16	4.22 ± 1.59[a]
t-value	0.122	0.953	0.240	2.118
P-value	0.903	0.343	0.811	0.037

Note: Compared with the same group before nursing, [a]$P < 0.05$

4. Discussion

COPD progresses slowly but is prone to recurrent attacks, inducing various discomforting symptoms, damaging lung function, and affecting normal life [6]. Clinically, routine treatment and nursing intervention are often implemented, which can quickly control symptoms and signs and delay the progression of the disease. However, this intervention method cannot continuously play an ideal role, making it difficult to quickly restore lung function and reduce the frequency of recurrent attacks, acute exacerbations, and readmission rates after discharge. Some patients lack accurate cognition of COPD, do not follow medical advice for continuous and effective intervention, and do not actively participate in disease rehabilitation training. As a result, the disease recurs in a short period of time, seriously affecting physical and mental health and increasing economic burden. Studies have pointed out that implementing rehabilitation training during routine treatment and care for elderly COPD patients can accelerate the stabilization of the disease, delay disease progression, eliminate disease-related symptoms, and improve patient rehabilitation effects [7].

Pulmonary rehabilitation exercise is a currently advocated COPD rehabilitation training that is simple, economical, and non-pharmacological. It emphasizes patient-centeredness and requires comprehensive improvement of cardiopulmonary function and enhancement of exercise endurance through respiratory training and exercise training based on COPD symptoms and pathological features [8]. However, there are individual differences in the cultural level, comprehension ability, and disease cognition among elderly COPD patients [9]. Some patients lack accurate cognition, resulting in low compliance with pulmonary rehabilitation exercises and difficulty ensuring exercise effectiveness. Empowerment education has been applied in the rehabilitation of various chronic diseases in recent years, which can effectively combine passive receipt of health knowledge with active acquisition of health concepts. It has distinct characteristics that stimulate rehabilitation confidence and compliance, enhance patients' self-management abilities, and encourage active participation in pulmonary rehabilitation exercises.

This study involved lung function, exercise endurance, and dyspnea indicators. The lung function index data could correspond with exercise endurance and dyspnea symptom data, verifying the comprehensive improvement effect of the experimental program on patients' respiratory system function. The results showed that after 14 days of nursing, the lung function of the intervention group was higher than that of the control group ($P < 0.05$), reflecting that the intervention measures optimized the efficacy by adjusting small airway resistance rather than simply increasing lung volume. The research results provided new data support for the precise treatment of airway obstructive diseases, but further validation of the intervention mechanism was needed in combination with bronchodilator tests. There was no difference in exercise endurance between the intervention group and the control group ($P > 0.05$), but the exercise endurance of both groups after nursing was higher than that before nursing ($P < 0.05$), indicating that both interventions could effectively improve exercise function, but the experimental program might have a better effect on sustainability. The dyspnea score of the intervention group was lower than that of the control group ($P < 0.05$), suggesting that the intervention group had a better relief effect, which was consistent with the research results of Zhou Xiaoxia et al., indicating that the experimental measures had more advantages in improving dyspnea symptoms [10]. The reason was that empowerment education was a new educational model that could inject new resources, vitality, and capabilities into education, improve educational effectiveness and quality, promote innovative development of education, cultivate talents using various techniques and methods, provide more opportunities and abilities for the educated, and better achieve educational goals. Empowerment education could adjust patients' psychology

and behavior, promote their mental health development by building empathetic relationships, establish a positive attitude and optimistic emotions, enhance their ability to resist frustration, and adjust treatment and nursing behaviors. Performing lung rehabilitation exercises assisted by empowerment education could precisely empower patients, enhance their enthusiasm and initiative in disease management, stimulate rehabilitation potential, and further improve rehabilitation compliance with the guidance and help of professional medical staff. It could also strengthen patients' self-management awareness and encourage them to follow doctors' advice to perform lung rehabilitation exercises regularly. Among them, respiratory training could effectively exercise the respiratory muscle groups, promote the diaphragm to participate in normal breathing movements, enhance the activity function of the muscle groups, relieve the symptoms of respiratory muscle fatigue, increase the pressure in the bronchi, expand the inner diameter of the bronchi, prevent the shortening of lung ventilation time caused by premature bronchial occlusion, improve lung ventilation function, reduce lung damage, and alleviate dyspnea symptoms. Exercise training could enhance muscle oxygen uptake capacity, improve the phenomenon of over-reliance on lung ventilation during activity, reduce discomfort symptoms such as lung fatigue and dyspnea, and accelerate recovery.

5. Conclusion

In summary, lung rehabilitation exercises based on empowerment education had a definite effect on elderly patients with COPD, which could significantly improve lung function and dyspnea symptoms, assist in controlling the disease, improve symptoms and signs, and have a more prominent effect in improving patients' exercise endurance, with more clinical application value.

This study had limitations. It did not objectively analyze the limitations that existed during the research process, such as the small sample size that might lead to insufficient test efficacy, and the short research period that could not observe long-term effects. These limitations were not conducive to a comprehensive and objective evaluation of the research results by readers, requiring further clinical research based on this.

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Disclosure statement

The authors declare no conflict of interest.

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