Evaluation of the Application Effect of the Health Belief Model in Inhaler Treatment for Elderly COPD Patients

Lei Yang[a#], Wei Dou[a#], Xing-Mei Dai[a], Shu-Yuan Yang[a], Yu-Qiong Liao[a], Xiao-Qing Wang[a]**, Ying Zhu[b]*

a Department of Geriatrics, The First People's Hospital of Yunnan Province, PR China, Affiliated Hospital of Kunming University of Science and Technology, The First People's Hospital of Yunnan Province, PR China

b Department of General Practice, The First People's Hospital of Yunnan Province, PR China, Affiliated Hospital of Kunming University of Science and Technology, The First People's Hospital of Yunnan Province, PR China

Lei Yang and Wei Dou should be considered joint first authors.

* Corresponding author. Department of General Practice, Affiliated Hospital of Kunming University of Science and Technology, The First People's Hospital of Yunnan Province, 157 Jinbi Road, Xishan district, Kunming, Yunnan, 650500, PR China.

** Corresponding author. Department of Geriatrics, Affiliated Hospital of Kunming University of Science and Technology, The First People's Hospital of Yunnan Province, 157 Jinbi Road, Xishan district, Kunming, Yunnan, 650500, PR China.

E-mail addresses: zhuying1973@gmail.com (Ying Zhu), 952852597@qq.com (Xiao-Qing Wang).

Abstract

Purpose: This study aims to evaluate the effectiveness of health education based on the Health Belief Model (HBM) in the management of inhalation treatment for elderly COPD patients. **Method**: A total of 75 elderly COPD patients who visited the Geriatric Medicine/General Medicine Department of the First People's Hospital of Yunnan Province from September 2020 to September 2021 were selected. Seven patients who were excluded due to reasons such as cognitive impairment and comorbidities that prevented inhalation therapy during the intervention were removed. Ultimately, 68 cases were included for health education based on the Health Belief Model (HBM). The usage scores of inhalation devices at baseline and at 3 and 6 months post-intervention, the Morisky Medication Adherence Scale (MMAS-8) scores, and the Short Form 36 Health Survey Questionnaire (SF-36) scores were compared. **Results**: After 3 months of intervention, the scores for inhalation device usage, MMAS-8, and SF-36 were higher than baseline. After 6 months of intervention, the scores for inhalation device usage, MMAS-8, and SF-

36 were higher than both baseline and the scores after 3 months of intervention ($P < 0.05$).**Conclusion**: The health education based on the Health Belief Model (HBM) can effectively improve the compliance and accuracy of inhalation treatment in elderly COPD patients, thereby enhancing prognosis and improving the patients' quality of life.

Keywords: Chronic Obstructive Pulmonary Disease, Health Belief Model, Inhalation Therapy

Chronic obstructive pulmonary disease (COPD) is a heterogeneous lung disease caused by the interaction between genetic (G) and environmental (E) factors, occurring throughout an individual's lifetime (GETomics). This interaction can impair the lungs and/or alter their normal development/aging process [1]. Due to continuous exposure to factors that cause COPD, such as smoking and an aging population, the incidence of COPD has been increasing in recent years [2], resulting in a significant burden on patients, their families, and society. Most medications used for the treatment of chronic obstructive pulmonary disease (COPD) are inhaled. Therefore, the proper use of inhaler devices is crucial for optimizing the benefit-risk ratio of inhalation therapy. Achieving this goal requires selecting appropriate devices, providing education and monitoring, regularly assessing the usage of inhalers, and making necessary adjustments to education and equipment when needed [1]. Currently, there are at least 33 different inhalation therapies available, including various bronchodilators (both short-acting and long-acting) and inhaled corticosteroids (ICS), either used alone or in combination. Furthermore, there are at least 22 different inhaler devices, including nebulizers, metered-dose inhalers (MDIs) with or without a valved holding chamber (VHC)/spacer, breath-actuated MDIs (BAIs), soft mist inhalers (SMIs), and dry powder inhalers (DPIs) [1]. Studies have shown that on average, over two-thirds of patients make at least one error when using inhaler devices, with the primary errors related to inhalation flow, timing, coordination, and other factors. The ability of patients to use inhalers correctly is influenced by their cognitive abilities, manual dexterity and coordination, the inspiratory flow they can achieve, the use of different types of devices, and the impact of previous education on inhaler techniques. As individual age, poor inhaler technique and device misuse become more common. Additionally, adherence to inhaled medication therapy is a critical issue. Adherence is influenced by various factors such as individual, family, social, environmental, and economic factors. Improving patient adherence will undoubtedly enhance the effectiveness of COPD treatment. The Health Belief Model (HBM) is a psychological model used to explain people's decision-making and behavior regarding health. The model suggests that individuals' health behavior is influenced by their perceptions and beliefs about health issues. The Health Belief Model includes several core concepts. Perceived Health Threat: The individual's perception and awareness of the severity and potential risks of their health problem. If individuals perceive themselves to be at risk of a serious health problem or threat, they are more likely to engage in positive health behaviors. Perceived Health Benefits: The individual's perception of the benefits and positive outcomes associated with adopting specific health behaviors. If individuals believe

that taking certain actions will lead to positive health outcomes, they are more likely to engage in those behaviors.Perceived Barriers: The individual's perception of the obstacles and difficulties associated with adopting specific health behaviors. These barriers can be economic, time-related, social, or psychological. If individuals perceive significant barriers to adopting a particular health behavior, they may be less inclined to engage in that behavior.Self-Efficacy: The individual's confidence in their ability to successfully adopt and maintain specific health behaviors. If individuals believe in their own ability to effectively carry out a health behavior, they are more likely to engage in and sustain that behavior.Cues to Action: Specific events, experiences, or information that trigger an individual's attention and action toward a health issue. These cues to action can come from personal experiences, recommendations from healthcare professionals or media, or other factors that stimulate individuals to take action.The Health Belief Model posits that individuals are more likely to engage in positive health behaviors if they perceive a serious health threat, believe in the benefits of taking specific actions, and have confidence in their ability to overcome barriers. This model has been widely applied in health education and promoting healthy behaviors, helping people understand and change unhealthy behaviors. Based on the importance of inhalation therapy in the treatment of chronic obstructive pulmonary disease (COPD) and the high rate of errors and poor adherence associated with inhalation therapy, this study focuses on patients and applies the Health Belief Model (HBM) to the management of elderly COPD patients and their caregivers. The study aims to explore the effects of health education based on the HBM on improving the correct usage and adherence to inhalation devices among elderly COPD patients.

Object and method

1.1 Research object

A total of 75 COPD patients, aged ≥65 years old, were selected from the Department of Geriatric Medicine/Department of General Practice of Yunnan First People's Hospital from September 2020 to September 2021, meeting the COPD diagnostic criteria in the Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease [4]. The 7 cases that could not be treated by inhalation due to cognitive impairment, comorbidities and death during the intervention were excluded, and 68 cases were finally included. The enrolled patients (including caregivers) participated in the study voluntarily under the principle of informed consent.

1.2 Inclusion and exclusion criteria

Inclusion criteria: (1) Inhalants are included in the drug used; (2) Normal thinking, with language communication skills, able to clearly understand and answer the questions asked; (3) The caregiver is the family member who knows the patient's condition best, and the family member can express normally and is willing to cooperate in this study.

Exclusion criteria: (1) Patients with mental illness, severe hearing impairment, visual impairment, and cognitive impairment; (2) Patients with critical illness and impaired consciousnes

1.3 Data and methods

1.3.1 General Information

Patients' age, sex, course of disease and inhalant use were included. 68 patients were aged 65-86

years, mean (70.5±4.4); The duration of the disease ranged from 5 months to 11 years, with an average of (6.24±1.91) years. Among them, 44 males accounted for 64.7% and 24 females accounted for 35.3%. Inhalant use: 20 cases of budesonide formoterol powder inhalants accounted for 29.4%, 26 cases of tiotropium bromide powder inhalants accounted for 38.2%, 22 cases of salmeteroticasone powder inhalants accounted for 32.4%.

1.3.2 Intervention methods

（1）Combined with the actual situation of patients within 1 to 5 days after admission, the relevant scale was used for comprehensive assessment of the elderly. (2) Establish health education groups: There are 4 members, who are composed of nursing staff with working years ≥ 10 years, bachelor degree or above, intermediate title or above, and unified professional training and learning of budesonide formoterol powder inhalants, tiotropium bromide powder inhalants, salmeteroticasone powder inhalants mechanism of action, methods of use, precautions and related knowledge of COPD. Doctors participate in guidance and education. Standardize educational language. (3) Health education: Through the distribution of health education manuals, PPT, videos and other ways to explain the pathogenesis of COPD, clinical symptoms, treatment, inhalant use methods and related precautions to patients and their caregivers. The education process focuses on three key steps of HBM: (1) The use of plain language to educate elderly patients with COPD and their caregivers. It is emphasized that the continuous and standardized use of inhalants can maintain the lung function of elderly patients with COPD, reduce the number of acute attacks and hospitalization, otherwise it will bring pain to patients and increase the economic burden of the family. (3) Encourage patients and their caregivers to correctly understand inhalants, actively cooperate with treatment, develop a good medication mode, stimulate the confidence of COPD patients in treatment, improve their enthusiasm for treatment, reduce the number of acute exacerbations and improve the quality of life of patients. Educate patients and their caregivers about the importance of long-term, standardized inhalant therapy. The follow-up was 6 months.

1.4 Observation Indicators

1.4.1 Score of the use of inhalation drug delivery device

The scoring criteria for inhalation methods are demonstrated by trained health education team members or clinicians who are familiar with DPIs, and then patients are allowed to use the inhalation device themselves. During hospitalization, inhalation method evaluation was performed on patients and correct guidance was given. The operation of each patient was scored according to the steps listed in the table. The recommended evaluation criteria for inhalation method of the penetroscope and inhalation method of the Dubao and inhaler were mainly formed into 7 steps and 10 items of scoring criteria. The total score is 10 points, 10 is completely mastered, 9 to 6 is basically mastered, and 6 points or less is not mastered. The total of basic mastery and complete mastery is the total mastery number. After the first evaluation, the patients' non-standard operation was corrected. After the first evaluation, the patients who had not mastered the inhalational drug delivery device were continuously scored and corrected from the 7 operating steps of the inhalational drug delivery device (loading, exhaling, biting, inhaling, breath-holding, repeating, gargling) to evaluate the use of the inhalational drug delivery device of the patients, and the correct operation of each step was awarded 1 point. The scores of inhalation drug delivery devices were compared at the time of enrollment and 3 and 6 months after enrollment.

1.4.2 Medication compliance

The Morisky Medication Adherence Scale (MMAS-8) was used to evaluate patients' medication

adherence at enrollment and 3 and 6 months after enrollment. The scale consists of 8 items with a total score of 11 points, and the higher the score, the higher the medication adherence [6].

1.4.3 Quality of life

The quality of life of the patients at enrollment and 3 and 6 months after enrollment was assessed by the Brief Health Status Questionnaire (SF-36), which included eight dimensions of physiological function, physiological function, physical pain, general health status, energy, social function, emotional function and mental health. The higher the score, the higher the quality of life of the patients.

1.5 Statistical Methods SPSS 20.0 statistical software was used for data processing. Measurement data conforming to normal distribution were expressed as (x±s), group T-test was used for comparison between groups, and two-factor repeated measurement ANOVA was used for repeated measurement data. The statistical data were expressed in relative numbers and $\chi 2$ test was used for comparison between groups. $P < 0.05$ was considered to be statistically significant.

2 Results

2.1 Scores for the use of inhalation drug delivery devicesThe score of inhalation device use of intervention patients after 3 months of enrollment was higher than that at the group, and the score of inhalation device use after 6 months of enrollment was higher than that at the group and after 3 months of enrollment, with statistical significance ($P < 0.05$), as shown in Table 1.

Table 1 - Comparison of Inhalation Device Usage Scores at Different Time Points in Intervention Patients

Number of columns	enrollment	3 months after enrollment	6 months after enrollment
68	5.57±0.82	6.00±0.91	6.46±1.07
		P＜0.05	P＜0.05

Note: Compared to the time of enrollment, $P < 0.05$; Compared to 3 months after enrollment, $P < 0.05$

2.2 MMAS-8 score and SF-36 score

MMAS-8 and SF-36 scores of intervention patients were higher after 3 months of enrollment than when they were enrolled, and MMAS-8 and SF-36 scores were higher after 6 months of enrollment than when they were enrolled and after 3 months of enrollment, with statistical significance ($P < 0.05$), as shown in Table 2.

Table 2: Comparison of MMAS-8 scores and SF-36 scores at different time points for the intervention group.

columns	MMAS-8 Score			SF-36 Score		
	enrollment	3 months after enrollment	6 months after enrollment	enrollment	3 months after enrollment	6 months after enrollment
68	7.31±1.58	9.51±1.33 P＜0.05	9.66±1.63 P＜0.05	54.99±22.43	62.85±22.70 P＜0.05	66.26±22.72 P＜0.05

Note: MMAS-8 = Morisky Medication Adherence Scale, SF-36 = Short Form-36 Health Survey. Compared to the time of enrollment, $P < 0.05$; Compared to 3 months after enrollment, $P < 0.05$

3. Discuss

COPD is a common and treatable, preventable disease. The pathogenesis of COPD manifests as a respiratory system disorder characterized by sustained airflow limitation and enhanced chronic inflammatory responses under the influence of harmful particulate matter and polluted air [7]. According to statistics, approximately 10% of the global population suffers from COPD, and this proportion is increasing every year [8]. Inhalation therapy is a crucial treatment for COPD patients. Educating patients on inhalation therapy using the Health Belief Model is of significant clinical and societal importance as it aims to enhance patient compliance and improve patient outcomes. This study demonstrates that health education based on the Health Belief Model can indeed enhance the effectiveness of inhalation therapy for patients.

Zhao [9] and others have shown that health beliefs and social support have a positive impact on online health information-seeking behavior among chronic disease patients. HBM interventions have been effective in the treatment of various chronic diseases, including diabetes, osteoporosis, and cancer [10-12]. Studies indicate that HBM programs can significantly reduce the breathlessness of COPD patients and improve their health confidence [13]. Another study suggests that a 6-week HBM program is beneficial in alleviating fatigue and anxiety in patients with acute exacerbation of COPD [14].

HBM is a comprehensive framework introduced in the 1950s for predicting individual preventive health behaviors and implementing health education [15]. This model illustrates the correlation between individual behavior and beliefs and posits that individual beliefs lead to preventive actions against risk conditions [16]. In a COPD self-management education program based on the HBM model, it enhanced patients' self-efficacy for COPD and overall health behaviors [17]. Research has confirmed that HBM interventions for COPD patients can effectively alleviate depression and anxiety, suppress inflammation, and improve the quality of life [8] (01). Inhalation therapy is an important treatment measure for COPD, and this study, through Health Belief Model interventions on the inhalation method of COPD patients, improved patient efficacy, which will further enhance patient prognosis. Self-management interventions for COPD patients

can improve health-related quality of life and reduce respiratory-related hospitalization rates [18], and this study, through HBM intervention, can further reduce COPD patients' readmission rates.

Currently, in the country, methods for improving patient adherence and accuracy in inhaler therapy mostly involve various forms of health education and medication reminders. Often, the focus has been on patient-centered health guidance. COPD patients are often elderly, and their manual dexterity is reduced. Factors related to the disease and insufficient family support can both lead to decreased adherence and accuracy in inhaler therapy.

The health education based on HBM adopted in this study is applicable not only to the elderly patients, but also to the caregivers of the patients. The results of this study showed that MMAS-8 and SF-36 scores were higher after 3 and 6 months of intervention than when the patients were enrolled. MMAS-8 and SF-36 scores were higher after 6 months of intervention than at the time of enrollment and 3 months after enrollment. It is suggested that health education based on HBM can effectively improve the compliance and accuracy of inhalant treatment in elderly COPD patients, and then improve the effectiveness of treatment, which provides a basis for long-term health education and inhalant management in elderly COPD patients. However, due to the impact of research funds and short follow-up time, this study could not observe the impact of long-term health education on the standardized use of inhalants in patients. Therefore, how to develop a common health education to improve the compliance and accuracy of inhalant therapy in elderly COPD patients is still a topic that needs to be discussed.

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