

World Journal of *Clinical Cases*

World J Clin Cases 2021 July 26; 9(21): 5754-6177



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The WJCC is now indexed in Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports/Science Edition, Scopus, PubMed, and PubMed Central. The 2021 Edition of Journal Citation Reports® cites the 2020 impact factor (IF) for WJCC as 1.337; IF without journal self cites: 1.301; 5-year IF: 1.742; Journal Citation Indicator: 0.33; Ranking: 119 among 169 journals in medicine, general and internal; and Quartile category: Q3. The WJCC's CiteScore for 2020 is 0.8 and Scopus CiteScore rank 2020: General Medicine is 493/793.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: Ji-Hong Lin; Production Department Director: Xiang Li; Editorial Office Director: Jin-Lei Wang.

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

EDITORS-IN-CHIEF

Dennis A Bloomfield, Sandro Vento, Bao-Gan Peng

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

July 26, 2021

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INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

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<https://www.wjgnet.com/bpg/GerInfo/287>

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PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Retrospective Study

Value of refined care in patients with acute exacerbation of chronic obstructive pulmonary disease

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Author contributions: Na N and Guo SL design the study; Zhang YY drafted the work; Ye M and Wu GX collected the data; Wu GX analyzed and interpreted the data; Zhang N and Ma LE wrote the article.

Institutional review board statement: The study was approved by the Medical Ethics Committee of the Affiliated Hospital of Qingdao University.

Informed consent statement: All study participants or their legal guardian provided informed written consent about personal and medical data collection prior to study enrolment.

Conflict-of-interest statement: The authors declare that there is no conflict of interest to disclose.

Data sharing statement: No additional data are available.

Open-Access: This article is an open-access article that was

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Abstract

BACKGROUND

Under physiological conditions, sputum produced during acute exacerbation of chronic obstructive pulmonary disease (AECOPD) can move passively with the cilia in the airway; the sputum is gradually excreted from the depth of the airways through the stimulation of the coughing reflex on the sensory nerve on the surface of the airway. However, when the sputum is thick, the cough is weak, or the tracheal cilia are abnormal, sputum accumulation may occur and affect the exchange of oxygen and carbon dioxide in the lung. Furthermore, the presence of pathogenic microorganisms in sputum may cause or aggravate the symptoms of pulmonary infection in patients, which is the main factor leading to AECOPD. Therefore, promoting effective drainage of sputum and maintaining airway opening are key points requiring clinical attention.

AIM

To explore the effect of refined nursing strategies in patients with AECOPD and

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Manuscript source: Unsolicited manuscript

Specialty type: Medicine, research and experimental

Country/Territory of origin: China

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): 0
Grade C (Good): 0
Grade D (Fair): 0
Grade E (Poor): 0

Received: February 23, 2021

Peer-review started: February 23, 2021

First decision: March 25, 2021

Revised: April 6, 2021

Accepted: May 21, 2021

Article in press: May 21, 2021

Published online: July 26, 2021

P-Reviewer: Hayes MJ

S-Editor: Fan JR

L-Editor: Wang TQ

P-Editor: Yuan YY



dysphagia.

METHODS

We selected 126 patients with AECOPD and difficulty of expectoration at our hospital, and divided them into a refined care group and a routine care group, with 63 cases each, using a random number table. The two groups of patients were treated with expectorant, anti-infection, oxygen inhalation, and other basic treatment measures; patients in the refined care group were given refined nursing intervention during hospitalization, and the routine care group received conventional nursing intervention. The differences in sputum expectoration, negative pressure suction rate, blood gas parameters, dyspnea score measured through the tool developed by the Medical Research Council (MRC), and quality of life were compared between the two groups.

RESULTS

After 7 d of intervention, the sputum expectoration effect of the refined care group was 62.30%, the effective rate was 31.15%, and the inefficiency rate was 6.56%. The sputum expectoration effect of the routine care group was 44.07%, the effective rate was 42.37%, and the inefficiency rate was 13.56%. The refined care group had better sputum expectoration than the routine care group ($P < 0.05$). The negative pressure suction rate in the refined care group was significantly lower than that of the routine care group during the treatment (22.95% vs 44.07%, $P < 0.05$). Before the intervention, the arterial oxygen saturation (PaO_2) and arterial carbon dioxide saturation (PaCO_2) values were not significantly different between the two groups ($P > 0.05$); the PaO_2 and PaCO_2 values in the refined care group were comparable to those in the routine care group after 7 d of intervention ($P > 0.05$). Before the intervention, there was no significant difference in the MRC score between the two groups ($P > 0.05$); the MRC score of the refined care group was lower than that of the routine care group after 7 d of intervention, but the difference was not statistically significant ($P > 0.05$). Before intervention, there was no significant difference in the symptoms, activities, disease impact, or St. George's Respiratory questionnaire (SGRQ) total scores between the two groups ($P > 0.05$). After 7 days of intervention, the symptoms, activities, and total score of SGRQ of the refined care group were higher than those of the routine care group, but the difference was not statistically significant ($P > 0.05$).

CONCLUSION

AECOPD with thick sputum, weak coughing reflex, and abnormal tracheal cilia function will lead to sputum accumulation and affect the exchange of oxygen and carbon dioxide in the lung. Patients with AECOPD who have difficulty expectorating sputum may undergo refined nursing strategies that will promote expectoration, alleviate clinical symptoms, and improve the quality of life.

Key Words: Refined care; Chronic obstructive pulmonary disease; Acute exacerbation period; Difficulty in expectoration

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Core Tip: This study confirmed the positive effect of refined nursing strategy on acute exacerbation of chronic obstructive pulmonary disease patients with difficulty in expectoration. It can promote expectoration, improve clinical symptoms, and improve the quality of life.

Citation: Na N, Guo SL, Zhang YY, Ye M, Zhang N, Wu GX, Ma LW. Value of refined care in patients with acute exacerbation of chronic obstructive pulmonary disease. *World J Clin Cases* 2021; 9(21): 5840-5849

URL: <https://www.wjgnet.com/2307-8960/full/v9/i21/5840.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v9.i21.5840>

INTRODUCTION

Complex pathological changes occur in acute exacerbation of chronic obstructive pulmonary disease (AECOPD)[1,2]. The disease not only seriously affects the respiratory function of patients but also has a serious impact on their physiological function, motor function, and quality of life[3-5]. Current clinical treatment focuses on preventing inflammation, relieving cough, and resolving phlegm[6-10]. Under physiological conditions, sputum can passively move with the cilia and be expelled from the depths of the airway by stimulating the sensory nerves on the surface of the airway in order to cough[11]. However, when the sputum is thick, the cough is weak, or the tracheal cilia are abnormal, sputum accumulation may occur and affect the exchange of oxygen and carbon dioxide in the lungs[12]. It can cause or aggravate the symptoms of pulmonary infection in patients due to the presence of a variety of pathogenic microorganisms in the sputum, which is the main factor leading to AECOPD[13-16]. Consequently, clinical care focuses on promoting effective sputum drainage and keeping the airway open. The implementation of a comprehensive healthcare intervention model can significantly improve the treatment effect, reduce the burden of hospitalization, and improve patient satisfaction and medical quality. This integrated working model can be applied and implemented within a specific scope. In addition, refined nursing adheres to the concept of “accurate, meticulous, and strict” and improves the nursing process according to scientific procedural principles to ensure a high degree of consistency in nursing level. High-quality nursing care provides optimal hospitalization conditions for patients through environmental nursing, good nutrition, and psychological support, which are good foundations for disease rehabilitation. This research aimed to explore the effect of nursing strategies on patients with AECOPD and dysphagia. This will help in the provision of effective, comprehensive, and satisfactory nursing services. We intended to promote strategies for better recovery from the disease and provide a theoretical basis for nursing interventions in the treatment of AECOPD.

MATERIALS AND METHODS

Subjects

A total of 126 patients with AECOPD complicated with difficulty in expectoration were randomly divided into two groups: A refined care group ($n = 63$) and a routine care group ($n = 63$). The patients were included between April 2017 and May 2019 from a single institution. This research did not violate the requirements of relevant medical ethics. The inclusion criteria were as follows: (1) Diagnosed with AECOPD based on the guidelines of the Respiratory Branch of the Chinese Medical Association in 2002; (2) Age ranging from 19 to 79 years; (3) Hospitalized in the institution; and (4) Conscious and able to understand and talk normally. The exclusion criterion was the existence of known co-morbidities such as: (1) Pulmonary tuberculosis; (2) Lung tumor; (3) History of pulmonary surgery; (4) Pulmonary interstitial fibrosis, pneumoconiosis, and other lung diseases; and (5) Severe heart failure, acute myocardial infarction, and cerebrovascular disease.

Treatment methods

All patients received routine treatment after admission, such as oxygen inhalation and anti-infection, anti-spasm, and anti-asthma therapies. The ventilator was routinely connected, and the ventilation mode was adjusted according to the condition of the disease. The common ventilation mode was synchronous intermittent forced ventilation + pressure support ventilation + positive end-expiratory pressure ventilation. If necessary, dexmetopril was administered. Patients were treated with aerosol inhalation of terbutaline sulfate and budesonide suspension (4 mL each) three times a day.

Nursing methods

The routine care group received routine nursing care, and the changes in patients' vital signs were closely monitored. In addition, the patients were instructed to take medicine in accordance with the doctor's advice, to quit smoking and drinking, to pay attention to increasing or decreasing clothes worn according to the weather, and to keep the ward environment clean. Moreover, we evaluated, in real time, the progression of the disease, guided patients to expel sputum, monitored respiratory parameters, and adjusted ventilator settings according to specific conditions.

The refined nursing model was applied to the refined care group, and the interventions were as follows: (1) Environmental nursing: This included strict verification, management of the environment, and disinfection of the ward twice a day to prevent cross-infection. The ward was naturally ventilated for more than 30 min, at least twice a day. The ventilation system was then turned on, and the air was changed after natural ventilation. The number of visitors per day was limited, and the daily rest time was set for the patients; lunch break was at 13:00 and sleep was at 21:30 to 06:30 the next day. In addition, the volume of each monitor was reduced during sleep, oil was applied on doors, windows, bearings, and pusher rollers on time, and obstructions were cleaned to reduce noise. For people with sleep disorders, light music was played to help them sleep; (2) Psychological nursing: Patients often refuse to receive treatment because of negative feelings, such as fear and anxiety. The medical staff communicated carefully with the patients, tried to understand their needs, analyzed their psychological state, and explained the impact of negative emotions on their condition. The staff also explained to the patients the information related to their disease (causes, treatments, and preventive measures), as well as machine operation principles, operating procedures, *etc.* They addressed the patients' anxiety, fear, and other ill feelings, in order to improve patients' compliance. The medical staff discussed success stories of treatment in order to improve treatment confidence, to encourage patients' families, and to bring comfort to patients. This entailed listening more to patients' emotions and allaying their fears; (3) Respiratory tract management: Patients were kept in a sitting or semi-recumbent position in the course of nursing procedures to avoid dyspnea due to the atrophy of the respiratory mucosa and decline of respiratory function. Patients with respiratory diseases laid on their sides, and the oral and nasal mucous membranes were wiped with sterilized cotton swabs. For patients who had difficulty expectorating sputum, their head was placed down and back pats were applied. If necessary, atomized sputum suction was applied; (4) Nutrition nursing: This involved the creation of a nutrition nursing plan according to the specific conditions of patients. People with eating difficulties could use enteral nutrition with a nasal feeding tube to ensure adequate caloric intake. It also ensures appropriate increase in the intake of high-quality proteins such as chicken and pork lean meat and intake of more fresh fruits and vegetables to maintain a balanced diet; and (5) Nursing care after weaning: Patients were treated with lip-shrinking breathing to exercise their respiratory function and improve their vital capacity before discontinuing the machine. Patients were treated with routine oxygen therapy to detect blood oxygen saturation and arterial blood gas, and were made ready to get on the machine in time according to the patient's condition after discontinuing the machine.

Observation indexes and evaluation methods

The sputum excretion effect, negative pressure sputum suction rate, dyspnea score using the Medical Research Council (MRC) tool, blood gas parameters (PaO_2 and PaCO_2), and the quality of life were compared between the two groups after 7 d of intervention.

Expectoration effect was classified as significant, effective, or ineffective as follows: (1) Significant expectoration: The patient's sputum effect was significant, the lung sound disappeared, and the lung secretion was obviously less; (2) Effective expectoration: The patient had better sputum effect, auscultation lung sound decreased, and lung secretion decreased; and (3) Ineffective expectoration: Patients had sputum but it was not easy to expectorate, sputum effect was poor, auscultation lung sound increased, and lung secretion increased.

The quality of life was evaluated using the St. George's Respiratory Questionnaire (SGRQ), with 50 questions divided into three parts: (1) Symptoms; (2) Activities; and (3) Disease impact. The three parts were averagely divided into the SGRQ total score.

The MRC scale is divided into five levels (1–5 points)[17]. The higher the level, the more severe the dyspnea. The corresponding descriptions for each level is as follows: Level 1: No obvious difficulty in breathing except for strenuous exercise; level 2: Shortness of breath when walking fast or walking on a gentle slope; level 3: Walking slower than their peers due to breathing difficulties, or needing to stop breathing when walking at their own speed on flat ground; level 4: Needing to stop breathing after walking on flat ground for 100 m or a few minutes; and level 5: Obvious difficulty in breathing, unable to leave the room, or shortness of breath when wearing or taking off clothes. Blood samples were collected from the radial artery for blood gas analysis on the first day after admission (before treatment) and on the seventh day after intervention. PaO_2 and PaCO_2 were monitored using a Leidu ABL-800 blood gas analyzer.

Statistical analysis

SPSS 21.0 software was used for statistical analyses. The measured values of PaO₂ and PaCO₂ in the two groups are expressed as the mean \pm standard deviation (SD). The *t*-test was used for comparison between the two groups, and χ^2 test or Mann-Whitney *U* test was used to compare the counting data between groups. *P* < 0.05 indicated that the difference was statistically significant.

RESULTS

Patient demographics

The patients in the refined care group were 57–79 years old, with a mean age of 69.7 ± 6.3 years. The sex composition of the patients included 36 males and 27 females; the body mass index (BMI) was 22.9 ± 2.0 kg/m²; the course of COPD was 16.3 ± 4.0 years; PaO₂ level was 58.6 ± 5.0 mmHg; PaCO₂ level was 58.2 ± 6.1 mmHg; concomitant diseases included 29 cases of hypertension and 15 cases of diabetes; and two cases dropped out of the study. By contrast, patients in the routine care group were 60–79 years old, with an average age of 70.2 ± 5.5 years. The sex composition of the patients was 40 males and 20 females; the BMI was 23.1 ± 2.2 kg/m²; COPD course was 17.0 ± 4.9 years; PaO₂ level was 58.3 ± 5.7 mmHg; PaCO₂ level was 57.8 ± 5.0 mmHg; concomitant diseases included 32 cases of hypertension and 10 cases of diabetes; and four cases dropped out of the study. In summary, there was no significant difference in the baseline data between the two groups (*P* > 0.05).

Comparison of expectoration effect between the two groups of patients

In the refined care group (*n* = 61), 62.30% (38/61) had significant expectoration, compared with the routine care group (*n* = 59) at 44.07% (26/59), after 7 d of intervention. The refined care group showed better results than the routine care group (*P* = 0.038) (Table 1).

Comparison of sputum suction with negative pressure between the two groups

The rate of sputum suction was 22.95% (*n* = 14) in the refined care group and was lower than the rate of 44.07% (*n* = 26) in the routine care group; the difference was statistically significant (*P* = 0.014) (Table 2).

Arterial blood gas monitoring between the two groups

There was no significant difference in the PaO₂ and PaCO₂ values between the two groups before intervention. In addition, there was no significant difference in the values of PaO₂ and PaCO₂ between the two groups after 7 d of intervention (Table 3).

Comparison of MRC score between the two groups

There was no significant difference in the MRC scores between the two groups before intervention. However, the MRC score of the refined care group was lower than that of the routine care group after 7 d of intervention, but the difference was not statistically significant (*P* > 0.05) (Table 4).

Comparison of quality of life scores between the two groups

There was no significant difference in the symptoms, activities, disease impact, or total SGRQ scores between the two groups before the intervention. However, the symptoms, activities, and total SGRQ scores in the refined care group were higher than those in the routine care group after 7 d of intervention, but the difference was not statistically significant (*P* > 0.05) (Table 5).

DISCUSSION

In the course of treatment, in addition to strengthening the treatment and monitoring the disease, clinical medical staff should also carry out comprehensive intervention on the nutritional status and quality of life of patients because of the particularity of AECOPD[18]. Studies have described the use of synchronous health education for stroke patients through refined nursing strategies, which can effectively reduce the occurrence of depression and improve the patients' quality of life. In addition, studies have been conducted on the implementation of refined nursing strategies for patients

Table 1 Comparison of expectoration effect between two groups of patients, *n* (%)

Group	<i>n</i>	Obviously effective	Effective	Ineffective
Refined care	61	38 (62.3)	19 (31.15)	4 (6.56)
Control	59	26 (44.07)	25 (42.37)	8 (13.56)
<i>Z</i>		-2.080		
<i>P</i> value		0.038		

Table 2 Comparison of sputum suction with negative pressure between the two groups, *n* (%)

Group	<i>n</i>	Yes	No
Refined care	61	14 (22.95)	47 (77.05)
Control	59	26 (44.07)	33 (55.93)
χ^2		6.018	
<i>P</i> value		0.014	

Table 3 Arterial blood gas monitoring of two groups of patients (mean \pm SD)

Group	<i>n</i>	PaO ₂ (mmHg)		PaCO ₂ (mmHg)	
		Before intervention	After intervention	Before intervention	After intervention
Refined care	61	58.6 \pm 5.0	85.2 \pm 6.1 ¹	58.2 \pm 6.1	42.9 \pm 4.7 ¹
Control	59	58.3 \pm 5.7	83.4 \pm 6.8 ¹	57.8 \pm 5.0	44.7 \pm 6.0 ¹
<i>t</i>		0.307	1.527	0.392	-1.833
<i>P</i> value		0.760	0.129	0.696	0.069

¹Compared with this group before intervention, *P* < 0.05.**Table 4 Comparison of medical research council scores between the two groups (mean \pm SD)**

Group	<i>n</i>	MRC		<i>t</i>	<i>P</i> value
		Before intervention	After intervention		
Refined care	61	3.44 \pm 0.52	1.82 \pm 0.50	17.387	0.000
Control	59	3.58 \pm 0.60	2.10 \pm 0.55	14.072	0.000
<i>t</i>		-1.367	-2.920		
<i>P</i> value		0.174	0.004		

MRC: Medical Research Council.

with asthma to improve their knowledge of asthma and related treatment methods, as well as increase their cooperation with nursing interventions[19,20]. It has been observed that a sound nursing strategy is very important for improving the quality of clinical care. However, there are relatively few clinical reports on the implementation of refined nursing strategies for AECOPD patients in China.

In this research, we tried to observe the effect of a refined nursing strategy on patients' clinical symptoms and quality of life, combined with the factors affecting the effective expectoration of patients. As a result, the expectoration effect of the refined care group was better than that of the routine care group after 7 d of intervention. Refined nursing strategies encourage patients to overcome fear, pain, and other factors, enhance their confidence in spontaneous expectoration, guide them to fix thoracic surgical incisions with both hands, and guide breathing training to enhance

Table 5 Comparison of quality of life scores between the two groups (mean \pm SD)

Group		n	Symptom part		Active part	
			Before intervention	After intervention	Before intervention	After intervention
1	Refined care	61	51.4 ± 8.5	76.8 ± 9.0 ¹	44.2 ± 7.4	71.9 ± 5.5 ¹
	Control	59	49.2 ± 6.2	71.0 ± 7.4 ¹	45.8 ± 6.6	67.7 ± 7.8 ¹
	t		1.615	3.849	-1.249	3.418
	P value		0.109	0.000	0.214	0.001
2			Disease impact		SGRQ score	
			Before intervention	After intervention	Before intervention	After intervention
	Refined care	61	47.2 ± 6.1	78.5 ± 8.5 ¹	47.6 ± 6.2	75.7 ± 7.5 ¹
	Control	59	49.4 ± 6.6	75.8 ± 7.6 ¹	48.1 ± 6.8	71.5 ± 5.8 ¹
	t		-1.897	1.832	-0.421	3.424
	P value		0.060	0.069	0.674	0.001

¹Compared with this group before intervention, *P* < 0.05.

SGRQ: St. George's Respiratory questionnaire.

airway cilia clearance and promote sputum production. Moreover, sputum can also be excreted by proper chest percussion. Consequently, the viscous sputum stuck to the surface of the alveoli or near the bronchi can be removed.

The results showed that there was no significant difference in the measured values of PaO₂ and PaCO₂ between the two groups before and 7 d after the intervention. The two groups of medical and nursing approaches can improve the blood gas parameters of patients. Effective treatment reduces the secretion of respiratory allergic substances, reduces wheezing, and can improve inhalation of drugs in the lungs to act as expectorants. In addition, in the refined nursing strategy, the sputum on the airway mucosa is released and excreted by gentle chest percussion on the back of the patient, which can effectively reduce airway pressure, improve respiratory muscle strength, reduce CO₂ retention, and improve PaO₂ and PaCO₂ levels. The patients' understanding of ventilators improved, and the compliance of patients with treatment improved after careful nursing intervention.

The results showed that there was no significant difference in the MRC score between the two groups either before or after 7 d of intervention. Dyspnea is usually the main symptom of AECOPD and mainly manifests as airway mucosal inflammation and smooth muscle spasm. Atomization therapy dilates the airway in routine treatment, which can effectively relieve airway spasms and improve the breathing of patients. In AECOPD patients with bronchial mucous gland hyperplasia and airway secretion of a large amount of mucus, sputum easily blocks the airway. In addition, the drug can quickly reach the site of action and quickly take effect through aerosol inhalation. Refined nursing strategies and routine treatments have synergistic effects. Patients can be placed in a more comfortable environment, with full confidence in the treatment of diseases and increased compliance through psychological and environmental management. The application of respiratory tract management can significantly improve the oxygenation of patients, coupled with aerosol inhalation and other measures, to reduce sputum, effectively drain sputum from the depths of the airway, and obtain optimal results efficiently.

AECOPD is mainly caused by infection, and its etiology is not affected by individual factors. Pathological changes include degeneration, necrosis, ulcer formation in bronchial mucosal epithelial cells, and increased mucous secretions. Patients often experience dyspnea, cough, and increased sputum. Drug treatment and effective nursing measures can improve patient prognosis. There was no significant difference in the symptoms, disease impact, activities, or SGRQ total scores between the two groups before the intervention. In addition, the score of the refined care group was higher than that of the routine care group after 1 wk of intervention, but the difference was not significant. The implementation of a refined nursing strategy of moderate respiratory function exercise can significantly reduce the incidence of dyspnea, improve exercise endurance, enhance physique, and improve quality of life. Exercise compliance is relatively low because most AECOPD patients do not fully understand

the positive effects of respiratory exercise on disease rehabilitation. In the refined nursing strategy, appropriate psychological education should be carried out before respiratory function exercises to enhance patients' understanding of the importance of exercise.

In AECOPD, the airway mucus is increased and thickened, ciliary movement is blocked, and sputum is not easily excreted. Promoting effective sputum drainage in patients with AECOPD is an important way to improve symptoms and the quality of life. Effective nursing strategies affect the recovery of patients after treatment implementation. There are few domestic clinical reports on the implementation of refined nursing strategies for patients with AECOPD. The results of this study show that refined nursing can effectively promote expectoration and improve clinical symptoms and quality of life through the implementation of different nursing methods for patients with AECOPD complicated with difficulty in expectoration, which is of significance in clinical treatment in the future.

CONCLUSION

Generally, refined nursing strategies for AECOPD patients with difficulty expectorating have a positive impact in promoting expectoration and improving the clinical symptoms and quality of life.

ARTICLE HIGHLIGHTS

Research background

Under physiological conditions, sputum produced during acute exacerbation of chronic obstructive pulmonary disease (AECOPD) can move passively with the cilia in the airway, is gradually excreted from the depth of the airway, and is coughed out of the body by stimulating the sensory nerve on the surface of the airway to cough. However, when sputum is thick, cough is weak, or trachea cilia are abnormal, sputum accumulation may occur and affect the exchange of oxygen and carbon dioxide in the lung. Furthermore, because sputum contains a variety of pathogenic microorganisms, it can cause or aggravate the symptoms of pulmonary infection in patients, which is the main factor leading to AECOPD.

Research motivation

Promoting effective drainage of sputum and maintaining airway opening are the key points of clinical attention. It is of great significance to the health of AECOPD patients.

Research objectives

To explore the effect of refined nursing strategies on patients AECOPD and dysphagia.

Research methods

A total of 126 patients with AECOPD and difficulty expectoration at our hospital were selected as the research subjects. They were divided them into either a refined care group or a routine care group with 63 cases each by using a random number table. The two groups of patients were treated with expectorant, anti-infection, oxygen inhalation, and other basic treatments measures. Patients in the study group were given refined nursing intervention during hospitalization, and the control group was given conventional nursing intervention. The differences in sputum expectoration, negative pressure suction rate, blood gas parameters, dyspnea score [medical research council (MRC)], and quality of life were compared between the two groups.

Research results

After 7 d of intervention, the sputum expectoration effect of the refined care group was 62.30%, the effective rate was 31.15%, and the inefficiency rate was 6.56%. The sputum expectoration effect of the control group was 44.07%, the effective rate was 42.37%, and the inefficiency rate was 13.56%. The negative pressure suction rate of 22.95% of the patients in the refined care group was lower than the 44.07% of the control group during the treatment, and the difference was statistically significant ($P < 0.05$). Before the intervention, the PaO_2 and PaCO_2 values of the two groups were not significantly different ($P > 0.05$); the PaO_2 and PaCO_2 values of patients in the refined care group

were comparable to those of the control group after 7 d of intervention ($P > 0.05$). Before the intervention, there was no significant difference in MRC score between the two groups ($P > 0.05$); the MRC score of the refined care group was lower than that of the control group after 7 d of intervention, but the difference was not statistically significant ($P > 0.05$). Before intervention, there was no significant difference in the symptoms, activities, disease impact, or St. George's Respiratory questionnaire (SGRQ) total scores between the two groups ($P > 0.05$); after the intervention for 7 d, the symptoms, activities, and total scores of SGRQ were higher in the refined care group than in the control group, but the difference was not statistically significant ($P > 0.05$).

Research conclusions

When the sputum is thick, cough is weak, or trachea cilia function is abnormal in AECOPD patients, sputum accumulation may occur and affect the exchange of oxygen and carbon dioxide in the lung. Patients with AECOPD who have difficulty expectorating sputum to adopt refined nursing strategies have a positive effect in promoting expectoration and improving clinical symptoms and quality of life.

Research perspectives

Refined nursing strategies for AECOPD patients with difficulty expectorating play a positive role in promoting expectoration and improving clinical symptoms and quality of life.

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