Original Article
Effect of high quality nursing and respiratory training on pulmonary function and quality of life in patients with chronic obstructive pulmonary disease

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Abstract: Objective: This research was aimed to evaluate the impact of high-quality nursing (HQN) plus respiratory training on treatment compliance, pulmonary function (PF) and quality of life (QoL) of patients with chronic obstructive pulmonary disease (COPD). Methods: We retrospectively analyzed 89 COPD patients who were treated at the affiliated Nanhua Hospital from February 2019 to February 2021. Among them, 40 cases received drug treatment and breathing training as the control group, and 49 cases were supplemented with HQN as the experimental group on the basis of the control group. The changes in PF, quality of life and compliance were compared between the two groups. Results: Vital capacity (VC) and alveolar ventilation (VA) increased in both cohorts after treatment (P < 0.05), and increased more significantly in experimental group compared with control group (P < 0.05). Experimental group also presented markedly higher total effective rate and noticeably lower scores of symptoms, activities and disease impact on daily life than control group (P < 0.05). Conclusions: HQN plus respiratory training can effectively improve the PF, efficacy and QoL of patients with COPD.

Keywords: High-quality nursing, respiratory training, chronic obstructive pulmonary disease, pulmonary function, quality of life

Introduction

Chronic diseases are the biggest threat to global health with about two-thirds of deaths worldwide. These deaths may be attributed to noncommunicable diseases, among which chronic obstructive pulmonary disease (COPD) ranks third in mortality [1]. COPD is a common respiratory disease, clinically manifested as persistent respiratory symptoms and airflow restriction [2]. Its onset is a dynamic cumulative process, which is relevant to external environment and inherent genetics [3]. In addition, patients with COPD are usually accompanied with poor prognosis and high readmission and mortality rates [4]. Although the prognosis of COPD is not ideal, reasonable nursing management planning has been shown to improve patients' compliance and prognosis [5]. Therefore, for patients with COPD, active treatment and nursing intervention should be taken to slow down disease progression, which has a positive impact on the prognosis of patients.

High-quality nursing (HQN) is a scientific nursing model proposed in recent years, which advocates deepening the patient-centered concept on the previous conventional nursing model [6]. HQN closely revolves around the needs of patients, and carries out nursing education for patients, This nursing mode optimizes nursing quality, strengthens basic nursing, improves patient satisfaction, and creates a safe medical environment for patients, so as to provide safe, high-quality and satisfactory medical service for patients [7]. Moreover, the American Heart Association has affirmed the application potential of HQN in cardiovascular

diseases [8]. Early studies have found that respiratory function exercise is a vital part of lung rehabilitation in patients with chronic obstructive pulmonary disease, and some studies have demonstrated that by promoting respiratory muscle rehabilitation, improving respiratory muscle function and increasing activity endurance, it can effectively improve the quality of life of patients [9]. Based on the above research, we speculate that high-quality nursing combined with respiratory exercise may improve compliance, pulmonary function and quality of life in patients with COPD.

Accordingly, this study is carried out to evaluate the influence of HQN plus respiratory training on treatment compliance, PF and QoL of patients with COPD, so as to provide references for clinical treatment.

Materials and methods

We retrospectively analyzed 89 COPD patients who were treated at the affiliated Nanhua Hospital from February 2019 to February 2021. Among them, 40 cases received drug treatment and breathing training as the control group, and 49 cases were supplemented with HQN as the experimental group on the basis of the control group. All patients knew about this study and signed the informed consent form. This study was approved by theinternal ethics committee. Ethics batch number: 2020 (Review) 104 (approval) 08.

Inclusion and exclusion criteria

Inclusion criteria: All the participants were hospitalized patients who were diagnosed with COPD according to the relevant guidelines in 2020 [10], with complete case data. The age of all the patients was more than 18 years old.

Exclusion criteria: The patients received targeted treatment 3 months before this treatment; those with severe heart, liver, kidney or other organ failure, cognitive impairment, senile dementia, severe cerebral infarction or cerebral hemorrhage, severe heart or other organ diseases, and mental diseases; pregnant or lactating women and dropouts.

Treatment and nursing plans

All patients were given symptomatic treatment such as oxygen inhalation, antitussive, anti-

asthmatic and anti-infection therapies, as well as correction of water and electrolyte disorders according to the specific condition. Patients in control group were given routine nursing. On this basis, EG was supplemented with HQN. The specific plans were as follows: (1) A HQN atmosphere was created. The concept of HQN was strengthened, and the nurses were regularly trained in the theoretical knowledge and practical operation knowledge related to HQN. Nurses' sense of responsibility and nursing skills were taken as the evaluation factors of HQN. And high performing nurses were appointed as members of the HQN team, with clear responsibilities. (2) Psychological nursing was given as most patients experienced negative emotions. The nurses took the initiative to communicate with patients, introduced the knowledge related to the disease, matters needing attention and key points of cooperation in detail, and introduced the cases with good treatment effect, so as to mitigate patients' bad mood. (3) Observation and monitoring. The changes of patients' condition were observed since their admission, especially the critical ill patients. The abnormalities were reported to the doctors in time, and effective treatment measures were taken in time if any. Besides, patients were monitored for vital signs. Nurses were on call if patients developed a high fever, and observation of respiratory rate and consciousness was strengthened. The sputum excretion and emergency of patients were also observed. Moreover, patients were encouraged to increase the daily amount of water to discharge phlegm, and were helped to turn over and pat the back irregularly to facilitate sputum excretion. Patients were also informed of effective methods of expectoration.

Endpoints

Primary endpoints: Patients' QoL was assessed from the domains of material life, social function, mental function and physical function using the Generic Quality of Life Inventory-74 (GQOLI-74) [11]. This questionnaire uses a percentile system, and higher scores indicate better QoL. The PF of patients, including vital capacity (VC) and alveolar ventilation (VA), were compared between the two cohorts before and after intervention. The alterations of negative emotions were evaluated before and after nursing with the Self-rating Anxiety/Depression

Table 1. Comparison of baseline data of patients

Variables	Control group (n=40)	Experimental group (n=49)	χ^2 value	P value
Age (year)				
> 60	20	27	0.230	0.632
< 60	20	22		
Gender				
Male	28	32	0.221	0.638
Female	12	17		
Body mass index (kg/m^2)				
> 22	25	29	0.102	0.750
≤ 22	15	20		
Course of disease (year)				
> 10	20	20	0.751	0.386
≤ 10	20	29		
History of dust exposure				
Yes	30	29	2.465	0.116
No	10	20		
History of smoking				
Yes	30	35	0.142	0.706
No	10	14		
History of alcoholism				
Yes	10	15	0.343	0.558
No	30	34		

Note: Chi-square test is used to analyze the data in the two groups.

Scale (SAS/SDS) [12]. The incidence of adverse reactions was recorded.

Secondary endpoints: The self-made treatment compliance scale was used to evaluate patient compliance: Complete compliance: Patients fully accepted the treatment plan and received the whole treatment; good compliance: patients cooperated with various nursing measures; partial compliance: patients did not understand the adverse reactions and did not cooperate with various medical and nursing work; non-compliance: patients just followed the doctor's advice, or just cooperated with nursing (formula: [complete compliance + partial compliance] cases/total cases × 100%), which was divided into complete compliance, partial compliance and non-compliance, were compared between the two cohorts. Nursing satisfaction was evaluated by hospital nursing satisfaction questionnaire, and a score of 0-10 was used to evaluate the satisfaction. The score > 8 represented very satisfactory, the score of 7-5 represented the more satisfied, and the score less than 4 indicated dissatisfaction. Satisfaction rate = (very satisfied + satisfied) cases/total cases × 100%.

Statistical methods

SPPSS22 statistical software was used for data processing. The measurement and counting data were described as mean ± standard deviation (x ± sd) and n (%), and compared using T test and χ^2 test respectively. The Paired t-test was used for intra-group comparison, and the independent sample t-test was used for inter-group comparison. The difference is considered significant when P < 0.05.

Results

Comparison of clinical data

The comparison of clinical data revealed no statistical difference in age, gender, body mass index, course of disease, dust exposure history, smoking history and alcohol abuse history between control group and Experimental group (**Table 1**, P > 0.05).

Comparison of patients' QoL

To understand the improvement of patients' QoL by the two schemes, we compared the QoL before and after treatment using the GQOLI-74. The comparison revealed noticeably higher GQOLI-74 scores in experimental group, which indicated that the combination of HQN and respiratory training could effectively improve patients' QoL (**Figure 1**, P < 0.05).

Comparison of PF

Comparison was also made on the effects of the two treatment schemes on pre- and post-treatment PF of patients. It identified no difference in pre-treatment VC and VA between the two cohorts (P > 0.05). While the VC and VA increased remarkably in both groups after treatment (P < 0.05), with more evident increases in EG (**Figure 2**, P < 0.05), suggesting that HQN plus respiratory training can better improve the PF of COPD patients.
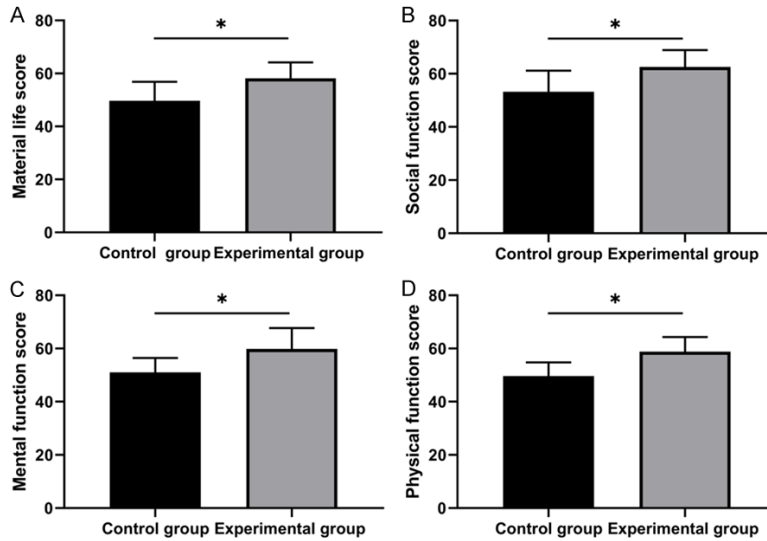
Figure 1. Comparison of GQOLI-74 scores between two groups after treatment. A. Comparison of material life scores between two groups after treatment. B. Comparison of social function scores between two groups after treatment. C. Comparison of mental function scores between two groups after treatment. D. Comparison of physical function scores between two groups after treatment. Note: *P < 0.05. Independent sample t-test is used to compare the two groups.
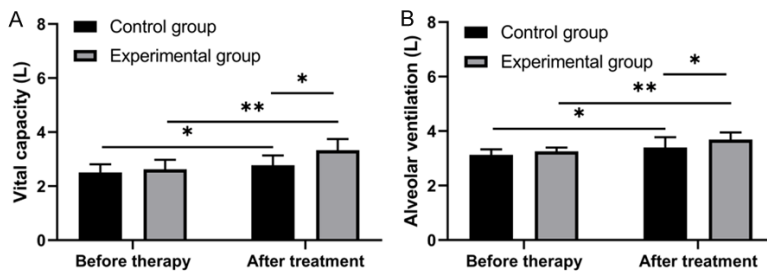

Figure 2. Comparison of vital capacity and alveolar ventilation between two groupsbefore and after treatment. A. Comparison of vital capacity between two groups before and after treatment. B. Comparison of alveolar ventilation between two groups before and after treatment. Note: *P < 0.05; **P < 0.01. The independent sample t test is used in the comparison between the two groups before and after treatment, and the paired t test is used for the group before and after treatment.

treatment (P < 0.05), with a higher compliance rate than control group (**Table 2**, P < 0.05).

Comparison of negative emotions

The negative emotions of patients before and after treatment were also compared. The results revealed no distinct difference in SAS and SDS scores between two groups before treatment (P > 0.05). After treatment, the scores reduced statistically in both groups (P < 0.05), with more evident reductions in experimental group (**Figure 3**, P < 0.05), indicating that HQN plus respiratory training can mitigate the negative emotions of patients with COPD.

Evaluation of nursing satisfaction

Regarding the nursing satisfaction, the results revealed that 20 patients in control group were very satisfied, 10 were satisfied and 10 were dissatisfied; While in experimental group, 30 patients were very satisfied, 14 were satisfied and 5 were dissatisfied. By comparison, we found that experimental group had more patients who were satisfied with the nursing service (P < 0.05), with a higher satisfaction rate than control group (**Table 3**, P < 0.05).

Treatment compliance

As for the treatment compliance, it was found that in control group, 12 patients were completely compliant, 13 patients were partially compliant and 15 patients were not compliant; While in experimental group, 20 cases were completely compliant, 22 cases were partially compliant and 7 cases were not compliant. By comparison, we found that patients in experimental group were more compliant with the

Comparison of adverse reactions

This study also made statistics on the incidence of adverse reactions. The number of cases with gaseous distention, redness and swelling of mouth and nose, and facial pressure injury was 5, 1, and 3 respectively in control group, while was 2, 1, and 0 respectively in experimental group. It shows a markedly lower incidence of adverse reactions in EG compared with control group (**Table 4**, P < 0.05).

Table 2. Comparison of treatment compliance

Groups	Complete compliance	Partial compliance	Non-compliance	Compliance rate
Control group (n=40)	12	13	15	62.50%
Experimental group (n=49)	20	22	7	85.71%
χ^2/Z value		-1.895		6.378
P value		0.047		0.011

Note: The rank sum test is used for the grade data, and the chi-square test is used for the medication rate.
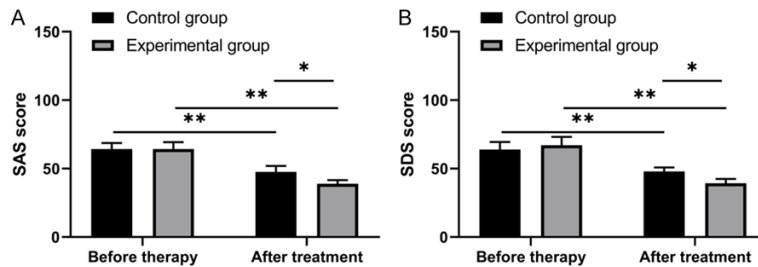

Figure 3. Comparison of SAS and SDS scores between two groups before and after treatment. A. Comparison of SAS scores between two groups before and after treatment. B. Comparison of SDS scores between two groups before and after treatment. Note: *P < 0.05; **P < 0.01. The independent sample t test is used in the comparison between the two groups before and after treatment, and the paired t test is used for the group before and after treatment.

Discussion

COPD is a commonly seen respiratory disease characterized by persistent respiratory symptoms and airflow restriction. Globally, there are more than 250 million patients with COPD [13]. Besides the inherent genetic factors, smoking and air pollution (e.g. PM2.5) are recognized as the main external environmental risk factors for COPD [14-17]. The prognosis of COPD is poor, with high rehospitalization and mortality rates [18]. Although the prognosis of COPD is not ideal, reasonable care program and appropriate exercise will help improve the prognosis of patients and facilitate their recovery [19].

Maintaining physical activity in patients with COPD is critical, and respiratory function training is an effective adjunct for patients with this disease to improve their breathing by reducing respiratory rate and dyspnea [20, 21]. In the present study, we used HQN plus respiratory training to intervene in patients with COPD. As an important part of the pulmonary rehabilitation program, respiratory training is known to play a significant role in promoting the recovery of PF and strengthening the respiratory mus-

cles [22]. It may reduce malignant ventilation and ameliorate respiratory symptoms through deep and slow breathing [23]. The experimental results showed that HQN plus respiratory exercise enormously improved the patients' VC and VA. It was previously shown that respiratory training could improve the ventilation quality of patients with COPD to a certain extent, which is consistent with our finding in this study [24]. We also showed that combined HQNnursing, can significantly improve the ventilation quality of patients. Hence, HQN combined with respiratory training can better improve the respiratory function of patients compared with respiratory training alone.

Clinical nursing programs are all routine care, which can no longer meet the needs of patients with the continuous improvement of living standards and quality [25]. Therefore, finding an effective nursing plan plays a key role in improving patients' QoL and mitigating negative emotions. HQN is a kind of patient-centered, comprehensive and objective assessment of the patients' condition to formulate a reasonable nursing plan. It can provide the patients with a comfortable treatment environment, and strengthen doctor-patient communication and respect the service concept in every nursing link, so as to establish a good doctor-patient relationship [26]. In this study, we found that the patients' QoL scores increased greatly after the intervention of HQN plus respiratory training, while SAS and SDS scores decreased notably, indicating that HQN plus respiratory training significantly bolstered their QoL and alleviated their negative emotions. Anxiety and

Table 3. Comparison of patient satisfaction

Groups	Very satisfied	Satisfied	Dissatisfied	Satisfaction rate
Control group (n=40)	16	12	12	70.00%
Experimental group (n=49)	30	14	5	89.80%
χ^2/Z value		-2.374		5.585
P value		0.018		0.018

Note: Rank sum test is used for grade data and chi-square test is used for satisfaction rate.

Table 4. Comparison of adverse reactions

	Control group (n=40)	Research group (n=49)	χ^2	P
Gaseous distention	5	2		
Redness and swelling of mouth and nose	1	1		
Facial pressure injury	3	0		
Total incidence of adverse events	9	3	5.064	0.024

Note: Chi-square test is used to analyze the total incidence of adverse events.

depression are common negative emotions in patients with COPD, which are mainly triggered by dyspnea and reduced physical activity. While HQN mainly includes monitoring patients' vital signs, giving appropriate oxygen therapy and providing timely psychological care. Thus, under HQN, patients can not only improve their PF through respiratory exercise during rehabilitation, but also receive psychological counseling. Thus, respiratory training plus HQN can relieve patients' anxiety and depression both physically and mentally. Also, a notably lower incidence of adverse reactions was determined in EG in our research.

We have compared the patients' treatment compliance and nursing satisfaction, and found higher treatment compliance and satisfaction in EG.

This study may still have some limitations due to small sample size, which may lead to biased results, and further follow-up study is needed to refine our research conclusions.

To sum up, HQN plus respiratory training can effectively improve the PF, efficacy and QoL of COPD patients.

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Disclosure of conflict of interest

None.

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