

Original Article

Effect of internet-based self-management on pulmonary function rehabilitation and living quality in patients with chronic obstructive pulmonary disease

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Abstract: Objective: This study explored and analyzed the effect of Internet-based self-management on pulmonary function rehabilitation and living quality in patients with chronic obstructive pulmonary disease (COPD). Methods: Altogether, 106 stable-staged COPD patients admitted to our hospital from June 2018 to September 2019 were enrolled as the research subjects, and divided into the control group (n=51) and the observation group (n=55) according to the order of visit. The control group received conventional health education, and the observation group was treated with an educational model by Internet-based self-management. Afterwards, the changes of self-management ability, pulmonary function and living quality before and after intervention were compared between the two groups. Results: The scores of each dimension of self-management behavior in both groups of patients after intervention were critically higher than those prior to intervention ($P<0.05$), and the scores in observation-group patients were remarkably higher than those in control-group patients ($P<0.05$). Besides, the two groups of subjects were observed with elevated pulmonary function indexes FVC, FEV1 and 6MWD after intervention compared with that in prior-intervention ($P<0.05$), and the indexes in the observation-group after intervention were obviously higher than those in the control-group ($P<0.05$). In addition, the scores of each dimension of living quality in both groups after the intervention had a conspicuously rise compared with the prior-intervention period ($P<0.05$), and the scores in the observation group were remarkably lower than those in the control group ($P<0.05$). The satisfaction in observation group was obviously higher than that in control group ($P<0.05$). Conclusion: Internet-based self-management can effectually improve the self-management ability of COPD patients. It is conducive to improve the patients' pulmonary function, and their living quality, thus it is worthy of clinical popularization and application.

Keywords: Internet, self-management, chronic obstructive pulmonary disease (COPD), pulmonary function, living quality

Introduction

Chronic obstructive pulmonary disease (COPD) is a disease characterized by limitation to air-flow. The main symptoms of patients include progressive dyspnea and pulmonary function decline accompanied by recurrent episodes, and periodization in clinical are acute exacerbation (COPD-AE) and stages of stabilization [1, 2]. Research has shown that continuous breathing exercises and good self-management during the stage of stabilization for COPD patients can effectively restore the respiratory

muscle function, improve pulmonary function and mobility, thereby alleviating the clinical symptoms and improving their living quality [3, 4]. For stable patients with mild clinical symptoms and relatively smooth vital signs, it is easy to reduce the continuous treatment of COPD and relax the self-management, which leads to the progressive development and aggravation of the disease [5, 6]. Under the traditional mode of health education, the disease management of patients mainly depends on the follow-up visits, which has poor continuity and management. With the continuous devel-

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development and progress of modern Internet technology, the Internet has become an indispensable part of people's lives. In order to further enhance the self-management ability of COPD patients under stable stages, this study explored and analyzed the effect of Internet-based self-management on pulmonary function rehabilitation and living quality in COPD patients. The detailed reports are as follows.

Materials and methods

Clinical materials

A total of 106 stable-staged COPD patients admitted from June 2018 to September 2019 were enrolled as the research subjects, and divided into the control group (n=51) and the observation group (n=55) according to the order of visit. The Ethics Committee of our hospital approved this study.

Inclusive and exclusive criteria

Inclusive criteria: (1) The symptoms of subjects were in line with the diagnostic criteria of the *Guidelines for Diagnosis and Treatment of Chronic Obstructive Pulmonary Disease* formulated by The Respiratory Branch of the Chinese Medical Association [7]; (2) Course of disease ≥ 5 years; (3) Patients had normal communication and reading skills; (4) The age of subjects ranged from 40 to 65 years old; and (5) The subjects had voluntarily signed the informed consent.

Exclusive criteria: (1) Patients with combined mental illness or cognitive impairment; (2) Patients with diseases that interfere with normal communication, such as hearing impairment or visual impairment; (3) Patients who did not use the WeChat tool; (4) Patients with serious diseases of the heart, brain or lung; or (5) Patients with malignant tumors.

Methods

The control-group patients were given a traditional health education model, including dietary guidance, exercise guidance, medication guidance, and oxygen therapy at home.

The observation-group patients received an Internet-based self-management mode on the basis of the treatment conducted in the control

group. The specific contents are as follows: (1) Set up an Internet management team, including one physician in charge, one head nurse, and five N2 nurses. All the team members had good communication, coordination and expression skills, and were proficient in operational skills in mobile phones and computers. (2) The nursing staff set up a "COPD Center" on the hospital website, and set up the corresponding WeChat account and exchange group at the same time. One day before patients were discharged, they were told to check the latest news on hospital website, follow the WeChat account and join the exchange group. (3) The nursing staff shared the knowledge of COPD disease and rehabilitation through the online center and WeChat official account in forms of pictures, popular texts, videos and comics. After reviewing the messages, the patients replied at the bottom of the content according to their own reading situation by "completely understood", "not understood", "fully implemented" or "not implemented", and the nursing staff counted and recorded the feedback information of patients every week. If over 20% of the pushed content of the week was "not understood" or "not implemented", the nursing staff would explain the content in detail in the WeChat group. For some patients who do not understand the content, the nursing staff would make video and telephone communication and then took records. Such personnel were the focus of attention in that month. (4) Patients can communicate and share their daily nursing experience in the WeChat group. For patients who did not speak or give feedback in the group for 2 consecutive weeks, the nursing staff would communicate with them individually by telephone and video to follow up about the patient's condition, and at the same time let the patient understand the importance of self-management to pulmonary function recovery, so that the patient's compliance with self-management can be improved. The intervention lasted for 6 months.

Observation of indicators

The primary observation indicators were self-management efficacy, quality of life and changes of lung function. The secondary observation indicators were patients' satisfaction with nursing.

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Table 1. Comparison of clinical data between the two groups of subjects

Clinical materials	Observation group (n=55)	Control group (n=51)	t/ χ^2	P
Gender				
Male	35	33	0.013	0.909
Female	20	18		
Age (years old, $\bar{x} \pm sd$)	57.48 \pm 9.34	56.94 \pm 10.26	0.284	0.777
Education degree				
Junior High school and below	8	6	0.568	0.570
Secondary and senior secondary schools	28	25		
Junior College and above	19	20		
Smoking				
Yes	21	20	0.012	0.913
No	34	31		
Course of disease (years, $\bar{x} \pm sd$)	7.38 \pm 2.74	7.42 \pm 2.80	0.074	0.941

(1) Self-management ability: The self-management ability prior to and in post intervention was evaluated by a system developed by Zhang Caihong et al. [8] as a COPD self-management ability scale. The scale included five dimensions, including daily life management (14 items), symptom management (8 items), emotion management (12 items), information management (8 items), and self-efficacy management (9 items), with a total of 51 items. Each item adopted a 5-level scoring method of 1 to 5 points, and the higher score represented better self-management ability. The scale Cronbach's $\alpha=0.926$.

(2) Pulmonary function: The pulmonary function of the two groups of subjects were tested in prior and post intervention, including forced vital capacity (FVC), forced expiratory volume in the first second (FEV1), and 6-min walking distance (6MWD).

(3) Living quality: The impact of chronic airflow limitation diseases on living quality before and after the intervention was measured by St. George's Respiratory Questionnaire (SGRO) [9]. The questionnaire included three dimensions by symptoms, activity ability, and the impact of disease on daily life, with a total of 50 items. The score of each part was equal to 100 times of the ratio between the positive option score of the part and the total predicted value of the part, and the total score was 100 times of the ratio between the score of all positive options and the total expected score of the whole test. The score ranged from 0 to 100, and a higher

score indicated worse living quality of the patients.

(4) Patients' satisfaction with care: The patients' satisfaction with nursing after intervention was evaluated by nursing satisfaction questionnaire designed by our hospital. The full score of the questionnaire was 100 points, of which 90-100 points were very satisfied, 80-89 points were satisfied, and <80 points were unsatisfied. The satisfaction rate = rate of very satisfied + rate of satisfied.

Statistical analysis

The data acquired was processed and analyzed via statistical tool SPSS 26.0. The t-test was adopted for comparison of measurement data, and chi-square test was used for comparison of counting data. The difference was statistically significant with $P<0.05$.

Results

Clinical materials

The difference in clinical data between the two groups was not statistically significant ($P>0.05$) (Table 1).

Score of behavior in self-management

The scores of each dimension of self-management behavior in both groups of patients after intervention were critically higher than those in prior-intervention ($P<0.05$), and the scores in the observation-group patients were remark-

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Table 2. Comparison of self-management behavior scores before and after intervention

Group	Time	Daily life Management	Symptom Management	Emotion Management	Information Management	Self-efficacy Management
Observation group (n=55)	Prior-intervention	41.67±3.84	18.27±2.16	40.75±5.03	31.79±3.72	30.82±4.26
	Post-intervention	49.71±5.29*	23.41±2.75*	47.96±5.72*	39.84±4.36*	37.65±4.52*
	t	9.122	10.901	7.020	10.417	8.155
	P	0.000	0.000	0.000	0.000	0.000
Control group (n=51)	Prior-intervention	40.92±4.11	18.12±1.79	40.16±4.75	31.56±3.55	30.24±4.10
	Post-intervention	45.86±5.28	20.85±2.06	44.63±5.26	35.64±4.09	33.97±4.68
	t	5.273	7.144	4.504	5.380	4.281
	P	0.000	0.000	0.000	0.000	0.000

Note: Compare with control group, *P<0.05.

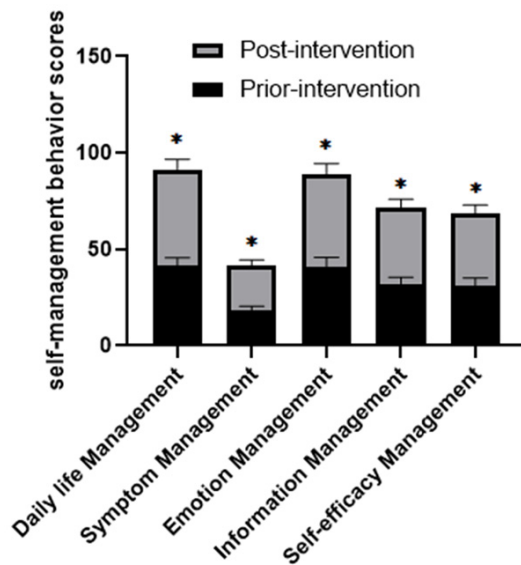


Figure 1. Self-management behavior scores in observation group before and after intervention. Note: Compared with before intervention, *P<0.05.

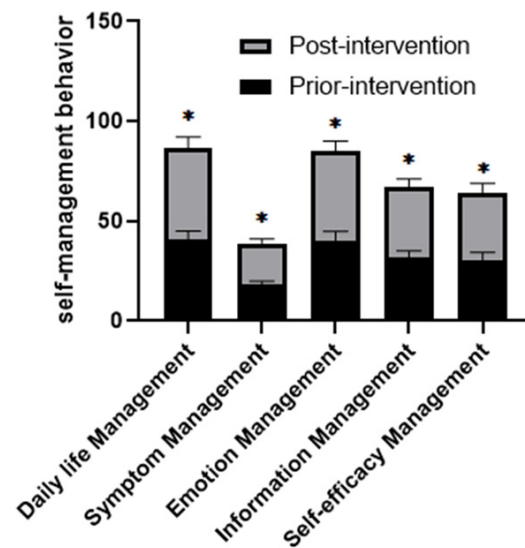


Figure 2. Self-management behavior scores in control group before and after intervention. Note: Compared with before intervention, *P<0.05.

ably higher than that in the control-group patients ($P<0.05$) (Table 2 and Figures 1, 2).

Changes of pulmonary function

The two groups of subjects were observed with elevated pulmonary function indexes FVC, FEV1 and 6MWD after intervention compared with that in the prior-intervention period ($P<0.05$), and the indexes in the observation-group after intervention were obviously higher than those in the control-group ($P<0.05$) (Table 3).

Score of living quality

The scores of each dimension of living quality in both groups after the intervention had a

conspicuous reduction compared with the prior-intervention period ($P<0.05$), and the scores in the observation group were remarkably lower than those in the control group ($P<0.05$) (Table 4).

Comparison of patients' satisfaction with nursing care

The nursing satisfaction in the observation group was obviously higher than that in the control group ($P<0.05$) (Table 5).

Discussion

The incidence of bronchial asthma and chronic bronchitis is high. If patients cannot get timely and effective treatment, it will become

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Table 3. The Changes of pulmonary function indexes before and after intervention ($\bar{x} \pm sd$)

Group	Time	FVC (L)	FEV1 (L)	6MWD (m)
Observation group (n=55)	Prior-intervention	2.16±0.42	1.47±0.39	319.48±47.38
	Post-intervention	3.07±0.58*	2.29±0.84*	436.58±60.21*
	T	9.424	6.566	11.335
	P	0.000	0.000	0.000
Control group (n=51)	Prior-intervention	2.10±0.45	1.49±0.41	321.85±45.29
	Post-intervention	2.76±0.49	1.83±0.79	387.65±56.42
	t	7.085	2.728	6.495
	P	0.000	0.008	0.000

Note: Compare with control group, *P<0.05.

Table 4. Comparison of living quality scores between the two groups of subjects before and after intervention

Group	Time	Symptom	Activity ability	The impact of disease on daily life	Total score
Observation group (n=55)	Prior-intervention	64.72±8.03	73.19±7.93	62.83±5.39	65.38±7.46
	Post-intervention	45.28±6.32*	49.21±7.22*	40.28±5.28*	45.86±5.29*
	t	13.586	15.968	21.343	15.829
	P	0.000	0.000	0.000	0.000
Control group (n=51)	Prior-intervention	64.28±7.59	73.64±6.95	62.17±6.12	64.97±8.16
	Post-intervention	56.09±6.07	58.32±7.20	49.86±6.38	51.23±5.82
	t	6.018	10.933	9.944	9.790
	P	0.000	0.000	0.000	0.000

Note: Compare with control group, *P<0.05.

Table 5. Comparison of patients' satisfaction with nursing care

Group	Number of cases	Very satisfied	Satisfied	Unsatisfied	Satisfaction rate (%)
Observation group	55	31 (56.36)	23 (41.82)	1 (1.82)	98.18
Control group	51	27 (52.94)	16 (31.37)	8 (15.69)	84.31
χ^2	-	-	-	-	4.887
P	-	-	-	-	0.027

cal therapeutic effect and the living quality of patients [13-15].

After discharge from the acute stage of treatment, most patients primarily received continuing treatment and rehabilitation information on

obstructive pulmonary disease with the progression of the disease, and cause a series of lesions that seriously affect the living quality [10]. Patients are often accompanied by a variety of clinical symptoms such as coughing, dyspnea, chest tightness, etc., which lead to reduced cardiopulmonary contraction function and hypoxemia [11, 12]. For patients with COPD, a longer curative period is often required, especially for those in stable stages. Due to their mild clinical symptoms, patients often relax treatment, so strict and effective nursing measures should be supplemented during the whole treatment process to improve the clinical

return visits and telephone follow-up. The health needs of patients cannot be met in real time, which affects the quality of life of patients [16]. Continuing management is a form of extension to the hospitalization management. Designed through a series of actions, the continuing management enables patients to receive continuous medical care in a familiar environment, which is of great significance to supply care of patients after discharge [17, 18]. Studies have shown that continuing care for discharged COPD patients, including telephone follow-up and home health care, can effectively relieve respiratory muscle fatigue and improve

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the pulmonary function, which has an exact effect on improving the clinical living quality of patients [19, 20]. In recent years, with the promotion and popularization of the Internet, the information exchange platform based on Websites and WeChat has had a great many advantages with the characteristics of convenience, quickness, timeliness and efficiency [21, 22].

This study explored and analyzed the effect of Internet-based self-management on pulmonary function rehabilitation and living quality in patients with chronic obstructive pulmonary disease (COPD). The results of the study showed that the improvement of self-management behavior, pulmonary function and living quality of the observation group were critically superior than the control group. Similar to the results released by other scholars [23, 24], the Internet-based self-management education mode can effectively lift the patients' promotion in self-management behavior, improve their rehabilitation of pulmonary function, thus effectively improve their living quality. Through website, WeChat official account and WeChat platform, COPD treatment and rehabilitation related knowledge can be released. Meanwhile, patients' feedback information can be collected, and patients' current rehabilitation and self-management can be understood. The personalized and focused guidance to patients of mastering the ability of self-management, can promote the recovery of their pulmonary function, help reduce the frequency of COPD acute attacks, improve the clinical symptoms and thus raising their living quality [25, 26]. In addition, through the WeChat public platform and WeChat exchange groups, a bridge of communication between medical staff and patients and caregivers has been established. Various forms of health education, such as pictures and videos, are beneficial to patients to understand and master the treatment of diseases, the use of drugs, rehabilitation and measures to prevent acute exacerbations. The nursing staff solved the problems encountered by patients in the process of rehabilitation in a timely manner, so that patients can recognize the early signs of acute exacerbation, master the control methods in the early stage of acute exacerbation, and conduct return visit as early as possible. Thus, the disease progression can be effectively controlled and the pulmonary

function rehabilitation of patients can be promoted, which is conducive to improve the nurse-patient relationship.

The results of this study, were similar to the related research reports of other scholars [27], indicating that Internet-based management may be helpful to strengthen the connection between professional nursing staff and patients and their caregivers; meanwhile, it expands patients' access to disease information, helps to improve their subjective initiative for cooperate with treatment, thus effectively controlling the disease.

The quantity of patients included in this study is limited. As a preliminary observational program, this study has achieved a certain effect. While in the later stage, further expanding of the sample size and the improvement of the research plan is needed to obtain a research program with more clinically guiding significance.

In summary, Internet-based self-management can effectually improve the self-management ability of COPD patients. It is conducive to improve the patients' pulmonary function, and their living quality, thus it is worthy of clinical popularization and application.

Disclosure of conflict of interest

None.

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