

The application value of continuous nursing for home oxygen therapy of patients in the stable phase of chronic obstructive pulmonary disease

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Abstract. – OBJECTIVE: To analyze the application value of continuous nursing in improving the effects of home oxygen therapy for patients in the stable phase of chronic obstructive pulmonary disease (COPD).

PATIENTS AND METHODS: Patients in the stable phase of COPD (n=106) were selected and divided into the control group and observation group based on parity digit of their admission number. There were 53 cases in each group. The patients in the control group received COPD health education at discharge, while the observation group received continuous nursing. The effect of home oxygen therapy in both groups after 3 months was compared.

RESULTS: The compliance in the observation group for home oxygen therapy was significantly higher than that in the control group. Blood gas analysis and various indicators of pulmonary function in the control group at follow-up visits were not changed compared with those before. In contrast, partial pressure of blood oxygen and blood oxygen saturation of the observation group were lower than those before discharge. With the increasing partial pressure of carbon dioxide in arterial blood, the indicators of pulmonary function became lower than before. Comparing the various indexes between both groups at follow-up visits, the differences were statistically significant ($p < 0.05$). The self-care ability and quality of life scores of patients in the observation group were higher than those of the control group, and the differences were statistically significant ($p < 0.05$).

CONCLUSIONS: By establishing health records and network platforms, continuous nursing can provide continuous health education and supervision for patients with COPD, which can effectively improve oxygen therapy compliance, self-care ability and quality of life. It has good application and promotional value.

Key Words:

Continuous nursing, Chronic obstructive pulmonary disease, Home oxygen therapy, Life quality.

Introduction

Chronic obstructive pulmonary disease (COPD) is a chronic disease of the respiration system. It is progressive, incompletely reversible, and has airway limitations. It is ranked first among causes of death from respiratory diseases¹. Because of long duration, repeated attacks, exacerbated progression, and treatment, COPD has a negative impact on the body and mind. Furthermore, it may cause abnormal behavior or patients may refuse normal human communication, which affects the daily quality of life². When patients with COPD pass through the acute phase to the stable phase, long-term oxygen therapy is the primary method of limiting tissue and organ hypoxia, and slowing deterioration of pulmonary function. A previous study³ showed that about 64.7% of patients were unable to conduct long-term oxygen therapy at home. The main reasons were a lack of disease-related knowledge and unsound home care services. Through network communication (such as telephone, WeChat, and e-mail), continuous nursing provides home management of chronic diseases and care services to improve patient treatment compliance and quality of life, reduce the recurrence of acute disease, and conserve medical resources^{4,5}. This study applied continuous nursing for home oxygen therapy of patients in the stable phase of COPD, which offered a new approach for COPD home care.

Patients and Methods

Patients

Patients in the stable phase of COPD (n=106) on home oxygen therapy and treated in our hospital from October 2014 to November 2015 were selected. The inclusion criteria were: 1- COPD without tuberculosis, pulmonary cancer, bronchiectasis, primary pulmonary hypertension, respiratory failure or other pulmonary complications; 2- stable disease status for at least 1 month; 3- quit smoking and standardized way of life in accordance with advice of the physician; 4- with certain degrees of self-care ability and cognitive ability. The exclusion criteria were: 1- combined with severe heart, liver, kidney, or other visceral dysfunctions; 2- no economic condition for continuous home oxygen therapy; 3- poor compliance and incomplete follow-up data. The study obtained the approval of the Ethics Committee of our hospital and informed consent from the patients and their family members. Selected patients were divided into the control group and observation group based on the parity digit of their admission number, with 53 cases in each group. In the control group, there were 32 males and 21 females, aged from 40-78 years old, with average age of 58.6 ± 8.3 years; the course of disease was from 5-20 years, with average course of 9.6 ± 4.8 years. In the observation group, there were 37 males and 16 females, aged from 40-80 years old, with average age of 59.5 ± 9.6 years; the course of disease was from 3-25 years, with average course of 10.8 ± 5.7 years. The baseline data of the two groups were comparable.

Study Methods

When leaving the hospital, patients in the control group received health education, while patients in the observation group received continuous nursing, designed as follows: 1- establishing a continuous nursing group including one head nurse appointed as group leader, three to five nurses and a nurse in charge with 5 years of experience in the pneumology department, one doctor and one dietitian with over 3 years of experience in the pneumology department. The study recommended that patients were out of the hospital if their illness shifted from the acute to stable phase of COPD. Members of the continuous nursing group provided health education for patients, maintained continuous nursing records of patients, delivered contact cards, and set up a WeChat platform for COPD health service and

ensured the fluency of continuous nursing. 2- continuous nursing methods: when patients were discharged from the hospital, they were given continuous nursing guidance, including enhanced guidance on home oxygen therapy, including: (i) education on nursing for oxygen therapy; patients were guided to prepare a household breathing machine, a household oxygenator and other household oxygen therapy machines at home. By referring to the instruction manual, the nursing group would guide the patients and their family members to learn the usage, maintenance, daily cleaning, disinfection, and other parameters related to oxygen therapy equipment. Additionally, the nursing group would make home oxygen cure cards whose contents included: the date of oxygen therapy, time of oxygen uptake, flow of oxygen uptake, the disinfection records of the oxygen tube, status of nasal obstruction and nasal catheter and the humidification bottle. Next, the cards were delivered to patients and their families, and they were guided to make the records by themselves at home; (ii) oxygen therapy method: the flow of oxygen uptake was controlled within 1.0-2.5 l/min and the time of oxygen uptake was over 15 hours per day. Furthermore, the nursing group members guided the patients to undergo oxygen uptake at the following times: before eating, before exercising, and at night; (iii) the coordination of exercise and diets: during the period of home oxygen therapy, patients were required to perform respiratory muscle functional training exercises. The methods were to conduct abdominal respiration and pursed lip breathing. The exercises were done before home oxygen therapy for 10 minutes each time. During the period of oxygen therapy, the principle of diet was to have smaller meals, more times per day. Food was high in protein and fiber, low in carbohydrates, sugar, and salt, and rich in vitamins. 3- follow-up visits: by setting up a WeChat platform to publicize COPD health knowledge, the nursing group members would answer questions for discharged patients in a timely manner. The group members would perform telephone follow-ups at 2, 7, 14, 21, 35, 49, and 84 days after patients were discharged from the hospital. In addition, 3 months after patients were discharged, the group members would make home visits in the middle of each month to promote the importance of home oxygen therapy, teach the proper methods of oxygen uptake, answer the patients' questions and monitor and make records of patients' heart rhythm, blood pressure, pulmonary function

indexes, blood pressure saturation and other indexes.

Evaluation Standards

At the 3-month follow-up visit, the patients in both groups were compared for home oxygen therapy compliance and improving statuses of blood gas analysis indexes, including partial pressure of carbon dioxide in arterial blood (PaCO_2), partial pressure of blood oxygen (PaO_2), and blood oxygen saturation (SpO_2); the pulmonary function indexes of the patients in both groups were compared, including forced vital capacity (FVC), forced expiratory volume in one second (FEV_1), $\text{F FEV}_1/\text{FVC}$, and peak expiratory flow rate (PEFR); ESCA (exercise of self-care agency scale) was used to evaluate patients in both groups and scores were marked based on four dimensions, including their health knowledge, self-concept, sense of responsibility of self-care, and self-care skills. Standards for evaluation were: (i) very characteristic of me - 4 points; (ii) kind of like me - 3 points; (iii) no comment - 2 points; (iv) kind of not like me - 1 point; (v) very or completely uncharacteristic of me - 0 points. Using a version of the quality of life scale adapted for Chinese people, quality of life was evaluated based on eight dimensions: physiology, society, emotional function, general condition, physiological role, physical disease, energy and mental health, which covered 36 items. Finally, we found that the ESCA scores and quality of life were positively correlated.

Statistical Analysis

SPSS 19.0 software (Version X; IBM, Armonk, NY, USA) was used for data analysis. Quantitative data are presented as mean \pm standard deviation. Independent sample, t -test was used for comparisons among groups. Paired t -test was

used for intra-group comparisons. Enumeration data are presented as rate and tested by χ^2 -test. $p < 0.05$ indicated statistical significance.

Results

Comparison of Compliance and Blood Gas Analysis Indexes of home Oxygen Therapy

The home oxygen therapy compliance of the observation group was significantly higher than that of the control group 79.2% (42/53) vs. 56.7% (30/53), $t=6.235$, $p=0.013$. The difference of blood gas analysis of the two groups before discharge showed no statistical significance ($p > 0.05$). The indexes of the observation group at follow-up visits showed no changes compared with earlier figures. PaO_2 and SpO_2 of the control group were lower than before discharge, and PaCO_2 was higher, and the differences were statistically significant ($p < 0.05$). The comparison of the indexes during the follow-up visits in the observation group and control group showed statistical significance ($p < 0.05$) (Table I).

Comparison of Indexes of Pulmonary Function

The comparison of the indexes of pulmonary function of the two groups before discharge showed no statistical significance ($p > 0.05$). Indexes during the follow-up visits of the observation group showed no changes while the indexes of the control group were lower than before discharge, showing statistical significance ($p < 0.05$). The differences of all indexes during follow-up visits between the observation group and control group showed statistical significance ($p < 0.05$) (Table II).

Table I. Comparison of blood gas analysis indexes of the two groups.

Group	PaO_2 (mmHg)		PaCO_2 (mm Hg)		SpO_2 (%)	
	Before discharge	Follow-up visit	Before discharge	Follow-up visit	Before discharge	Follow-up visit
Observation group	86.6 \pm 10.3	82.2 \pm 12.2	42.2 \pm 6.3	45.6 \pm 9.3	96.5 \pm 5.8	94.5 \pm 8.2
Control group	87.3 \pm 12.4	73.4 \pm 13.5	43.4 \pm 7.8	52.7 \pm 10.5	97.6 \pm 6.3	90.6 \pm 8.8
t	0.123	5.707	0.348	5.637	0.524	5.857
p	0.768	0.024	0.763	0.025	0.639	0.022

PaO_2 : Partial pressure of blood oxygen; PaCO_2 : pressure of carbon dioxide in arterial blood, SpO_2 : blood oxygen saturation.

Table II. Comparison of indexes of pulmonary function between the two groups.

Group	FEV ₁ (%)		FEV ₁ /FVC(%)		PEFR (l/s)		FVC (l)	
	Before discharge	Follow-up visits	Before discharge	Follow-up visits	Before discharge	Follow-up visits	Before discharge	Follow-up visits
Observation group	2.8±1.0	2.7±0.8	86.5±10.3	81.7±12.5	4.8±0.9	4.7±1.3	2.8±0.6	2.7±0.8
Control group	2.8±0.9	2.2±0.9	85.7±12.4	73.9±13.1	4.7±0.8	4.4±1.2	2.9±0.8	2.3±0.7
<i>t</i>	0.236	6.032	0.326	6.532	0.265	5.967	0.126	6.521
<i>p</i>	0.842	0.018	0.854	0.010	0.863	0.023	0.935	0.010

FEV₁: forced expiratory volume in one second; FVC: forced vital capacity; PEFR: peak expiratory flow rate.

Comparison of self-care Ability

The self-care ability of the observation group was significantly higher than that of the control group ($p < 0.05$) (Table III).

Comparison of Quality of life Scores

The quality of life scores of the observation group was higher than those of the control group, and the differences were statistically significant ($p < 0.05$) (Table IV).

Discussion

During the stable phase of COPD, measures for preventing acute recurrence, improving pulmonary function, and home oxygen therapy are often taken, which are important for favorable

prognosis. Because of poor self-care ability determined by personal subjective reasons, as well as objective factors such as family, society, and the economy, treatment compliance during the stable phase is poor, thus the condition of patients cannot be effectively controlled. Home oxygen therapy has been widely applied for long-term nursing in Europe and America⁶. From the perspective of human resources, long-term oxygen uptake therapy can be done at home, making it an important treatment method for the stable phase of COPD. Home oxygen therapy can enhance oxyhemoglobin saturation and partial pressure of blood oxygen, lower partial pressure of carbon dioxide, correct disorders of metabolism, and prevent metabolic acidosis. Together with respiratory muscle contractility training, pressure within the lung can be improved

Table III. Comparison of self-care ability of the two groups (score).

Group	Health knowledge	Self-care sense of responsibility	Self-concept	Self-care skills
Observation group	41.5±6.3	27.6±3.8	31.7±4.3	42.2±4.2
Control group	37.9±5.9	23.8±5.1	28.2±5.5	38.7±6.5
<i>t</i>	5.576	5.859	5.247	5.165
<i>p</i>	0.032	0.030	0.036	0.038

Table IV. Comparison of quality of life quality score of the two groups.

	Physiological function	Physiological role	Physical disease	General condition	Social function	Energy	Mental health	Emotional function
Observation group	83.4±6.7	75.6±11.7	81.2±5.7	63.4±5.5	74.5±7.4	72.5±9.8	62.4±5.3	68.1±4.1
Control group	79.7±9.8	66.7±15.3	77.6±5.9	59.8±5.4	67.9±11.6	65.9±10.9	58.9±6.7	65.7±5.4
<i>t</i>	5.703	5.820	5.647	5.322	5.628	6.361	5.754	5.581
<i>p</i>	0.030	0.028	0.032	0.036	0.032	0.020	0.030	0.033

to prevent small airways from early occlusion and facilitate the process of residual gas output, increase the tidal volume and lung capacity, and improve the reserve capacity of the lung to effectively prevent pulmonary heart disease, heart failure, and hypoxic necrosis of lung tissue. Meanwhile, immunity can be enhanced to prevent the patient from diseases and improve quality of life⁷⁻⁹. With social and economic development, quality of life of the population has improved, as has the level of nursing services. Continuous nursing, a model extending nursing service from the hospital to social platforms and to the home. It takes advantage of networking platforms such as telephone, e-mail, QQ, and WeChat, as well as home visits, to realize effective interactions between nursing staff, patients, and their family members, to maintain patient health and improve their quality of life¹⁰. During the stable phase of COPD, patients are influenced by factors including educational background, economic level and personal daily habits, and compliance of home oxygen therapy is relatively poor¹¹⁻¹³. Patients with lower levels of education (junior or senior high school) do not believe in, or are skeptical of the effects of oxygen uptake. They worry that long-term oxygen uptake might lead to dependence. Therefore, their compliance for home oxygen therapy is poor. Patients with higher levels of education (junior college or higher), with better access to, and higher ability to comprehend information related to diseases, often are likely to make their own decisions and will change oxygen uptake time or flow without authorization, which also leads to poor compliance. Therefore, effective continuous care not only improves the self-care ability of patients, but effectively supervises and guides patients to improve compliance with oxygen therapy and help them to recover pulmonary function more quickly¹⁴. The present study showed that compliance with home oxygen therapy of the observation group was significantly higher than that of the control group. Current blood gas analysis and lung function indexes of the observation group showed no changes compared with earlier figures, while in the control group, PaO₂ and SpO₂ were lower than before discharge, and PaCO₂ was higher. The pulmonary function indexes were lower than before discharge. The differences of the indexes between the observation group and control group during the follow-up visits were statistically significant. The scores of self-care ability and quality of

life of the observation group were significantly higher than those of the control group.

Conclusions

Continuous nursing teaches and guides patients with COPD, by establishing health files and online platforms, can effectively improve compliance for oxygen therapy, self-care ability, and quality of life. Therefore, it has a strong application and a promotional value.

Conflict of interest

The authors declare no conflicts of interest.

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