



Effects of the health belief model following acute exacerbation of chronic obstructive pulmonary disease in a hospital in China

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Background: This study aims to investigate the effects of education with health belief model (HBM) on anxiety and fatigue among patients with acute exacerbation of chronic obstructive pulmonary disease (AECOPD).

Methods: Patients with AECOPD admitted into Taizhou People's Hospital, Jiangsu, China between December 2012 and October 2013 were randomly selected for the present study according to random number table. A total of 99 cases with anxiety were included. These patients were divided into two groups: experimental group educated by HBM (n=47), and control group educated by conventional method (n=52). The scores for anxiety and fatigue were evaluated using the self-rating anxiety scale (SAS) and multidimensional fatigue inventory (MFI-20).

Results: After educational intervention by HBM, patients achieved a significant decrease in anxiety and fatigue scores, when compared to patients in the control group, who were educated by the conventional method at the time of admission, discharge, and 6 weeks after discharge ($P < 0.05$).

Conclusions: HBM program effectively may alleviate anxiety and fatigue, providing necessary information for symptom management among patients with AECOPD.

Keywords: Health belief model program (HBM program); acute exacerbation of chronic obstructive pulmonary disease (AECOPD); anxiety; fatigue

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Introduction

Chronic obstructive pulmonary disease (COPD) is a debilitating and preventable chronic lung disease characterized by alveolar destruction, lung inflammation and airflow limitation (1). Patients with acute exacerbation of COPD (AECOPD) have a high incidence of developing anxiety and fatigue (2). It was hypothesized that anxiety and fatigue may be risk factors for developing AECOPD and lower the effectiveness of the present therapeutic approach.

Therefore, it would be a useful approach for preventing AECOPD to reduce the anxiety and fatigue of patients with COPD.

Recent studies have shown that depression, anxiety and fatigue are major complications that significantly affect disease severity and recovery after treatment in patients with AECOPD (3). Due to the prevalence and significance of patients with AECOPD, several studies have aimed to reduce depression, anxiety and fatigue in recent years. Health education programs in nursing care

Table 1 Patient characteristics

Project	Experimental group (n=52), n (%)	Control group (n=47), n (%)	t/ χ^2	P
Disease course, years			0.251	0.882
<10	28 (53.8)	24 (51.1)		
10–20	9 (17.3)	10 (21.3)		
>20	15 (28.8)	13 (27.7)		
Gender			0.017	0.896
Female	15 (28.8)	13 (27.7)		
Male	37 (71.2)	34 (72.3)		
Smoke history			0.007	0.932
Yes	25 (48.1)	23 (48.9)		
No	27 (51.9)	24 (51.1)		
Age, years			0.09	0.946
≤60	6 (11.5)	5 (10.6)		
61–74	21 (40.4)	18 (38.3)		
≥75	25 (48.1)	24 (51.1)		
Education			1.871	0.392
Elementary school	29 (55.8)	29 (61.7)		
Middle school	17 (32.7)	16 (34.0)		
High school or above	6 (11.5)	2 (4.3)		

have been proven to be useful in the therapy of many diseases. Uchmanowicz *et al.* recently reported that early identification and assessment of depression and anxiety symptoms allow health care providers to offer patients at risk of depression a special medical supervision. Rapid start of antidepressant therapy may increase illness acceptance and improve prognosis among patients with COPD (4). Livi *et al.* recently proposed a health belief model (HBM), that has confirmed very beneficial to disease recovery (5). In this model, social psychologists suggested that the development of human related-diseases is caused by the alteration of interaction between physiological and psychological behavior processes. Psychological health has a significant impact on the progression and recovery of almost all human-related diseases. Therefore, it would be beneficial to improve psychological health among patients and achieve better therapeutic effects in many diseases including AECOPD (6). In the present study, the anxiety and fatigue

scores were compared between the two groups of AECOPD patients, who were educated using the conventional method and the HBM program, respectively. These results have significant beneficial impacts in improving the well-being of patients with AECOPD and other related human diseases.

Methods

Patient characteristics

This study was reported based on STROBE checklist. A total of 99 patients with AECOPD were randomly selected between December 2012 and October 2013 in the Department of Respiratory, Taizhou People's Hospital, according to random number table. The inclusion criteria: (I) patients diagnosed with AECOPD and received medical treatment following the guidelines for the diagnosis and treatment of COPD (revised edition, 2007); (II) patients complicated with anxiety according to the evaluation of the self-rating anxiety scale (SAS); (III) patients with a forced the first second of expiratory volume/forced vital capacity (FEV1/FVC) ratio of ≤70% and a FEV1 between 30–80% measured by the pulmonary function test; (IV) patients with a Karnofsky performance score of >50 points (Intensive health care and medical treatment are required for the patients with Karnofsky performance scores >50 points); (V) patients who voluntarily participated in the present study; (VI) patients who were conscious and had no history of receiving anti-anxiety medicines; (VII) patients who lived near the hospital for convenient visits during follow-ups. The exclusion criteria: (I) patients who had low or no ability to perform daily routines; (II) patients who had severe mental and/or cognitive disorders; (III) patients who had severe heart and/or lung diseases.

A total of 71 males and 28 females between the age of 35 and 96 years old (average age: 74.12±10.16 years old). The sample size was calculated by PASS software. These patients were divided into two groups, according to the order of admission and receiving health care education through the HBM program and conventional method, respectively: experimental group (n=47), and control group (n=52). Differences in gender, disease course, age and other factors were not observed between these two groups ($P>0.05$, *Table 1*). The present study was approved in accordance with guidelines of the research ethics committee of Taizhou People's Hospital. Signed informed consent forms were provided by all patients who participated in the present study.

Experimental design

The present study was conducted by a group of researchers, including pulmonologists, psychologists and educational nurses. A total of 10 senior nurses with expertise in patient education and management of COPD were included. All group members collaborated on the research project according to the guidance of the educational training program. In the control group, patients received conventional health education at the time of hospital admission and discharge. In the experimental group, hospitalized patients received education through the HBM program, which offered 30–45 minutes of educational sessions for five times a week. The discharged patients were consulted twice a week by telephone and received home visits within 2 weeks of discharge. At 2 weeks after discharge, patients were offered the HBM educational program once each week for 15–30 minutes. Patients were offered the HBM educational program for a total of 6 weeks after discharge from the hospital.

HBM educational program

The HBM educational program comprised of two sections, including the scientific knowledge of the patient's physiological condition with COPD and psychological belief support. First, hospitalized patients were educated by pulmonologists and senior nurses about the fundamentals of COPD pathophysiology, ensuring that patients have a basic understanding of the initiation, progression, susceptibility and severity of AECOPD. The information was presented using different methods, including the retrospective review of medical records, video shows, and Q&A sessions with patients. Through this program, patients obtained knowledge of the prevalence, risk factors, and clinical symptoms of AECOPD. This program increased the patient's and their relative's awareness of AECOPD's influence on family life, society and the economy. During the educational sessions, patients were encouraged to interact with experts by asking questions and expressing their thoughts and feelings. The pulmonologist and nurses emphasized to patients that optimism and good mental health helped in disease recovery. In addition, the doctor and nurses emphasized the importance of smoking cessation, long-term oxygen therapy, efficient relaxing and coughing skills. Patients were also given training programs such as abdominal breathing, lip breathing, breathing exercises

and other related training courses through video shows, tables and pictures under instruction of doctors and nurses. Anxiety and fatigue were evaluated before and after the training programs. Because spiritual support of family member is critical for patients with AECOPD, the relatives of AECOPD patients were also encouraged to foster a supportive environment by participating in the HBM education program.

It is very important to help patients establish optimistic beliefs and obtain spiritual support from family members with the HBM education program. To do this, patients were treated with warmth and supportiveness, in order to establish mutual trust between patients and doctors. Each patient received praise and encouragement. The healthy and supportive environment provided health benefits for patients and prevented them from having negative thoughts about their disease. In order to increase patient routine activities, the patients and their family members were encouraged to participate in a variety of educational events and activities. In addition, the friends and colleagues of patients, and even successfully cured patients, were encouraged to participate in these activities, in order to help cultivate the optimism and active attitudes of patients during treatment and nursing care. In the past, the investigators were able to successfully organize a COPD health care education day, and periodically arranged the one-day event to promote the exchange of experiences and ideas between patients. During the activity, patients were given access to many informative resources, such as magazines, pamphlets and websites relevant to COPD. Other communication methods, such as phone and email, were also utilized to allow patients to keep in touch with the hospital. Through these activities, patients established a healthy lifestyle and positive attitudes.

Evaluation of anxiety and fatigue

Anxiety and fatigue were evaluated in these two groups of patients at the time of admission, discharge, and 6 weeks after discharge. The SAS was used for evaluating anxiety (7). A total of 20 factors were considered for the evaluation of anxiety. Each factor was scored 4 points with a maximum score of 100 for each case. A higher score indicated more severe anxiety. Patients were also evaluated for fatigue using the multidimensional fatigue inventory (MFI-20) developed by Holland's Smets in 1995 (8). A higher score indicated more severe fatigue.

Table 2 Comparison of SAS scores between two groups at admission, at discharge and 6 weeks after discharge

Groups	n	Admission	Discharge	6 weeks after discharge
Experimental group	47	58.85±6.62	47.16±7.45	39.77±6.34
Control group	52	56.38±8.93	55.47±8.50	51.21±7.97
<i>t</i>		1.036	5.146	7.846
<i>P</i>		0.303	0.013	0.016

Repeated measure analysis of variance, $F_{\text{time}}=197.81$, $P<0.01$; $F_{\text{interaction}}=35.07$, $P<0.01$; $F_{\text{group}}=26.51$, $P<0.01$.

Table 3 Comparison of MFI-20 scores between two groups at the time of admission discharge and 6 weeks after discharge

Groups	n	Admission	Discharge	6 weeks after discharge
Experimental group	47	78.85±10.61	64.72±8.09	56.77±9.96
Control group	52	82.27±10.19	75.42±13.18	73.19±12.56
<i>t</i>		1.634	4.807	7.159
<i>P</i>		0.105	0.016	0.007

Repeated-measure analysis of variance, $F_{\text{time}}=130.85$, $P<0.05$; $F_{\text{interaction}}=22.73$, $P<0.05$; $F_{\text{group}}=28.65$, $P<0.05$.

Statistical analysis

All data were statistically analyzed for SAS and MFI-20 scores using the SPSS version 17.0 software (SPSS Inc.; Chicago, IL, USA). Data were presented as mean ± standard deviation. Student *t*-test was used to compare the differences between the experimental group and control group. $P<0.05$ was considered statistically significant.

Results

A total of 71 males and 28 females between the age of 35 and 96 years old (average age: 74.12±10.16 years old). These patients were divided into two groups, experimental group ($n=47$), and control group ($n=52$). Differences in gender, disease course, age and other factors were not observed between these two groups ($P>0.05$, *Table 1*).

Education by HBM significantly reduced anxiety among patients with AECOPD at different time points

The present study revealed that patients educated by the

HBM program in the experimental group ($n=47$) had significantly lower anxiety scores, when compared to patients who received conventional education in the control group ($n=52$), at the time of discharge and at 6 weeks after discharge ($P<0.05$). There were significant differences in time and group effects ($P<0.01$, *Table 2*).

Education by HBM significantly reduced fatigue among patients with AECOPD at different time points

MFI-20 scores in these two groups were statistically analyzed among these two groups of patients after education at the time of discharge and at 6 weeks after discharge. These results revealed that patients educated by the HBM program in the experimental group ($n=47$) had significantly lower MFI-20 scores, when compared to patients received by conventional education in the control group ($n=52$), at the time of discharge and at 6 weeks after discharge ($P<0.05$). There were significant differences in time and group effects ($P<0.05$, *Table 3*).

Discussion

The outcomes of this study presented that patients achieved a significant decrease in anxiety and fatigue scores after educational intervention by HBM when compared to patients in the control group, who were educated by the conventional method at the time of admission, discharge, and 6 weeks after discharge.

COPD is a chronic lung inflammatory disease with poor prognosis. Long-term cigarette smoking is a major cause of COPD. Patients who periodically suffer from acute episodes of COPD (AECOPD) are characterized by anxiety, fatigue and dyspnea, which ultimately reduce their physical activities (9). Anxiety is a risky factor for fatigue in patients with AECOPD (10). However, at present, there is no effective approach to reduce anxiety and fatigue associated AECOPD. The HBM education program has been previously explored, and it has been shown to reduce some disease symptoms (11). In order to determine whether the HBM education program has some beneficial effects on patients with AECOPD, a total of 47 AECOPD patients were treated with the HBM education program in the present study, and the anxiety scores of these patients were compared with patients who received conventional education at the different time points. The results revealed that the HBM education program significantly reduced the anxiety score (*Table 2*). Patients were more aware of their

conditions, and thereby allowed them to be better equipped to overcome difficulties during the treatment. Furthermore, patients were happier, more optimistic, more cooperative, and had fewer psychological issues.

In addition, the program can improve the patient's lung function. This improvement is attributed to the patient's reduced anxiety. Gabriel *et al.* (12) and Jácome *et al.* (13) previously reported that patients with COPD negatively influenced the moods of their family member's. As previously described, a patient's mood affects his or her attitude. Therefore, it is not only important to educate patients about their disease, but also critical to establish a good communication platform for patients and their family members. A previous study revealed that patients who strengthened their coping mechanisms had higher self-confidence, and subsequently had better recovery (14). In addition to the spiritual support received from health care professionals and family members, television, magazines, other media and materials are useful resources for patients to better understand their condition (15). In the present study, reduced anxiety scores and psychological distress were observed in patients educated by the HBM program at the time of admission and at post-discharge, confirming the beneficial effects of continuous HBM education in alleviating patient psychological issues. Thus, the present HBM educational program can greatly improve disease recovery by effectively improving patient attitude.

AECOPD patients are predisposed to the development of fatigue due to chronic disease, low level of activity and lethargy. Fatigue has been the most common symptom in patients with AECOPD. It has been reported that psychological intervention can alleviate fatigue among patients with COPD (16). In addition, Law *et al.* previously reported (17) that breathing training can effectively alleviate the fatigue of COPD patients. The present results revealed that HBM-based education can significantly alleviate the fatigue of patients with AECOPD at the time of discharge and at 6 weeks after discharge ($P < 0.05$, Table 3). These results indicated that the HBM program not only alleviated the anxiety of patients (18), but also reduced their fatigue. After receiving educational HBM program (19), the patients more enthusiastically participated in group routine activities. They were more optimistic, self-confident and better interacted with medical care staff and family members. Therefore, the HBM program improved the behavior and attitude of patients, which benefited their recovery from AECOPD (20).

There are still some limitations in this paper. Firstly, this study was open labeled, not a blinded trial. Secondly, due

to the limitations of sample size, the effects of education with HBM on anxiety and fatigue among patients with AECOPD still need to be further researched with another large sample size on clinical trial. Thirdly, the follow-up was short and should be further research with longer clinical follow-up.

Conclusions

In summary, the new HBM health education program for patients with AECOPD was explored and successfully confirmed in the Department of Respiration, Taizhou People's Hospital, Jiangsu, China. After AECOPD patients underwent the comprehensive educational program, their anxiety and fatigue were significantly decreased at the time of admission, discharge, and after discharge. This program not only provided benefits for in-hospital patients, but also provided benefits for out-hospital patients (21). These results warrant future long-term studies on AECOPD patients undergoing the HBM program.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The present study was approved in accordance with guidelines of the research ethics committee of Taizhou People's Hospital. Signed informed consent forms were provided by all patients who participated in the present study.

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