Int J Clin Exp Med 2019;12(6):7673-7682
www.ijcem.com /ISSN:1940-5901/IJCEM0093049

Original Article

Improved respiratory function of patients with chronic obstructive pneumonia complicated with respiratory failure by comprehensive nursing intervention

Ning Zhang

Intensive Care Unit, Shandong Provincial Third Hospital, Jinan, Shandong, China

Received February 26, 2019; Accepted April 10, 2019; Epub June 15, 2019; Published June 30, 2019

Abstract: Purpose: To explore the improvement of respiratory function and nursing satisfaction of patients with chronic obstructive pneumonia complicated with respiratory failure by comprehensive nursing intervention. Methods: 82 patients with chronic obstructive pneumonia and respiratory failure who were treated in Shandong Provincial Third Hospital from December 2016 to September 2017 were selected. All patients were treated with the same treatment plan and divided into the observation group and the control group according to the nursing plan. The control group received routine nursing, and the observation group received comprehensive nursing intervention. The changes in blood gas and related lung function indexes before and 1 day after intervention and 7 days after intervention were compared between the two groups. The nursing effect and satisfaction of patients in the observation group and the control group were statistically analyzed. Results: The temperature recovery time, duration of lung rumbling, duration of breathlessness, and hospitalization time in the observation group were significantly less than in the control group ($P<0.001$). The value of pH, PaO_2 and SaO_2 showed a gradual upward trend from before intervention to 7 days after intervention. $PaCO_2$ showed a downward trend from before intervention to 7 days after intervention. Moreover, the improvement of each blood gas index of the observation group was significantly better than that of the control group after 7 days of intervention ($P<0.05$). The MVV, FEV1 and FEV1% of the observation group and the control group showed a gradual upward trend from before intervention to 7 days after intervention. The MVV, FEV1 and FEV1% of the observation group were higher than those of the control group after intervention ($P<0.05$). The total nursing efficiency and overall nursing satisfaction of patients in the observation group were significantly higher than those in the control group ($P<0.05$). Conclusion: Comprehensive nursing intervention can effectively improve the respiratory function of patients, shorten the time of remission of clinical symptoms, and improve the nursing satisfaction of patients with chronic obstructive pneumonia combined with respiratory failure, which is worth promoting in clinical practice.

Keywords: Comprehensive nursing intervention, chronic obstructive pneumonia, respiratory failure, respiratory function, nursing satisfaction

Introduction

Chronic obstructive pulmonary disease, also known as COPD, is a devastating chronic respiratory disease [1, 2]. With continuous development and progress in society, the incidence of chronic obstructive pulmonary disease complicated with respiratory failure is steadily rising in recent years due to the unhealthy lifestyle and environmental changes [3-5]. Hypoxemia, hypoxia, carbon dioxide retention and hypercapnia are all caused by airflow limitation in patients with COPD complicated with respiratory failure, resulting in pulmonary ventilation or ventilation dysfunction. These severe clinical symptoms threaten the safety and quality of life of patients [6-8]. A large number of related reports show that intervention with effective and reasonable nursing can significantly improve quality of life of patients with COPD and respiratory failure, and promote the recovery of respiratory system-related functions in patients with COPD and respiratory failure [9, 10].

Therefore, in this study, we analyzed the effect of comprehensive nursing intervention on the improvement of respiratory function in patients with COPD combined with respiratory failure by

monitoring the changes of blood gas index and pulmonary function related indexes in both groups.

Materials and methods

Clinical data

82 patients with chronic obstructive pneumonia and respiratory failure who were treated in Shandong Provincial Third Hospital from December 2016 to September 2017 were selected. All patients were treated with the same treatment plan and divided into the observation group and the control group according to the nursing plan. The control group received routine nursing, and the observation group received comprehensive nursing intervention. Inclusion and exclusion criteria: (1) All patients with chronic obstructive pneumonia combined with respiratory failure admitted to Shandong Provincial Third Hospital were diagnosed according to the diagnostic criteria of chronic obstructive pneumonia combined with respiratory failure formulated by the World Health Organization. (2) Patients with unconsciousness, shock, or mental dysfunction were excluded. Patients with respiratory failure caused by other diseases were also excluded. Before the study was officially launched, patients and their families were informed in advance and signed informed consent. This study has been approved by the Ethics Committee of Shandong Provincial Third Hospital.

Nursing methods

Patients in the control group received routine nursing such as catheter nursing, airway nursing, ventilator mask nursing, mental health education nursing, diet nursing, etc. The observation group received comprehensive nursing intervention on the basis of the routine nursing received by the control group. (1) Admission guidance: Relevant medical staff patiently and carefully explain the precautions concerning treatment and nursing methods of COPD complicated with respiratory failure to patients and their families, so that patients can fully understand the importance of reasonable treatment and nursing intervention, and actively cooperate with the treatment. (2) Postural nursing: the relevant medical staff must correctly adjust the postural position of patients in strict accordance with the doctor's instructions. Be careful to ensure that extension and flexion of limb of the patient remain in a moderate range, guide and assist the patient in performing passive movements of the limb. Avoid situations where the patient's limbs are stressed, and turn patient over once every 2 hours, effectively improving patient comfort. (3) Nursing of tracheal intubation: In order to avoid gas leakage and damage to the patient's airway mucosa due to excessive pressure of the airbag, the relevant medical staff should pay close attention to the fluctuations of the patient's thorax at all times. Always ensure that the pressure of the airbag is within the proper range, accurately intubate the trachea to a suitable position, and take care to properly fix the catheter. In order to avoid the occurrence of pulmonary atelectasis in patients, the relevant health care staff shall timely dilute the sputum in the airway by humidifying the airway. (4) Sputum aspiration nursing: Relevant medical personnel must strictly carry out hand hygiene measures and comply with technical requirements of sterile operation when conducting endotracheal tube sputum aspiration. In order to alleviate or avoid the patient's airway mucosa injury during the operation, the action must be gentle to improve patients' comfort during the operation. In order to avoid hypoxia or asphyxia in patients, pure oxygen ventilation is required before and after sputum aspiration. (5) Psychological care: the relevant medical staff should be patient and explain the occurrence, development and treatment of chronic obstructive pneumonia complicated with respiratory failure. When the patients have severe negative emotions, the relevant medical staff should take the initiative to relieve patients' negative emotions. In order to help patients to build confidence, it is appropriate to analyze several successful treatment cases in front of patients, so that patients can overcome psychological barriers and face treatment with a positive attitude. Both groups were intervened as described and followed for 1 month.

Outcome measures

The changes of blood gas and related lung function indexes before, 1 day and 7 days after intervention were monitored between the two groups.

Satisfaction is evaluated according to the self-made questionnaire by the hospital. 80~100 points is very satisfied, 60-80 points is satis-

Table 1. General baseline data of patients in both groups [n (%)]

Group	Observation group (n=41)	Control group (n=41)	t/X^2	*P*
Gender			0.201	0.654
Male	18 (43.90)	16 (39.02)		
Female	23 (56.10)	25 (60.98)		
Age (years)	71.05±5.49	72.86±6.35	1.381	0.171
BMI (Kg/m^2)	20.17±1.23	20.45±1.08	1.095	0.277
Smoking status			0.210	0.647
Yes	27 (65.85)	25 (60.98)		
No	14 (34.15)	16 (39.02)		
Living environment			0.060	0.806
City	30 (73.17)	29 (70.73)		
Outskirts	11 (26.83)	12 (29.27)		
Routine blood				
Hb (gm/dl)	9.48±2.05	11.37±3.21	3.177	<0.05
RBC (×10^{12}/L)	4.69±0.83	5.07±0.38	2.665	<0.05
PLT (×10^9/)	156.18±30.29	143.63±29.03	1.915	0.059
Liver function				
ALT (U/L)	22.89±10.54	23.48±9.32	0.269	0.789
AST (U/L)	18.96±8.52	17.29±6.77	0.983	0.329
Renal function				
TP (g/L)	125.56±14.36	78.17±12.49	15.940	<0.001
UREA (mmol/L)	8.16±1.43	4.47±1.89	9.969	<0.001
CRE (μmol/L)	178.33±30.72	100.25±20.37	13.560	<0.001
UA (μmol/L)	603.58±40.29	367.69±50.20	23.47	<0.001

fied, and 60 points or less is not satisfied. The nursing effects were analyzed taking into account the following indexes, such as blood gas related indexes including pH, partial pressures of oxygen (PaO_2), which is the percentage of available binding sites on hemoglobin that are bound with oxygen in arterial blood; arterial oxygen saturation (SaO_2), which is a measurement of the percentage of how much hemoglobin is saturated with oxygen; arterial blood carbon dioxide partial pressure ($PaCO_2$), which is a test that measures the movement of CO_2 from the lungs to the blood. Pulmonary function related indexes include maximal voluntary ventilation (MVV) which is a measure of the maximum amount of air that can be inhaled and exhaled within one minute; forced expiratory volume in the first second (FEV1) which is the volume exhaled during the first second of a forced expiratory maneuver started from the level of total lung capacity; forced expiratory volume in one second and forced vital capacity ratio (FEV1%) which is the ability of the forced expiratory volume for 1 second, expressed as a percentage of the forced vital capacity.

Efficacy evaluation criteria

Markedly effective means that the physiological test indexes of the patients after nursing are within the normal range, the breathing is smooth, and the clinical symptoms are basically normal, and no serious complications occur. Effective means that all the physiological indicators of the patients were stable, the breathing was basically normal, and the clinical symptoms were better than before. Ineffective means that the clinical symptoms and signs have not changed before and after the patient's nursing intervention, and even the disease is aggravated.

Statistical methods

SPSS19.0 (Beijing boyizhixun information technology co., LTD.) software system was used for statistical analysis, and count data are represented by [n (%)], and were tested by x^2. Measurement data are expressed as (x±s), and the t-value test was used to compare the data between the two groups. When the *P* value was <0.05, the difference was statistically significant.

Results

Baseline data

There were 18 males and 23 females in the observation group, with an age range of (55-86) years and an average age of (71.05±5.49) years. There were 16 males and 25 females in the control group, with an age range of (59-88) years and an average age of (72.86±6.35) years. There was no significant difference in the baseline data (P>0.05), and the two groups were comparable (**Table 1**).

Comprehensive nursing improves clinical symptoms

The results of comparison between the two groups showed that the temperature recovery

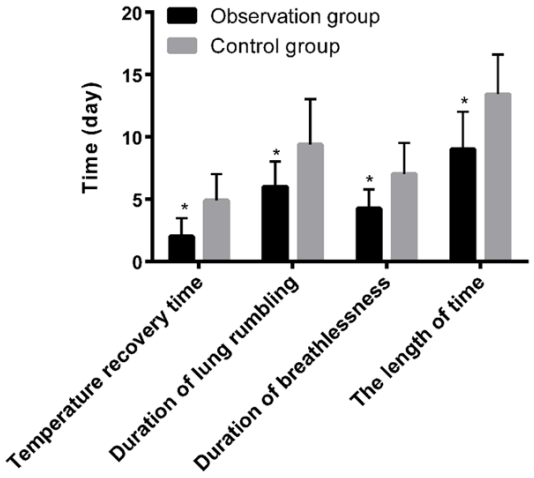

Figure 1. Clinical symptoms of the observation group and the control group. The recovery time of the body temperature, the disappearance time of the lung rale, the disappearance time of the asthma and the hospitalization time in the observation group were significantly less than in the control group. The difference was statistically significant (P<0.001). Note: *indicated a statistically significant difference from the control group (P<0.001).

time, duration of lung rumbling, breathlessness, and hospitalization time of the observation group were significantly lower than those of the control group (P<0.001). Based on the above results, we speculated that the comprehensive nursing intervention was more effective in improving the clinical symptoms of patients with chronic obstructive pneumonia combined with respiratory failure (**Figure 1**, **Table 2**).

Comprehensive nursing improves acid-base balance

The intra-group comparison showed that the pH values of the two groups showed a gradual upward trend from before intervention to 7 days after intervention, and the difference between several different time points was statistically significant (P<0.001). There was no significant difference in pH between the two groups before intervention (P>0.05). The pH value of the observation group 1 day and 7 days after intervention was significantly higher than those of the control group (P<0.001). Based on the above results, we speculated that the comprehensive nursing intervention was more effective in improving the acid-base balance of the internal environment of patients with chronic obstructive pneumonia complicated with respiratory failure (**Table 3**).

Comprehensive nursing regulates PaO_2

The intra-group comparison showed that PaO_2 in both groups showed a gradual upward trend from before intervention to 7 days after intervention, and the difference of PaO_2 between several different time points was statistically significant (P<0.001). Compared with other time points, PaO_2 before intervention in the control group showed statistically significant differences (P<0.05). The difference of PaO_2 between the two groups before intervention was not statistically different (P>0.05). PaO_2 of the observation group 1 day and 7 days after intervention was significantly higher than those of the control group (P<0.001). Based on the above results, we speculated that comprehensive nursing intervention was more effective in regulating PaO_2 in patients with chronic obstructive pneumonia complicated with respiratory failure (**Table 4**).

Comprehensive nursing regulates SaO_2

The intra-group comparison showed that SaO_2 in both groups showed a gradual upward trend from before intervention to 7 days after intervention, and the difference of SaO_2 between several different time points was statistically significant (P<0.001). Compared with other time points, SaO_2 before intervention in the control group showed statistically significant differences (P<0.05). The difference of SaO_2 between the two groups before intervention was not statistically different (P>0.05). The SaO_2 of the observation group 1 day and 7 days after intervention was significantly higher than those of the control group (P<0.001). Based on the above results, we speculated that comprehensive nursing intervention was more effective in regulating SaO_2 in patients with chronic obstructive pneumonia complicated with respiratory failure (**Table 5**).

Comprehensive nursing regulates $PaCO_2$

The intra-group comparison showed that $PaCO_2$ in both groups showed a gradual downward trend from before intervention to 7 days after intervention, and the difference of $PaCO_2$ between several different time points was statistically significant (P<0.001). The difference of $PaCO_2$ between the two groups before intervention was not statistically different (P>0.05). $PaCO_2$ of the observation group 1 day and 7

Table 2. Comparison of clinical symptoms between the observation group and the control group ($\bar{x}$ ± s, d)

Group	Observation group (n=41)	Control group (n=41)	t	*P*
Temperature recovery time	2.01±1.46	4.90±2.11	7.212	<0.001
Duration of lung rumbling	6.01±2.02	9.40±3.64	5.214	<0.001
Duration of breathlessness	4.25±1.53	7.03±2.47	6.127	<0.001
Length of time	9.01±3.02	13.45±3.16	6.504	<0.001

Table 3. Changes of pH value before and after nursing intervention in the two groups

Group	Observation group (n=41)	Control group (n=41)	t	*P*
Before the intervention	7.02±0.03*	7.03±0.02*	1.776	0.080
Intervention after 1 day	7.43±0.02*,#	7.21±0.04*	27.200	<0.001
Intervention after 7 days	7.84±0.04*,#	7.44±0.03*	51.230	<0.001
F	7130.000	1791.000		
P	<0.001	<0.001		

Note: *indicates that the difference with other time points in the group has statistical significance (P<0.05); #indicates that the difference was statistically significant (P<0.05).

Table 4. Changes of PaO_2 (mmHg) before and after nursing intervention in the two groups

Group	Observation group (n=41)	Control group (n=41)	t	*P*
Before the intervention	50.14±9.33*	51.26±10.27@	0.517	0.607
Intervention after 1 d	67.24±9.86*,#	56.25±10.45	4.898	<0.001
Intervention after 7 d	73.05±7.14*,#	59.26±9.66	7.351	<0.001
F	74.160	6.520		
P	<0.001	<0.05		

Note: *indicates that the difference with other time points in the group has statistical significance (P<0.05); @indicates that the difference with other time points in the group is statistically significant (P<0.05); #indicates that the difference was statistically significant (P<0.05).

Table 5. Changes of SaO_2(%) before and after nursing intervention in the two groups

Group	Observation group (n=41)	Control group (n=41)	t	*P*
Before the intervention	83.20±6.45*	84.66±7.56	0.941	0.350
Intervention after 1 d	89.57±8.09*,#	85.39±7.48	2.429	0.017
Intervention after 7 d	95.77±7.26*,#	88.65±6.41@	4.707	<0.001
F	30.410	3.600		
P	<0.001	0.030		

Note: *indicates that the difference with other time points in the group has statistical significance (P<0.05); @indicated that the difference was statistically significant compared with SaO2 before intervention in the group (P<0.05). #indicates that the difference was statistically significant (P<0.05).

days after intervention was significantly higher than those of the control group (P<0.001). Based on the above results, we speculated that comprehensive nursing intervention was more effective in regulating $PaCO_2$ in patients with chronic obstructive pneumonia complicated with respiratory failure (**Table 6**).

Comprehensive nursing regulates MVV

The intra-group comparison showed that MVV in both groups showed a gradual upward trend from before intervention to 7 days after intervention, and the difference of MVV between several different time points was statistically significant (P<0.001). The intra-group comparison showed that there was no significant difference in MVV between the two groups before intervention (P> 0.05). MVV of the observation group 1 day and 7 days after intervention was significantly higher than those of the control group (P<0.05). Based on the above results, we speculated that comprehensive nursing intervention was more effective in regulating MVV in patients with chronic obstructive pneumonia complicated with respiratory failure (**Table 7**).

Comprehensive nursing regulates FEV1

The intra-group comparison showed that FEV1 in both groups showed a gradual upward trend from before intervention to 7 days after intervention, and the difference of FEV1 between several different time points was statistically significant (P<0.001). There was no significant difference in the FEV1 values between the two groups before intervention (P>0.05). However, FEV1 values of the observation group were significantly higher th-

Table 6. Changes of $PaCO_2$ (mmHg) before and after nursing intervention in the two groups

Group	Observation group (n=41)	Control group (n=41)	t	*P*
Before the intervention	70.01±10.25*	71.26±9.27*	0.579	0.564
Intervention after 1 d	59.37±9.55*,#	66.48±8.56*	3.550	<0.001
Intervention after 7 d	48.26±6.56*,#	59.63±7.12*	7.520	<0.001
F	60.800	20.020		
P	<0.001	<0.001		

Note: *indicates that the difference with other time points in the group has statistical significance (P<0.05); #indicates that the difference was statistically significant (P<0.001).

Table 7. Changes of MVV (L) before and after nursing intervention in the two groups

Group	Observation group (n=41)	Control group (n=41)	t	*P*
Before the intervention	70.24±9.08*	71.56±9.58*	0.640	0.524
Intervention after 1 d	81.46±7.45*,#	76.23±8.29*	3.005	0.004
Intervention after 7 d	97.01±10.25*,#	87.26±10.56*	4.242	<0.001
F	91.470	29.390		
P	<0.001	<0.001		

Note: *indicates that the difference with other time points in the group has statistical significance (P<0.05); #indicates that the difference was statistically significant (P<0.05).

Table 8. Changes of FEV1 (L) before and after nursing intervention in the two groups

Group	Observation group (n=41)	Control group (n=41)	t	*P*
Before the intervention	0.98±0.05*	0.97±0.05	0.905	0.368
Intervention after 1 d	1.36±0.13*,#	0.99±0.06	16.55	<0.001
Intervention after 7 d	1.67±0.24*,#	1.01±0.12	12.67	<0.001
F	190.800	2.400		
P	<0.001	0.100		

Note: *indicates that the difference with other time points in the group has statistical significance (P<0.05); #indicates that the difference was statistically significant (P<0.05).

Table 9. Changes of FEV1% in the two groups before and after nursing intervention

Group	Observation group (n=41)	Control group (n=41)	t	*P*
Before the intervention	46.20±12.01@	47.34±11.39	0.441	0.660
Intervention after 1 d	50.36±12.47	48.15±13.05	0.784	0.435
Intervention after 7 d	56.14±13.05#	49.02±12.67	2.507	0.014
F	6.521	0.189		
P	0.002	0.828		

Note: @indicates that the difference with other time points in the group has statistical significance (P<0.05); #indicates that the difference was statistically significant (P<0.05).

an those of the control group 1 day and 7 days after intervention (P<0.001). Based on the above results, we speculated that comprehensive nursing intervention was more effective in regulating FEV1 in patients with chronic obstructive pneumonia complicated with respiratory failure (**Table 8**).

Comprehensive nursing regulates FEV1%

The intra-group comparison showed that the difference of FEV1% between the two groups before intervention was not statistically significant (P>0.05). The FEV1% value of the observation group after 7 days of intervention was significantly higher than that of the control group (P<0.05). Based on the above results, we speculated that comprehensive nursing intervention was more effective in regulating FEV1% in patients with chronic obstructive pneumonia complicated with respiratory failure (**Table 9**).

Comprehensive nursing improves nursing satisfaction

The total effective rate of nursing in the observation group was significantly higher than that in the control group, and the overall nursing satisfaction of the observation group was significantly higher than that of the control group (P<0.05). Based on the above results, we speculated that comprehensive nursing intervention was more effective and more acceptable for patients with chronic obstructive pneumonia complicated with respiratory failure. (**Tables 10** and **11**).

Discussion

Chronic obstructive pulmonary disease (COPD) shows high mo-

Table 10. Comparison of nursing effect between the two groups [n (%)]

Group	Excellent	Effective	Invalid	Total effective
Observation group (n=41)	21 (51.22)	18 (43.90)	2 (4.88)	39 (95.12)
Control group (n=41)	16 (39.02)	14 (34.15)	11 (26.83)	30 (73.17)
X^2	1.231	0.820	7.405	7.405
P	0.267	0.365	0.007	0.007

Table 11. Comparison of nursing satisfaction between the two groups [n (%)]

Group	Very satisfied	Satisfied	Not satisfied	Total satisfaction
Observation group (n=41)	30 (73.17)	11 (26.83)	0 (0.00)	41 (100.00)
Control group (n=41)	17 (41.46)	18 (43.90)	6 (14.63)	35 (85.37)
X^2	8.424	2.614	6.474	6.474
P	0.004	0.106	0.011	0.011

rbidity. If the patient's condition cannot be timely and effectively controlled and treated, the patient's condition will develop to the stage of respiratory failure and endanger the patient's life [11, 12]. A large number of clinical surveys indicate that patients with chronic obstructive pneumonia combined with respiratory failure generally have respiratory dysfunction or abnormal phenomena [13]. Among them, the abnormal status of related indicators such as respiratory mechanics, lung function and blood gas of patients are important indicators of respiratory dysfunction [14-16]. Related reports show that when the condition of patients with chronic obstructive pneumonia develops to the stage of respiratory failure, it will further affect the abnormal state of pulmonary function of patients [17]. In the process of respiratory failure, the abnormal fluctuation of oxygen metabolism in the blood of patients with chronic obstructive pneumonia is caused by the damage of ventilation function, and the fluctuation of oxygen metabolism in the blood of patients will lead to further deterioration of blood gas indexes [18, 19]. When patients' respiratory function and oxygen supply are adversely affected, only reasonable treatment and nursing methods can be adopted as soon as possible to effectively reverse hypoxia in patients with chronic obstructive pneumonia and respiratory failure. Only effective reversal of respiratory failure can effectively improve the condition of patients [20]. Therefore, in this study, we analyzed the effect of comprehensive nursing intervention on the improvement of respiratory function in patients with chronic obstructive pneumonia combined with respiratory failure by monitoring the changes of blood gas index and pulmonary function as related indicators in the two groups.

In this study, there was no significant difference in the baseline data (P> 0.05), and the two groups were comparable. We compared the clinical symptoms of the observation group and the control group after nursing intervention and found that patients with comprehensive nursing intervention had significantly less temperature recovery time, duration of lung rumbling, duration of breathlessness, and hospitalization time than those of patients with conventional nursing. The differences were statistically significant. Studies have shown that patients with chronic obstructive pneumonia combined with respiratory failure are susceptible to clinical symptoms such as lung rumbling and breathlessness. Therefore, in addition to related ventilation treatment, reasonable nursing intervention is very important [21, 22]. We believe that comprehensive nursing intervention can promote the recovery of patients with COPD complicated with respiratory failure, shorten hospitalization time of patients, and improve the clinical symptoms such as lung rumbling and breathlessness. Then, by monitoring the changes of blood gas indices and lung function index before and after the nursing intervention of the two groups of patients, we found that the improvement of respiratory function was significantly different between the two groups. The results of this study suggested that the differences in the blood gas related indicators of pH, PaO_2, SaO_2 and $PaCO_2$ between the two groups before the intervention were not statistically significant, while pH, PaO_2 and SaO_2 showed a gradual upward trend from before intervention to 7 days after intervention, and $PaCO_2$ showed a gradual downward trend from before intervention to 7 days after intervention. Moreover, the improvement of each blood gas index of the observation group 7 days after intervention

was significantly better than that of the control group, and the difference was statistically significant. Research shows that pH, PaO_2, SaO_2 and $PaCO_2$ are often used as blood gas monitoring indicators because they are easily affected by respiratory and metabolic factors [23]. Proper regulation of pH, PaO_2, SaO_2 and $PaCO_2$ values is of great significance for improving the pH balance and respiratory function in the patient's internal environment [24]. Therefore, we speculated that the comprehensive nursing intervention was more effective in improving the acid-basic balance and respiratory order in the internal environment of patients with chronic obstructive pneumonia combined with respiratory failure. By monitoring the pulmonary function of patients in the two groups, it can be found that MVV, FEV1 and FEV1% of patients in the observation group and the control group showed a gradual upward trend from before intervention to 7 days after intervention, while MVV, FEV1 and FEV1% of patients in the observation group were higher than those in the control group after the intervention. Related studies have shown that MVV reduction is associated with pulmonary dysfunction such as respiratory insufficiency, and airway obstruction [25, 26]. The ratio of FEV1/forced vital capacity (FVC), FEV1% is a commonly used indicator of pulmonary function monitoring in clinical practice. The FEV1% of obstructive or mixed pneumonia would be significantly lower than the normal level of 83% [27].

According to relevant references and the above research results, we believe that the comprehensive nursing intervention is more effective in improving the respiratory function of patients with chronic obstructive pneumonia combined with respiratory failure. Finally, based on the follow-up results, we found that the total nursing efficiency of care and the overall nursing satisfaction of patients in the observation group were significantly higher than the control group, with statistically significant differences. Based on the above results, we believe that the comprehensive nursing intervention can improve the respiratory function of patients with chronic obstructive pneumonia combined with respiratory failure. The nursing effect was more obvious, and the patients' acceptability was also higher.

In this study, the number of people included is too small to be considered as a big data statistic, which may lead to the contingency of statistical results. For this problem, we will continuously increase the number of subjects in the later period to constantly improve the study.

In summary, reasonable comprehensive nursing intervention can effectively improve respiratory function and the treatment efficiency of patients with chronic obstructive pneumonia combined with respiratory failure. And the patient's acceptance of comprehensive nursing intervention is extremely high, which is worthy of clinical promotion.

Disclosure of conflict of interest

None.

Address correspondence to: Ning Zhang, Intensive Care Unit, Shandong Provincial Third Hospital, No.12, Wuyingshan Middile Road, Jinan 250000, Shandong, China. Tel: +86-0531-85953277; E-mail: ningzhangyx@163.com

References

[1] McCarthy B, Casey D, Devane D, Murphy K, Murphy E and Lacasse Y. Pulmonary rehabilitation for chronic obstructive pulmonary disease. Cochrane Database Syst Rev 2015; CD003793.

[2] Pascoe S, Locantore N, Dransfield MT, Barnes NC and Pavord ID. Blood eosinophil counts, exacerbations, and response to the addition of inhaled fluticasone furoate to vilanterol in patients with chronic obstructive pulmonary disease: a secondary analysis of data from two parallel randomised controlled trials. Lancet Respir Med 2015; 3: 435-442.

[3] To T, Zhu J, Larsen K, Simatovic J, Feldman L, Ryckman K, Gershon A, Lougheed MD, Licskai C and Chen H. Progression from asthma to chronic obstructive pulmonary disease. Is air pollution a risk factor? Am J Respir Crit Care Med 2016; 194: 429-438.

[4] Celli BR, Decramer M, Wedzicha JA, Wilson KC, Agustí A, Criner GJ, MacNee W, Make BJ, Rennard SI and Stockley RA. An official American thoracic society/European respiratory society statement: research questions in chronic obstructive pulmonary disease. Am J Respir Crit Care Med 2015; 191: e4-e27.

[5] Chen W, Thomas J, Sadatsafavi M and FitzGerald JM. Risk of cardiovascular comorbidity in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. Lancet Respir Med 2015; 3: 631-639.

[6] Dreher M, Neuzeret PC, Windisch W, Busam D, Hoheisel G, Gröschel A, Woehrle H, Grund K,

Graml A and Köhnlein T. Prevalence of stable hypercapnic chronic obstructive pulmonary disease (COPD)-preliminary data from the homevent registry. In: editors. B40. CLINICAL ISSUES IN COPD I. American Thoracic Society 2018; 3265-3265.

[7] Saglam M, Vardar-Yagli N, Savci S, Inal-Ince D, Calik-Kutukcu E, Arikan H and Coplu L. Functional capacity, physical activity, and quality of life in hypoxemic patients with chronic obstructive pulmonary disease. Int J Chron Obstruct Pulmon Dis 2015; 10: 423.

[8] Hartley RA, Barker BL, Newby C, Pakkal M, Baldi S, Kajekar R, Kay R, Laurencin M, Marshall RP and Sousa AR. Relationship between lung function and quantitative computed tomographic parameters of airway remodeling, air trapping, and emphysema in patients with asthma and chronic obstructive pulmonary disease: a single-center study. J Allergy Clin Immunol 2016; 137: 1413-1422.

[9] Kruis AL, Boland MR, Assendelft WJ, Gussekloo J, Tsiachristas A, Stijnen T, Blom C, Sont JK, Rutten-van Mölken MP and Chavannes NH. Effectiveness of integrated disease management for primary care chronic obstructive pulmonary disease patients: results of cluster randomised trial. BMJ 2014; 349: g5392.

[10] Siouta N, van Beek K, Preston N, Hasselaar J, Hughes S, Payne S, Garralda E, Centeno C, van der Eerden M and Groot M. Towards integration of palliative care in patients with chronic heart failure and chronic obstructive pulmonary disease: a systematic literature review of European guidelines and pathways. BMC Palliat Care 2016; 15: 18.

[11] Miravitlles M, Soler-Cataluña J, Calle M, Molina J, Almagro P, Quintano J, Trigueros J, Cosio BG, Casanova C and Antonio JR. Spanish guidelines for management of chronic obstructive pulmonary disease (GesEPOC) 2017. Pharmacological treatment of stable phase. Arch Bronconeumol 2017; 53: 324-335.

[12] Vogelmeier CF, Criner GJ, Martinez FJ, Anzueto A, Barnes PJ, Bourbeau J, Celli BR, Chen R, Decramer M and Fabbri LM. Global strategy for the diagnosis, management, and prevention of chronic obstructive lung disease 2017 report. GOLD executive summary. Am J Respir Crit Care Med 2017; 195: 557-582.

[13] Malhotra A, Schwartz AR, Schneider H, Owens RL, DeYoung P, Han MK, Wedzicha JA, Hansel NN, Zeidler MR and Wilson KC. Research priorities in pathophysiology for sleep-disordered breathing in patients with chronic obstructive pulmonary disease. An official American thoracic society research statement. Am J Respir Crit Care Med 2018; 197: 289-299.

[14] Varricchi G, Bagnasco D, Borriello F, Heffler E and Canonica GW. Interleukin-5 pathway inhibition in the treatment of eosinophilic respiratory disorders: evidence and unmet needs. Curr Opin Allergy Clin Immunol 2016; 16: 186.

[15] Hollams EM, De Klerk NH, Holt PG and Sly PD. Persistent effects of maternal smoking during pregnancy on lung function and asthma in adolescents. Am J Respir Crit Care Med 2014; 189: 401-407.

[16] Stehling F, Alfen K, Dohna-Schwake C and Mellies U. Respiratory muscle weakness and respiratory failure in pediatric neuromuscular disorders: the value of noninvasive determined tension-time index. Neuropediatrics 2016; 47: 374-379.

[17] Gold DR, Litonjua AA, Carey VJ, Manson JE, Buring JE, Lee IM, Gordon D, Walter J, Friedenberg G and Hankinson JL. Lung VITAL: rationale, design, and baseline characteristics of an ancillary study evaluating the effects of vitamin D and/or marine omega-3 fatty acid supplements on acute exacerbations of chronic respiratory disease, asthma control, pneumonia and lung function in adults. Contemp Clin Trials 2016; 47: 185-195.

[18] Julie-Ann C, Aram R, John G, Luke H and Ronan OD. Relating oxygen partial pressure, saturation and content: the haemoglobin-oxygen dissociation curve. Breathe (Sheff) 2015; 11: 194-201.

[19] Moneim SA, Fahmy TS and Abed N. Predictors of failure of early shift from invasive to noninvasive ventilation in weaning chronic obstructive pulmonary disease patients who have failed the initial spontaneous breathing trial: a prospective cohort study. Egyptian Journal of Bronchology 2018; 12: 49.

[20] Felten S and Cydulka RK. ASTHMA, chronic obstructive pulmonary disease and pneumonia. Emergency Medicine Secrets 2015; 177.

[21] Festic E and Scanlon PD. Incident pneumonia and mortality in patients with chronic obstructive pulmonary disease. A double effect of inhaled corticosteroids? Am J Respir Crit Care Med 2015; 191: 141-148.

[22] Dharmarajan K, Strait KM, Tinetti ME, Lagu T, Lindenauer PK, Lynn J, Krukas MR, Ernst FR, Li SX and Krumholz HM. Treatment for multiple acute cardiopulmonary conditions in older adults hospitalized with pneumonia, chronic obstructive pulmonary disease, or heart failure. J Am Geriatr Soc 2016; 64: 1574-1582.

[23] Chen LY, Wang YF, He SS, Zeng CF and Zhong Y. Effect of Shenqi Fuzheng injection and naloxone and BiPAP ventilator on serum inflammatory factors, immune function and blood gas analysis indexes in patients with AECOPD with type II respiratory failure. Journal of Hainan Medical University 2017; 23: 9-12.

[24] Zhang XM, Wu HY and Sun XJ. Application of non-invasive ventilator in the treatment of

acute heart failure merged with respiratory failure in ICU. Journal of Hainan Medical University 2017; 23: 109-111.

[25] Shei RJ, Chapman RF, Gruber AH and Mickleborough TD. Respiratory effects of thoracic load carriage exercise and inspiratory muscle training as a strategy to optimize respiratory muscle performance with load carriage. Springer Sci Rev 2017; 5: 49-64.

[26] Dimitriadis Z, Kapreli E, Strimpakos N and Oldham J. Respiratory dysfunction in patients with chronic neck pain: what is the current evidence? J Bodyw Mov Ther 2016; 20: 704-714.

[27] Achuthan A and BalaKrishnan P. Pulmonary dysfunction-an overt leprosy sequel: study done in a rehabilitation centre. International Journal of Research in Medical Sciences 2017; 4: 2843-2849.