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Original Article

Efficacy of comprehensive nursing in patients with pneumoconiosis and its influence on quality of life

Jing Yang, Huiling Zhang

Department of Occupational Disease, Henan Provincial Institute for Occupational Health (Henan No. 3 Provicial People's Hospital), Zhengzhou 456000, Henan Province, China

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Abstract: Objective: To investigate the efficacy of comprehensive nursing for patients with pneumoconiosis and its influence on patients' quality of life (QoL). Methods: Sixty-two patients with pneumoconiosis diagnosed and treated in the Henan Provincial Institute for Occupational Health (Henan No. 3 Provicial People's Hospital) from October 2018 to October 2019 were included in this retrospective study. According to the nursing model, patients receiving comprehensive nursing were included in the experimental group (n=31) and those receiving general care were included in the reference group (n=31). The pulmonary function (PF) indices, QoL score, emotional score and health behavior compliance were compared between the two groups before and after nursing. Results: (1) A significantly higher overall response rate was determined in the experimental group compared with the reference group (P<0.05). (2) There were no significant differences in heart rate (HR) and oxygen saturation between the two groups before nursing intervention (P>0.05). After nursing, significantly lower HR and higher oxygen saturation were observed in the experimental group compared with the reference group (all P<0.05). (3) The PF indexes also showed no significant differences between the two groups before nursing (P>0.05). After nursing, the experimental group exhibited higher forced expiratory volume in 1 second percent predicted ($FEV1\%_{pred}$), forced vital capacity percent predicted ($FVC\%_{pred}$), and blood oxygen partial pressure than the reference group, with statistical significance (all P<0.05). (4) The two groups showed similar QoL before nursing (P>0.05). After nursing, the experimental group scored significantly higher in physiological function, mental health, social function and vitality than the reference group (P<0.05). (5) The Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) scores, which were not statistically different between groups before nursing (P>0.05), were significantly lower in the experimental group after nursing compared with reference group (P<0.05). (6) The compliance of medication, diet, respiratory training and home oxygen therapy was higher in the experimental group compared with the reference group, showing statistical significance (P<0.05). Conclusions: Comprehensive nursing care for patients with pneumoconiosis can effectively enhance the curative effect, PF and QoL of patients, improve their HR, oxygen saturation and mood, and enhance their compliance with health behaviors.

Keywords: Pneumoconiosis, comprehensive nursing, quality of life

Introduction

Pneumoconiosis, a common occupational disease in China, accounts more than 89% of the Chinese patients with occupational diseases. Pneumoconiosis is generally caused by long-term inhalation of dust which causes interstitial fibrosis [1]. Clinical manifestations of pneumoconiosis include abnormal pulmonary function (PF), negative emotions (NEs), respiratory symptoms and reduced exercise tolerance etc. [2]. It is estimated that about 125,000 patients with pneumoconiosis die each year worldwide, with developing countries having the highest incidence of pneumoconiosis [3]. The ultimate goal of care and treatment for pneumoconiosis is to help patients carry out active self-health management to improve their clinical symptoms [4]. As far as the current treatment of pneumoconiosis is concerned, there is no specific drug, and the treatment options are quite limited [5, 6]. Therefore, exploring a new management model for pneumoconiosis patients from the perspective of nursing is of great value in improving patients' clinical symptoms and quality of life (QoL) and relieving NEs. The

current routine nursing intervention is mainly targeted intervention based on the actual condition of patients, but the effect is limited, and the quality of nursing needs to be improved [7]. With the continuous optimization of the nursing process in recent years, a series of nursing models such as refined nursing, high-quality nursing, and comprehensive nursing have been derived, which have greatly improved the QoL of patients [8-10]. This study mainly focused on the clinical application effect of comprehensive nursing in pneumoconiosis patients, aiming to provide a new reference for the optimization of the management of pneumoconiosis patients. Comprehensive nursing, a more scientific nursing method than other nursing models, pays close attention to patients' feelings and psychological needs based on the principle of people-orientation, so as to reduce their psychological burden and enhance patients' confidence in rehabilitation [11].

The innovation of this study lies in the comparative evaluation of the application effect of conventional nursing and comprehensive nursing in pneumoconiosis patients from multiple dimensions such as clinical efficacy, heart rate (HR), oxygen saturation, PF indices, QoL score, emotional score, and health behavior compliance, which will help optimize the management of patients with pneumoconiosis.

Clinical data and methods

Clinical data

Patients (n=99) with pneumoconiosis diagnosed and treated in the Henan Provincial Institute for Occupational Health (Henan No. 3 Provicial People's Hospital) from October 2018 to October 2019 were included in this retrospective study.

Inclusion criteria: (1) Patients who meet the diagnostic criteria of pneumoconiosis in China [12]; (2) Patients who voluntarily participated in this study after being informed of relevant information; (3) Patients who were confirmed as having pneumoconiosis by X-ray or CT examination [13]. Exclusion criteria: (1) Patients with abnormal cognitive ability; (2) Patients with other moderate and severe organic diseases; (3) Patients with language or hearing disorders.

After screening, 62 patients (62.62%) were finally included and grouped according to the nursing model. Among them, patients receiving comprehensive nursing were included in the experimental group (n=31) and those receiving general care were included in the reference group (n=31). The female-to-male ratio, average age and mean duration of pneumoconiosis of patients in the experimental group were 13:18, (58.50±8.34) years old, and (1.71± 0.39) years, respectively, and 15:16, (59.18± 7.57) years old, and (1.73±0.33) years in the reference group, respectively. The data of the two groups, such as age, gender and duration of pneumoconiosis, were compared and no significant differences were found between the two groups (P>0.05), indicating group comparability. This study was approved by the Ethics Committee of the Henan Provincial Institute for Occupational Health (Henan No. 3 Provicial People's Hospital).

Methods

The reference group received general care. Patients were given anti-infection therapy, oxygen inhalation, and antitussive treatment according to their clinical presentations [14], and the corresponding implementation of these measures was provided by the general nursing staff.

The experimental group was treated with comprehensive nursing, with the specific measures as follows: First, a professional psychological care team, with the goal of having a significant positive effect on improving the psychological state of pneumoconiosis patients, was established to implement psychological intervention and nursing care to ensure the mental health of patients. In addition, the psychological nursing team compiled psychological status files for patients, assessed different NEs of patients through professional scales, and conducted research within the team according to patients' characteristics, so as to develop targeted psychological nursing and intervention programs for patients and give them professional psychological nursing intervention. Targeted psychological intervention provided by a professional psychological nursing team can effectively mitigate patients' NEs and improve their QoL with exact clinical application effect, which can further enhance patients' nursing compliance and

improve patients' physical and mental health [15]. Second, health education was carried out for pneumoconiosis patients. Due to the differences in cultural background, health concepts, cognitive ability, etc., pneumoconiosis patients have different cognitive levels of pneumoconiosis-related health knowledge. Some patients with pneumoconiosis are affected by cognitive deficiency, resulting in excessive psychological pressure and anxiety, which greatly influences their physical and mental health. Therefore, health education for pneumoconiosis patients is essential, which can not only mitigate patients' NEs, but also play a significant role in improving patients' treatment and nursing compliance as well as clinical efficacy [16]. Third, psychological nursing measures were also implemented. Psychological nursing intervention is very necessary for pneumoconiosis patients, which can effectively reduce the proportion of patients with acute symptoms. During psychological nursing, nurses pay attention to the scientific and comprehensiveness of the nursing measures, evaluate the emotional state of patients through psychological scales, closely observe the changes of patents' conditions, and strengthen the communication with pneumoconiosis patients, so as to understand the causes of patients' NEs to implement targeted psychological nursing intervention [17]. In addition, during the actual psychological nursing, the most important thing is to stabilize the mood of pneumoconiosis patients. This is particularly true for some patients with pessimism and world-weariness, as these emotions can easily lead to poor treatment compliance and other problems. Therefore, for such emotionally unstable patients, meticulous communication and targeted psychological intervention should be implemented to channel their pessimism and world-weariness and improve patient compliance with treatment and nursing. Fourth, exercise guidance was given according to the patient's condition, and personalized exercise programs were developed for each patient, generally including upper and lower limb muscle exercise and whole-body exercise, in order to enhance their accessory respiratory muscular endurance. Upper limb exercise mainly included weightlifting and ball throwing, lower limb movement included running, walking, treadmill exercise, and climbing stairs, while whole-body exercise included cleaning, rehabilitation gymnastics, etc. The exercise was carried out twice a day for at least 30 min each time. Fifth, the respiratory muscles of patients were trained by respiratory training (resistance breathing, respiratory gymnastics, controlled deep and slow breathing, comprehensive respiratory muscle training) or respiratory training apparatus (pulmonary function trainer, auxiliary diaphragm pacemaker), 3 times a day for more than 20 min each time. Sixth, patients were given guidance on coughing and expectoration. Patients were instructed to take a sitting or semi-recumbent position, with the upper body slightly leaning forward, and cough the sputum out smoothly by a few light coughs first to loosen the sputum and then taking a deep breath and cough hard.

Outcome measures

(1) Therapeutic efficacy. Markedly effective - significantly improved clinical symptoms and characteristics; Effective - clinical symptoms and characteristics were obviously relieved; Ineffective - no significant improvement or even aggravation in the clinical symptoms and characteristics. The overall response rate (ORR) = (markedly effective cases + effective cases)/ total cases *100%. (2) HR and oxygen saturation of pneumoconiosis patients before and after nursing were detected. (3) PF indices, including forced expiratory volume in 1 second percent predicted ($FEV1\%_{pred}$), forced vital capacity percent predicted ($FVC\%_{pred}$) and partial pressure of oxygen, were measured. (4) Patients' QoL before and after nursing was assessed by the Quality of Life Scale (score range: 0-100), including physiological function, mental health, social function and vitality. Higher scores indicates better QoL [18]. (5) The Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) [19] were used to assess the NEs of patients before and after nursing. Each scale has a score range of 0-100, and the score is directly proportional to the severity of patients' NEs. (6) The health behavior compliance of pneumoconiosis patients, including medication, diet, respiratory training and home oxygen therapy (HOT), was investigated through follow-up via means of telephone interviews, visits and medical records queries. The follow-up was conducted once every three months for one year.

Statistical analysis

The medical record data of all 62 pneumoconiosis patients were input into SPSS 19.0 soft-

Table 1. Baseline data of patients in the two groups [n (%), mean ± SD]

Variables	n	Experimental group (n=31)	Reference group (n=31)	χ^2/t	P
Gender				0.261	0.610
Male	28	13 (41.94)	15 (48.39)		
Female	34	18 (58.06)	16 (51.61)		
Average age (years)	62	58.50±8.34	59.18±7.57	0.336	0.738
Course of disease	62	1.71±0.39	1.73±0.33	0.218	0.828
History of dust exposure (year)	62	20.17±8.22	21.62±7.03	0.746	0.458
Staging				0.389	0.823
I	20	10 (32.26)	10 (32.26)		
II	24	11 (35.48)	13 (41.94)		
III	18	10 (32.26)	8 (25.80)		
Type of pneumoconiosis				0.876	0.349
Cement pneumoconiosis	13	5 (16.13)	8 (25.81)		
Coal worker pneumoconiosis	49	26 (83.87)	23 (74.19)		
Education level				0.369	0.544
Primary school	48	23 (74.19)	25 (80.65)		
Junior high school or above	14	8 (25.81)	6 (19.35)		
Residence				0.729	0.393
Urban	17	7 (22.58)	10 (32.26)		
Rural	45	24 (77.42)	21 (67.74)		
Marital status				0.337	0.562
Single	16	9 (29.03)	7 (22.58)		
Married	46	22 (70.97)	24 (77.42)		

Table 2. Comparison of curative effects between the two groups after nursing [n (%)]

Groups	N	Markedly effective	Effective	Ineffective	Overall response rate
Experimental group	31	16 (51.61)	12 (38.71)	3 (9.68)	28 (90.32)
Reference group	31	10 (32.26)	11 (35.48)	10 (32.26)	21 (67.74)
χ^2	-	-	-	-	4.769
p	-	-	-	-	0.029

ware for analysis. The measurement data (e.g. HR, oxygen saturation, $FEV1\%_{pred}$, $FVC\%_{pred}$, blood oxygen partial pressure, QoL score, anxiety and depression score) were all normally distributed and expressed as mean ± standard deviation. The counting data, including curative effect, medication, diet, respiratory training and compliance of HOT, were presented in the form of n (%), and tested by the χ^2 test. $P<0.05$ was the significance level of data validation.

Results

Baseline data

The two groups were comparable in baseline data such as gender, average age, dust exposure history, disease staging, pneumoconiosis type, education level, place of residence and marital status (all $P>0.05$, **Table 1**).

Comparison of curative effects of different nursing models in pneumoconiosis patients

Comparing the clinical efficacy in pneumoconiosis patients after nursing (**Table 2**) showed that the markedly effective, effective and ineffective cases in the experimental group were 16, 12, and 3, respectively, while those in the reference group were 10, 11, and 10, respectively, indicating the ORR of the experimental group was significantly higher than that of the reference group ($P<0.05$).

Comparison of improvement of HR and oxygen saturation before and after nursing between the two groups of patients

The HR and oxygen saturation in pneumoconiosis patients before and after nursing was compared (**Table 3**). The data showed that there

Table 3. Comparison of improvement of heart rate and oxygen saturation before and after nursing between the two groups of patients

Groups	Cases (n)	Heart rate (beats/min)		Oxygen saturation ($\times 10^{-2}$)	
		Before nursing	After nursing	Before nursing	After nursing
Experimental group	31	94.12±8.85	72.98±9.97	86.58±5.36	93.66±5.32
Reference group	31	93.67±9.17	87.17±8.40	86.78±4.05	90.03±4.53
t		0.1966	6.0602	0.1658	2.8925
P		0.8448	0.0000	0.8689	0.0053

Table 4. Comparison of $FEV1\%_{pred}$, $FVC\%_{pred}$ and oxygen partial pressure before and after nursing between the two groups of patients

Groups	Cases (n)	$FEV1\%_{pred}$		$FVC\%_{pred}$		Oxygen partial pressure (mmHg)	
		Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing
Experimental group	31	50.21±2.69	63.69±2.13	57.91±3.29	65.53±3.02	57.02±4.94	68.49±7.11
Reference group	31	50.48±2.75	57.29±3.74	58.13±3.37	60.11±4.12	57.33±7.85	60.93±5.14
t		0.3907	8.2791	0.2600	5.9074	0.1860	4.7977
P		0.6973	0.0000	0.7956	0.0000	0.8530	0.0000

Table 5. Comparison of physiological function, mental health, social function and vitality scores before and after nursing between the two groups of patients

Groups	Cases (n)	Physiological function		Mental health		Social function		Vitality	
		Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing
Experimental group	31	85.16±6.77	92.58±3.91	81.06±8.14	90.27±4.58	83.20±7.89	91.68±4.16	84.29±7.24	92.03±4.7
Reference group	31	85.43±7.02	88.62±5.30	81.29±8.42	85.36±5.97	83.65±8.06	87.09±5.31	84.37±7.51	87.89±6.39
t		0.1541	3.3476	0.1093	3.6331	0.2221	3.7886	0.0426	2.9058
P		0.8780	0.0014	0.9132	0.0005	0.8249	0.0003	0.9660	0.0051

were no significant differences in the two indexes between the two groups before nursing (P>0.05). After nursing, the HR was statistically lower and the oxygen saturation was higher in the experimental group compared with the reference group (all P<0.05).

Comparison of $FEV1\%_{pred}$, $FVC\%_{pred}$ and blood oxygen partial pressure before and after nursing between the two groups of patients

The PF indexes of pneumoconiosis patients before and after nursing were also compared between the two groups (**Table 4**). The PF indexes showed no significant differences between the two groups before nursing (P>0.05). After nursing, the experimental group exhibited significantly higher $FEV1\%_{pred}$, $FVC\%_{pred}$, and blood oxygen partial pressure than the reference group (all P<0.05).

Comparison of physiological function, mental health, social function and vitality scores before and after nursing between the two groups of patients

Comparing the QoL score of pneumoconiosis patients before and after nursing (**Table 5**), we observed similar QoL scores in both groups before nursing (P>0.05). After nursing, the experimental group scored statistically higher in physiological function, mental health, social function and vitality than the reference group (all P<0.05).

Comparison of SAS and SDS scores before and after nursing between the two groups of patients

The SAS and SDS scores of pneumoconiosis patients before and after nursing were compared (**Table 6**). The emotional scores of pneu-

Table 6. Comparison of SAS and SDS scores before and after nursing between both groups of patients (point)

Groups	Cases (n)	SAS		SDS	
		Before nursing	After nursing	Before nursing	After nursing
Experimental group	31	58.64±4.23	38.26±3.21	61.39±4.39	40.11±3.11
Reference group	31	58.91±4.06	44.49±4.14	61.45±4.27	51.44±3.94
t		0.2563	6.6213	0.0545	12.5674
P		0.7985	0.0000	0.9566	0.0000

Table 7. Comparison of compliance with medication, diet, respiratory training and home oxygen therapy between both groups of patients [n (%)]

Groups	Cases (n)	Medication	Diet	Respiratory training	Home oxygen therapy
Experimental group	31	31 (100.00)	30 (96.77)	27 (87.10)	28 (90.32)
Reference group	31	25 (80.65)	23 (74.19)	20 (64.52)	21 (67.74)
X^2		6.6428	6.3689	4.3092	4.7692
P		0.0099	0.0116	0.0379	0.0289

moconiosis patients before nursing were similar in two groups (P>0.05). However, the experimental group exhibited significantly lower SAS and SDS scores than the reference group after nursing (all P<0.05).

Comparison of compliance of pneumoconiosis patients with medication, diet, respiratory training and home oxygen therapy (HOT)

The comparison of health behavior compliance of pneumoconiosis patients (**Table 7**) revealed that the compliance of medication, diet, respiratory training and HOT behaviors was significantly higher in the experimental group than in the reference group (all P<0.05).

Discussion

Pneumoconiosis, or black lung disease, refers to the retention of productive dust inhaled by someone for a long, which can be divided into inorganic dust pneumoconiosis and organic dust pneumoconiosis. The main presentations are cough, expectoration, chest pain, and decreased respiratory function, with poor PF, resulting in a decline in QoL causing serious harm to the life and safety of patients [20]. Similar to other chronic diseases, pneumoconiosis patients require long-term treatment. Suffering from a pain and treatment burden, patients are more susceptible to NEs, which affect not only the treatment effect but also the QoL and self-management compliance of pneumoconiosis patients.

In this paper, comprehensive nursing care was given to pneumoconiosis patients in the experimental group. The results identified a higher ORR in the experimental group after nursing care compared with the reference group, suggesting that comprehensive nursing care can significantly improve the clinical efficacy of treatment for patients. The comprehensive nursing mainly includes psychological nursing and health education, which can improve the treatment efficacy by improving patients' disease-related cognition and nursing compliance and alleviating their NEs. The effect of comprehensive nursing has also been confirmed in different disease-settings such as endometrial cancer, acute cerebral infarction, and primary nephrotic syndrome [21-23]. Second, the experimental group exhibited lower HR and higher oxygen saturation than the reference group after nursing, which may be related to the exercise guidance and supervision given to patients, since moderate exercise has a positive effect on improving patients' HR and oxygen saturation [24,25]. In terms of PF indexes, $FEV1\%_{pred}$, $FVC\%_{pred}$ and blood oxygen partial pressure were higher in the experimental group compared with the reference group after nursing, suggesting that comprehensive nursing has a significant positive effect on patients' pulmonary function. The potential mechanism of action may be related to the fact that patients in the experimental group received professional exercise, respiratory training and guidance on coughing and expectoration, of

which exercise training can help improve patients' coordination ability of the cardiopulmonary system, respiratory training can effectively improve their respiratory efficiency, and cough and expectoration guidance can prevent patients from acquiring pulmonary infection [26]. In the evaluation of QoL, the scores of physiological function, mental health, social function and vitality were found to be higher in the experimental group after nursing, which indicates that comprehensive nursing is beneficial to improve the QoL of pneumoconiosis patients. The promotive effect of comprehensive nursing on the above three aspects was mainly attributed to the effective intervention of health education, which established correct health concepts and living habits for patients that laid a good foundation for the norms of patients' healthy behavior. Some previous studies have also confirmed that comprehensive nursing can significantly improve the hemodynamics, PF, and QoL of patients [27, 28]. Furthermore, the psychological analysis identified lower anxiety and depression scores in the experimental group after nursing, indicating that the negative psychological state of pneumoconiosis patients can be significantly alleviated after comprehensive nursing intervention, similar to the research results of Chen et al. [29]. This may be related to the fact that the psychological nursing team evaluated patients' NEs through professional scales and formulated and provided targeted psychological nursing and intervention plans for patients. In addition, the nursing team paid great attention to the differences of patients' cultural background, health concept, cognitive ability and other aspects in the treatment process, and gave health education to reduce patients' stress and anxiety, which also played a positive role in mitigating their NEs. Moreover, the behavior compliance of medication, diet, respiratory training and HOT was found to be higher in the experimental group, demonstrating that comprehensive nursing can promote the development of patients' healthy behaviors, which is consistent with the research of Ju et al. [14]. Through health education and emotional care, pneumoconiosis patients can overcome bad moods, and adapt to the changes in their living habits caused by disease, so as to realize self-acceptance [30]. During the actual nursing period, nurses attached great importance to the individualized differences among pneumoconiosis patients. Due to the significant differences in patients' cognitive ability, acceptance ability, condition, treatment methods, cultural background and other factors, it is necessary to carry out targeted nursing and design the nursing plan based on the actual situation of pneumoconiosis patients, so as to improve the clinical nursing effect, enhance patients' health behavior compliance suggested by the doctor, and enhance their QoL [2]. In addition, the importance of family care should be emphasized during the period of comprehensive care. In recent years, there have been many foreign and domestic studies on the management of chronic diseases. During treatment and recuperation of patients with chronic diseases, family support exerts a particularly important influence on the clinical treatment effect. This is particularly true for middle-aged and elderly patients, as the poor level of self-health management behavior, insufficient access to health knowledge and skills, and declining physical quality all lead to reduced therapeutic effects in such patients [31].

There are some limitations in this study that need further improvement. First, this is a small single-center study with a small sample size, which may affect the accuracy of experimental results to some extent. Second, complications were not recorded in the analysis, so more studies in this aspect are needed to further understand the impact of comprehensive nursing on the complications of patients with pneumoconiosis. Third, the related factors influencing the improvement of patients with pneumoconiosis after comprehensive nursing can be analyzed to further optimize the nursing process.

In conclusion, comprehensive nursing is worthy of clinical popularization and application in the intervention of pneumoconiosis patients.

Disclosure of conflict of interest

None.

Address correspondence to: Huiling Zhang, Department of Occupational Disease, Henan Provincial Institute for Occupational Health (Henan No. 3 Provicial People's Hospital), 3 Kangfu Middle Street, Erqi District, Zhengzhou 456000, Henan Province, China. Tel: +86-13673367969; E-mail: zhanghuiling202202@163.com

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