Am J Transl Res 2021;13(5):4825-4834
www.ajtr.org /ISSN:1943-8141/AJTR0128777

Original Article

The effect of targeted nursing on the quality of sleep and life in lung cancer patients undergoing chemotherapy

Hongmei Wang, Yuan Liang, Duo Lu, Yuwei Zhao

Second Department of Thoracic Cancer, Cancer Hospital of China Medical University, Liaoning Cancer Hospital & Institute, Shenyang, Liaoning Province, China

Received December 22, 2020; Accepted January 22, 2021; Epub May 15, 2021; Published May 30, 2021

Abstract: Objective: To explore the effect of targeted nursing on the quality of sleep and life in lung cancer patients undergoing chemotherapy. Methods: This study was conducted in 88 lung cancer patients who underwent chemotherapy. According to the random number table, these patients were assigned to the control group (n=44) and the experimental group (n=44). In the control group, patients received routine nursing. Meanwhile, patients in the experimental group received both routine nursing and targeted nursing. The quality of sleep score, quality of life score, psychological state-related score, and visual analogue scale (VAS) score on admission and 1 week after discharge were compared between the two groups. Results: There were no differences in the quality of sleep score, quality of life score, psychological state-related score, and VAS score between the two groups of patients on admission (all P>0.05). Compared with those on admission, the quality of sleep score, quality of life score, psychological state-related score, and VAS score in both groups 1 week after discharge were declined (all P<0.05). Additionally, the changes in the experimental group were much bigger than those in the control group (all P<0.001). Satisfaction in nursing in the experimental group was higher than that in the control group (P<0.05). Conclusion: Targeted nursing can improve the quality of sleep, quality of life, psychological state, and satisfaction in nursing in lung cancer patients undergoing chemotherapy.

Keywords: Lung cancer chemotherapy, sleep disorder, quality of life, targeted nursing

Introduction

Lung cancer is one of the most common malignant tumors. Its morbidity and mortality rate rank the first among malignant tumors, and have been increasing year by year [1]. The etiology and pathogenesis of lung cancer are still unknown, posing too many difficulties in early detection, diagnosis, and treatment [2]. Many patients are not diagnosed until they have advanced lung cancer. Accordingly, chemotherapy is carried out [3, 4]. During the course of treatment, patients suffer from not only the pain of lung cancer, but also various complications accompanied by chemotherapy, the essential treatment of lung cancer [5, 6]. Sleep disorder and declined life quality are common complications of lung cancer patients after chemotherapy [7, 8]. As we know, chemotherapy can prolong the survival of lung cancer patients. However, it can also induce a series of adverse effects, like nausea, vomiting, bone marrow suppression, blood cell reduction, tiredness, and increased fatigue. As a result, patients' quality of life is decreased. Additionally, the decline of life quality is more significant when the cycle of chemotherapy increases [9, 10]. Lung cancer patients have prolonged daytime sleep as the treatment is mainly carried out in the daytime. In this case, driving force for sleep and circadian rhythm of the body are interfered. Ultimately, nighttime sleep is reduced and sleep disorder is developed [11]. At the same time, sleep disorder disrupts patients' original rhythm of rest and activity, resulting in decreased quality of life. Sleep disorder and decline in the quality of life influence and promote each other, forming a vicious circle [12]. In clinical nursing, how to take effective measures to improve the sleep quality and

life quality of lung cancer patients undergoing chemotherapy has become an important problem that needs to be resolved as early as possible. In recent years, targeted nursing has been widely implemented in clinical nursing. As an evidence-based model, targeted nursing is characterized by patient-centered care. Also, it is problem-oriented, exploring the causes of problems. Furthermore, targeted nursing measures are formulated. It was confirmed that the application of targeted nursing in lung cancer patients undergoing chemotherapy could improve their quality of sleep and life [13, 14]. However, there has not yet been consensus on the content of targeted nursing. Its rules are still to be standardized and specified. In addition, clinical studies related to its effects are quite insufficient. On the basis of existing reports, we further explored the effect of targeted nursing on the quality of sleep and life in lung cancer patients undergoing chemotherapy, hoping to provide more evidence and clues for the improved clinical nursing of lung cancer patients undergoing chemotherapy.

Materials and methods

General information

This study was approved by the ethics committee of our hospital. In total, 88 lung cancer patients who underwent chemotherapy in our hospital between January 2018 and January 2019 were recruited in this study. According to the random number table, these patients were assigned to the control group and the experimental group (44 patients in each group).

Inclusion criteria: Patients were diagnosed by imaging and pathological examinations; patients would like to receive chemotherapy (combined or not combined with surgical treatment, targeted therapy, and immunotherapy); patients' estimated survival time was more than 3 months; patients had normal cognitive function; patients were able to understand, read and write text; patients could cooperate in various scale surveys; patients were informed of the study, and signed the informed consent.

Exclusion criteria: Patients had mental illness or cognitive impairment; patients had severe infection; patients had severe organ insufficiency; patients had other malignant tumors; patients were contraindicated to chemotherapy; patients refused to receive chemotherapy; patients underwent concurrent radiotherapy; patients' estimated survival time was less than 3 months.

Data collection and research methods

Data collection: Patients' data, including age, gender, body mass index (BMI), comorbidity (hypertension, diabetes, and hyperlipidemia), whether or not smoking/drinking, vital signs on admission (respiration, pulse, blood pressure, and heart rate), routine laboratory examinations (blood routine, five items of blood coagulation, and biochemistry), pathological classification and staging of lung cancer, the quality of sleep score on admission and after intervention, and the quality of life score on admission and after intervention, were collected.

Methods: Patients in the control group received routine nursing, which was composed of the following measures: (1) A pleasant ward environment was created, and a clean and ventilated ward was maintained; (2) Patients' body temperature, blood pressure, and heart rate were monitored and recorded, while instruction on their eating habit was provided; (3) Patients were instructed to take medicines in accordance with the medical advice. Also, adverse reactions occurred during medication administration were observed; (4) Health education, which included knowledge on common complications of lung cancer chemotherapy, guidance on diet and exercise during chemotherapy, was publicized to patients.

Besides routine nursing, patients in the experimental group received targeted nursing [15]. It was described in detail below. (1) A professional nursing group, which consisted of 1 team leader and 6 nursing staff, was established. The team leader was in charge of the education and training of the team members on relevant knowledge, and formulation of a detailed nursing plan. (2) Targeted psychological care: in order to know patients' psychological state, nursing staff evaluated and analyzed their condition. They introduced the progress of current treatment and possible future situations to patients to improve their psychological expectations and tolerance. In routine work, nursing staff tried their best to comfort patients to relieve their anxiety and tension. Also, they frequently encouraged patients to increase their

compliance to treatment and confidence in overcoming the disease. (3) The improvement of patients' sleep habit and condition: patients were assisted to develop a good life and sleep habit. Factors that might affect patients' sleep, including strong stimulation of light in the ward corridor, loud voice spoken out by family members that accompanied patients, were promptly found out and eliminated. According to the actual sleep condition of different patients, methods like relaxed imagination, passive somatosensory training, and mindfulness decompression were used to make their physical and psychological state relaxed [16]. If necessary, patients were informed of specific behaviors that might influence sleep quality. Their sleep time and habit were standardized to the great extent. (4) The increase of patients' sense of social identity: group intervention was implemented to promote the competition between patients. They were encouraged to actively participate in social activities as much as possible. Patients who had achieved good therapeutic effects were invited to share their anti-cancer experience. Moreover, family members were recommended to accompany patients to minimize their negative emotions. (5) The enhancement of daily care: nursing staff strove to improve their knowledge and technical level. In this way, they could acquire the trust of patients and their family members by skilled nursing ability. Patients were informed of various methods concerning diet, exercise, and wear protection. Accordingly, excessive fatigue, infection and other adverse reactions and events were reduced. (6) The elevation of patients' self-confidence: nursing staff attempted to maintain patients' image and self-confidence. They showed understanding and sympathy to patients' hair loss and haggardness during chemotherapy, and encouraged them to face and accept the reality. To relieve patients' negative emotions like pain and low self-esteem, they were allowed to wear spare clothes and wigs, and have makeup.

Outcome measures

Main outcome measures: The quality of sleep: Pittsburgh Sleep Quality Index (PSQI) scale was used to assess sleep quality. The scale included 23 items, with 18 self-evaluation items. The lower the score was, the better the sleep quality.

The quality of life: The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) was employed to assess life quality. The scale was composed of 30 items. Among them, item 1-28 was divided into 4 grades, while item 29 and 30 were divided into 7 grades. Mental function, physiological function, material life, and social function were the 4 aspects of the items. The quality of life was negatively correlated with the score of items 1-28, while positively correlated to the score of items 29-30. Hence, the score needed to be converted into a standard one after obtaining the score of each item. The lower the standard score was, the better the quality of life. The quality of life score displayed in this study was standard. In other words, the lower the score was, the better the quality of life.

Secondary outcome measures: Psychological state: Self-rating anxiety scale (SAS) and self-rating depression scale (SDS) were applied to assess anxiety and depression, separately. The cut-off value of SAS score was 50 points; the higher the SAS score was, the severer the anxiety. The cut-off value of SDS score was 53 points; the higher the SDS score was, the severer the depression.

Pain degree: Visual analogue scale (VAS) was implemented to assess the pain degree before and after nursing. The total score was 10 points; the higher the score was, the severer the pain.

Satisfaction in nursing: Satisfaction in nursing was evaluated using a self-made questionnaire. The total score was 100 points. Results were classified into very satisfied (80-100 points), basically satisfied (60-79 points), and dissatisfied (below 60 points). Satisfaction in nursing = (very satisfied + basically satisfied)/ the total number of patients × 100%.

Statistical methods

All data were analyzed using SPSS statistical software version 26.0. The measurement data were calculated as mean ± standard deviation ($\bar{x}$ ± sd); independent sample t test was used for inter-group comparison, while paired t-test was applied for before-after comparison within the same group. The enumeration data were expressed as number/percentage (n/%); comparison was conducted with chi-square test. The difference was statistically significant when *P* value was less than 0.05.

Table 1. Baseline data (n)

Group	Experimental group (n=44)	Control group (n=44)	χ^2/t	P
Age (years)	62.1±7.8	63.5±7.6	0.853	0.396
Gender (male/female)	24/20	26/18	0.185	0.667
BMI (kg/m^2)	24.74±2.68	24.12±2.89	1.043	0.298
Smoking	30	32	0.218	0.640
Drinking	22	24	0.182	0.669
Comorbidity				
Chronic lung disease	38	36	0.340	0.526
Hypertension	22	24	0.182	0.669
Diabetes	15	19	0.501	0.479
Hypercholesterolemia	12	15	0.481	0.488
Cardiovascular disease	23	26	0.414	0.522
Cerebrovascular disease	27	23	0.741	0.389
Education background			0.745	0.863
University	8	10		
Senior high school	18	20		
Junior high school	12	9		
Primary school and below	6	5		
Lung cancer staging			0.863	0.942
Stage 0	7	6		
Stage 1	8	6		
Stage 2	16	18		
Stage 3	10	9		
Stage 4	3	5		
Combined therapy			0.764	0.589
Surgical treatment	9	11		
Targeted therapy	14	12		
Immunotherapy	7	5		
Pathological classification			0.450	0.930
Adenocarcinoma	15	17		
Squamous cell carcinoma	18	15		
Small cell carcinoma	9	10		
Others	2	2		
Course of disease (months)	7.5±5.4	6.9±6.1	0.489	0.626
Chemotherapy regimens			0.905	0.864
NP	8	5		
GP	6	8		
CAV	7	9		
DP	4	4		
BCP	5	4		
TP	7	8		
EP	4	3		
PC	3	3		

Note: BMI: body mass index; regimen NP: vinorelbine combined with cisplatin; regimen GP: gemcitabine combined with cisplatin; regimen CAV: cyclophosphamide combined with doxorubicin and vincristine; regimen DP: docetaxel combined with cisplatin; regimen BCP: paclitaxel combined with carboplatin and bevacizumab; regimen TP: paclitaxel combined with cisplatin; regimen EP: etoposide combined with cisplatin; regimen PC: pemetrexed combined with cisplatin.

Results

Baseline data

As displayed in **Table 1**, there were no significant differences concerning age, gender, BMI, smoking history, drinking history, comorbidity (chronic lung disease, hypertension, diabetes, hyperlipidemia, and cardiovascular disease), and pathological classification between the two groups (all P>0.05).

The quality of sleep score

As shown in **Table 2** and **Figure 1**, there were no differences in the quality of sleep scores between the two groups on admission (all P> 0.05). Compared with before nursing, the quality of sleep scores in the two groups after nursing were decreased (all P<0.05), and the decline of the quality of sleep scores in the experimental group was more significant than that in the control group (all P<0.001).

The quality of life score

As displayed in **Table 3** and **Figure 2**, there were no differences concerning the quality of life scores between the two groups on admission (all P> 0.05). Compared with before nursing, the quality of life scores in both groups after nursing were decreased (all P<0.05), and the decrease of the quality of life scores in the experimental group was more significant than that in the control group (all P<0.001).

Psychological state

As shown in **Table 4** and **Figure 3**, there were no differences in SDS and SAS scores between

Table 2. The quality of sleep score

Group	Time	Fall asleep time	Sleep time	Sleep efficiency	Sleep disorder
Control group (n=44)	On admission	3.4±0.3	2.7±0.4	2.3±0.5	2.4±0.3
	One week after discharge	3.2±0.5*	2.4±0.8*	2.1±0.4*	2.2±0.5*
Experimental group (n=44)	On admission	3.5±0.3	2.7±0.3	2.6±0.4	2.6±0.4
	One week after discharge	1.4±0.2***,###	1.2±0.3***,###	0.9±0.4***,###	1.4±0.3***,###

Note: Compared with that on admission, *P<0.05, ***P<0.001; compared with control group, ###P<0.001.

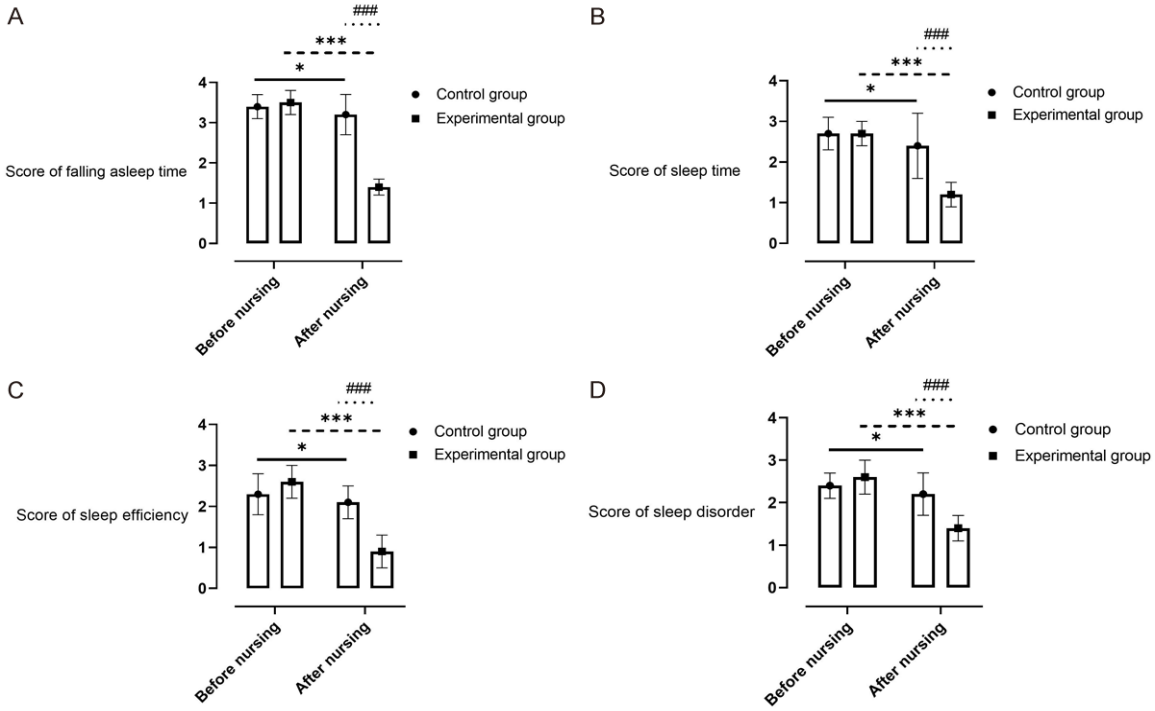

Figure 1. Comparison of the quality of sleep score before and after nursing. A: Comparison of fall asleep time score before and after nursing; B: Comparison of sleep time score before and after nursing; C: Comparison of sleep efficiency score before and after nursing; D: Comparison of sleep disorder score before and after nursing. Compared with that before nursing, *P<0.05, ***P<0.001; compared with control group, ###P<0.001.

Table 3. The quality of life score

Group	Time	Function factor	Symptom factor	Specific factor	General health
Control group (n=44)	On admission	72.4±2.8	50.6±4.5	31.3±1.6	51.2±2.8
	One week after discharge	71.2±2.1*	48.6±4.8*	30.8±1.8*	49.5±3.4*
Experimental group (n=44)	On admission	74.5±1.8	49.4±4.7	30.2±1.5	50.4±2.7
	One week after discharge	51.4±1.6***,###	21.2±4.4***,###	18.4±1.3***,###	30.2±2.8***,###

Note: Compared with that on admission, *P<0.05, ***P<0.001; compared with control group, ###P<0.001.

the two groups on admission (both P>0.05). Compared with before nursing, SDS and SAS score in both groups after nursing were declined (both P<0.05), and the decline of SDS and SAS scores in the experimental group was more significant than that in the control group (both P<0.001).

Pain degree

As displayed in **Table 5** and **Figure 4**, there was no difference concerning VAS score between the two groups on admission (P>0.05). VAS score in the two groups after nursing was reduced when compared with that before nurs-

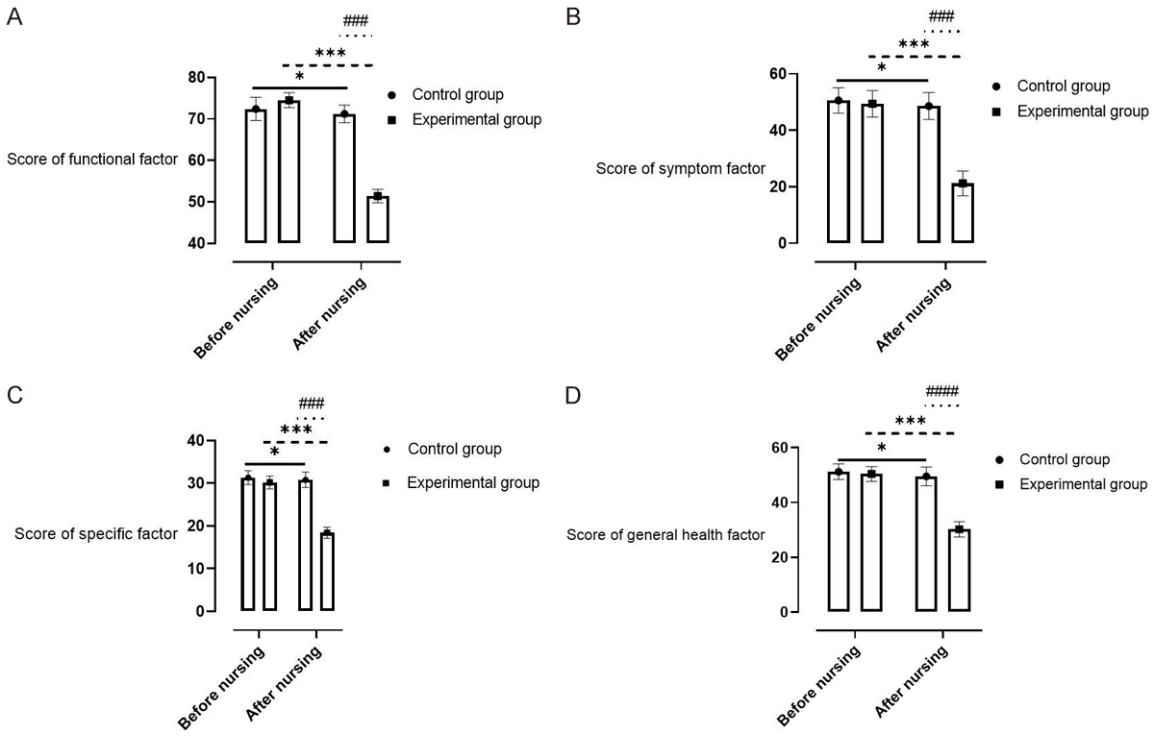

Figure 2. Comparison of the quality of life score before and after nursing. A: Comparison of function factor score before and after nursing; B: Comparison of symptom factor score before and after nursing; C: Comparison of specific factor score before and after nursing; D: Comparison of general health score before and after nursing. Compared with that before nursing, *P<0.05, ***P<0.001; compared with control group, $^{\#\#\#}$P<0.001.

Table 4. Psychological state

Group	Time	SDS score	SAS score
Control group (n=44)	On admission	49.2±3.0	50.4±4.5
	One week after discharge	47.9±2.8*	48.6±4.8*
Experimental group (n=44)	On admission	49.4±2.8	51.2±4.2
	One week after discharge	40.7±2.5$^{***,\#\#\#}$	38.2±4.1$^{***,\#\#\#}$

Note: Compared with that on admission, *P<0.05, ***P<0.001; compared with control group, $^{\#\#\#}$P<0.001. SDS: self-rating depression scale; SAS: self-rating anxiety scale.

ing (P<0.05), and the decrease of VAS score in the experimental group was more significant than that in the control group (P<0.001).

Satisfaction in nursing

Satisfaction in nursing in the experimental group after nursing was significantly higher than that in the control group (P<0.001, **Table 6**).

Discussion

Sleep disorder is a common complication observed in lung cancer patients undergoing chemotherapy. Due to the pain and chemotherapy, lung cancer patients suffer from severe physical and psychological stress. To be specific, they have bad sleep quality, poor quality of life, and negative psychological state. As a result, their coordination to treatment is seriously influenced and long-term survival rate is reduced [17-19]. Patient-centered and clinical problem-oriented care is the focus of targeted nursing. The targeted intervention measures are made through exploring the causes of the problems. Consequently, it is necessary to first find out the causes of sleep disorder in lung cancer patients undergoing chemotherapy. Thereafter, targeted nursing models and intervention measures are designed. Sleep disor-

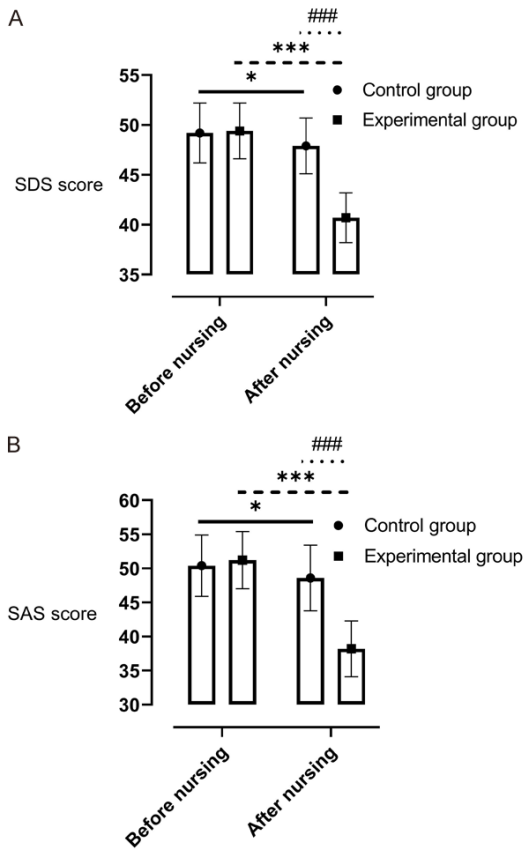

Figure 3. Comparison of psychological state before and after nursing. A: SDS score; B: SAS score. Compared with that before nursing, $^{*}P<0.05$, $^{***}P<0.001$; compared with control group, $^{###}P<0.001$. SDS: self-rating depression scale; SAS: self-rating anxiety scale.

der, the clinical problem, is eventually solved. At present, it is believed that the causes of sleep disorder in lung cancer include the following [20]: (1) After the diagnosis of lung cancer, patients have severe fear and despair. Their negative emotions are further amplified as a result of various adverse reactions and complications (such as nausea, vomiting, weight decrease, hair loss, and increased economic burden) during chemotherapy. Therefore, patients are anxious and nervous; (2) Patients' knowledge in lung cancer and chemotherapy are inadequate. They seriously doubt and distrust the effectiveness of the treatment. Therefore, they are prone to pessimistic and negative emotions; (3) Patients have declined commonality and recognition of the society and other people. The sense of despair, that is, they are abandoned and given up is thus produced. Their temper is changeable and prone to be aggressive and irritable. Specifically, they often conflict with the medical staff and their family members for minor matters. What's more, they refuse to cooperate during the treatment process.

The alleviation of negative emotions, enrichment of knowledge in lung cancer, and increase of social commonality and identity are effective measures to improve the sleep quality of lung cancer patients undergoing chemotherapy, because the above causes of sleep disorder in lung cancer patients undergoing chemotherapy can be eliminated by these measures. In this study, patients in the experimental group received targeted nursing in addition to routine nursing. On the one hand, patients' psychological state was improved by the combined psychotherapy and behavioral therapy and other related methods. In this way, their negative emotions such as anxiety, fear, and irritability were relieved. On the other hand, nursing staff actively learned relevant knowledge from the team members and colleagues in the hospital to raise their awareness of sleep quality-related problems in lung cancer patients undergoing chemotherapy. Thereafter, they could provide sleep health education for patients and formulate individualized plan for each patient. The plan was timely reported to the doctor in charge. A management strategy, which was patient-centered and medical staff dominated, was carried out to improve patients' sleep quality. Here, psychological state scores and sleep quality scores in both groups after nursing were lower than those before nursing; what' more, the decrease in the experimental group was more significant when compared with the control group.

Present studies have shown that the reduction and control of physical and psychological symptoms in lung cancer patients undergoing chemotherapy contribute to the improvement of sleep quality. In other words, the sleep quality of lung cancer patients undergoing chemotherapy can be raised through improving their psychological state [21]. It was consistent with our result, indicating that targeted nursing is effective in the improvement of psychological state and sleep disorder. There are two reasons contributing to the result. First, the improvement of psychological state in lung cancer patients undergoing chemotherapy is accompanied by the increase of sleep quality. Second, direct

Table 5. Pain degree

Group	Time	VAS score
Control group (n=44)	On admission	7.8±1.4
	One week after discharge	7.1±1.7*
Experimental group (n=44)	On admission	8.2±1.2
	One week after discharge	3.3±1.1***,###

Note: Compared with that on admission, *P<0.05, ***P<0.001; compared with control group, ###P<0.001. VAS: visual analogue scale.

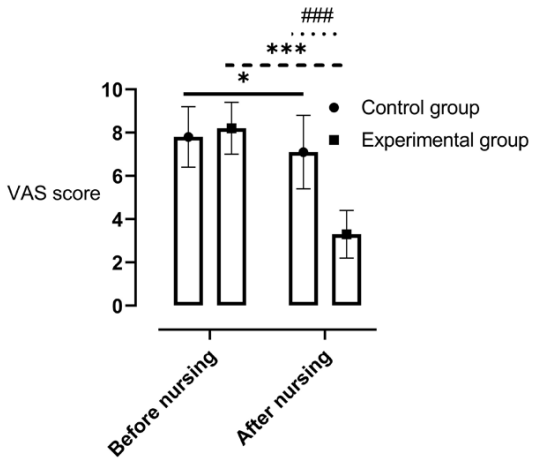

Figure 4. Comparison of VAS score before and after nursing. Compared with that before nursing, *P<0.05, ***P<0.001; compared with control group, ###P<0.001. VAS: visual analogue scale.

intervention of the measures (such as mindfulness decompression) in target nursing improved patients' sleep quality.

Quality of life is also known as survival quality and life quality. Its definition is: the realization and achievement of individual's own goals, standards, expectations, and things they valued, and the satisfaction brought by them. The quality of life is the reflection of good and bad life. Compared with the basic standard of living, the quality of life focuses more on people's senior needs (like spiritual and cultural needs) and satisfaction in the environment. With the continuous progress and development of the nursing model, the ultimate goal of nursing is no longer limited to merely extending the survival time of patients, but improving the life quality of patients. Currently, studies have confirmed that the sleep quality of lung cancer patients undergoing chemotherapy is positively related to many aspects of the quality of life (such as role function, physical function, and cognitive function). The decline of patients' sleep quality often contributes to the decreased quality of life. It means that the quality of life can be raised through the improvement of sleep quality [22, 23]. In our study, sleep quality in the two groups after nursing were increased when compared with before nursing. At the same time, the quality of life scores in both groups were declined. In addition, the decrease of quality of life scores in the experimental group was more significant than that in the control group. These results suggest that targeted nursing is more beneficial for the increase of life quality. With targeted nursing measures, the qualities of sleep and life in lung cancer patients undergoing chemotherapy are both improved, which is consistent with the results reported previously. This might be correlated with the reduced adverse condition, like fatigue, anxiety, and irritability, which were accompanied by the improved sleep disorder.

Pain is one of the most common complications in all cancer patients. There are about 55-57% cancer patients suffering from sleep disorder, which is caused by cancer pain [24]. Pain can not only delay patients' physical and mental recovery, but also decrease their immunity and resistance. What's worse, fatigue and anxiety are developed. Hence, life quality is declined, and a syndrome named pain-fatigue-negative emotions-sleep disorder is developed [25]. Accordingly, it is particularly important to reduce patients' pain degree in clinical nursing. In our study, pain degree in both groups after nursing was lower than that before nursing. Additionally, the decrease of VAS score in the experimental group was more significant than that in the control group. These results indicate that target nursing can reduce the pain degree of lung cancer patients undergoing chemotherapy, which is consistent with the results reported by Li [15]. Meanwhile, our results showed that the relief of pain in both groups was corresponded with the improvement of sleep quality, suggesting that targeted nursing can improve the sleep disorder of lung cancer patients by reducing their pain.

Satisfaction in nursing was acquired through the follow-up investigation. In this way, patients' satisfaction in clinical nursing was understood

Table 6. Satisfaction in nursing

Group	Control group (n=44)	Experimental group (n=44)	χ^2	P
Very satisfied	19	25		
Basically satisfied	15	17		
Dissatisfied	10	2		
Satisfaction in nursing	77.27	95.45	86.001	<0.001

and grasped. By doing so, omissions are checked and vacancies are filled in. The nursing work is thus continuously improved and optimized. In addition, the service concept continues to be deepened. Ultimately, clinical nursing service quality is improved. In our study, satisfaction in nursing in the experimental group was significantly higher than that in the control group, suggesting that targeted nursing is helpful for the increase of satisfaction in nursing. It is also consistent with the results reported by Li [15]. The reason might be that a better trust relationship was established between patients and nursing staff during the process of targeted nursing. As a result, physiological state is improved, sleep disorder is eliminated, cancer pain is reduced, and the quality of life is improved in all aspects.

Due to the limited condition, this study has some shortcomings. First, the sample size is small. Second, the evaluations of patients' sleep quality, life quality, physiological state, and pain degree are relatively single. Subsequent study will be performed in a larger number of patients.

In summary, the application of targeted nursing in lung cancer patients undergoing chemotherapy can improve their sleep quality, life quality, and psychological state, reduce their pain degree, and raise their satisfaction in nursing. It is worthy of further clinical application.

Disclosure of conflict of interest

None.

Address correspondence to: Hongmei Wang, Second Department of Thoracic Cancer, Cancer Hospital of China Medical University, Liaoning Cancer Hospital & Institute, No.44 Xiaoheyan Road, Dadong District, Shenyang 110042, Liaoning Province, China. Tel: +86-18900918236; E-mail: wanghongmei5u2e@163.com

References

[1] Chen WQ, Sun KX, Zheng RS, Zeng HM, Zhang SW, Xia CF, Yang ZX, Li H, Zou XN and He J. Cancer incidence and mortality in China, 2014. Chin J Cancer Res 2018; 30: 1-12.

[2] Gao K, Lai Y, Huang J, Wang YF, Wang XW and Che GW. Preoperatiove airway bacterial colonization: the missing link between non-small cell lung cancer following lobectomy and postoperative pneumonia? Chin J Lung Cancer 2017; 20: 239-247.

[3] Lehto RH. Lung cancer screening guidelines. The nurse's role in patient education and advocacy. Clin J Oncol Nurs 2014; 18: 338-342.

[4] Park YS, Lee J, Keum B and Oh BM. Feasibility of an eight-week outpatient-based pulmonary rehabilitation program for advanced lung cancer patients undergoing cytotoxic chemotherapy in Korea. Thorac Cancer 2018; 9: 1069-1073.

[5] Wu XN, Su D, Li HP, Wang WL, Wu WQ, Yang YJ, Yu FL and Zhang JP. Relationship between the depression status of patients with resectable non-small cell lung cancer and their family members in China. Eur J Oncol Nurs 2013; 17: 668-672.

[6] Morgensztern D, Campo MJ, Dahlberg SE, Doebele RC, Garon E, Gerber DE, Goldberg SB, Hammerman PS, Heist RS, Hensing T, Horn L, Ramalingam SS, Rudin CM, Salgia R, Sequist LV, Shaw AT, Simon GR, Somaiah N, Spigel DR, Wrangle J, Johnson D, Herbst RS, Bunn P and Govindan R. Molecularly targeted therapies in non-small-cell lung cancer annual update 2014. J Thorac Oncol 2015; 10: S1-S63.

[7] Dean GE, Ziegler P, Chen H, Steinbrenner LM and Dickerson SS. Trajectory of insomnia symptoms in older adults with lung cancer: using mixed methods. Support Care Cancer 2019; 27: 2255-2263.

[8] Barre PV, Padmaja G, Rana S and Tiamongla. Stress and quality of life in cancer patients: medical and psychological intervention. Indian J Psychol Med 2018; 40: 232-238.

[9] Lee JL and Jeong Y. Quality of life in patients with non-small cell lung cancer. Cancer Nurs 2018; 42: 475-483.

[10] Yang C, Hsiao L, Tu Y, Lee H, Lin P and Su C. 0399 dysfunctional sleep beliefs in cancer-related insomnia. Sleep 2017; 40: A148-A149.

[11] Tomlinson D, Diorio C, Beyene J and Sung L. Effect of exercise on cancer-related fatigue: a meta-analysis. Am J Phys Med Rehabil 2014; 93: 675-686.

[12] Gotts ZM, Newton JL, Ellis JG and Deary V. The experience of sleep in chronic fatigue syndrome: a qualitative interview study with patients. Br J Health Psychol 2016; 21: 71-92.
[13] Shen YM, Zhang XL and Ma MY. Application of targeted nursing intervention in patients with non-small cell lung cancer undergoing thoracoscopic surgery. China Mod Doct 2019; 57: 161-163, 168.
[14] Sun Y. Exploring the effects of targeted nursing intervention on non-small cell lung cancer patients treated with thoracoscopic surgery. Smart Healthcare 2019; 5: 79-80.
[15] Li X. Effect of target nursing mode for patients with lung cancer underwent chemotherapy. J Clin Med Pract 2018: 22: 14-17.
[16] Zernicke KA, Campbell TS, Speca M, McCabe-Ruff K, Flowers S and Carlson LE. A randomized wait-list controlled trial of feasibility and efficacy of an online mindfulness-based cancer recovery program: the etherapy for cancer applying mindfulness trial. Psychosom Med 2014; 76: 257-267.
[17] Daroff RB. The international classification of sleep disorders: diagnostic and coding manual. Neurology 1991; 41: 160-160.
[18] Hoang HTX, Molassiotis A, Chan CW, Nguyen TH and Nguyen LV. New-onset insomnia among cancer patients undergoing chemotherapy: prevalence, risk factors, and its correlation with other symptoms. Sleep Breath 2020; 24: 241-251.
[19] Kaous M, Balachandran D, Pacheco G, Murphy V, Knox A, Bashoura L and Faiz S. Sleep disorders in lung cancer. Chest 2017; 152: A1075.
[20] Gu F, Li XF, Xu JF, Gao GH, Wu YF and Zhou CC. Effect of nicotine dependence on quality of life and sleep quality in patients with lung cancer who continue to smoke after diagnosis. J Thorac Dis 2018; 10: 2583-2589.
[21] Mercadante S, Adile C, Ferrera P, Masedu F, Valenti M and Aielli F. Sleep disturbances in advanced cancer patients admitted to a supportive/palliative care unit. Support Care Cancer 2017; 25: 1301-1306.
[22] Erickson JM, Beck SL, Christian BR, Dudley W, Hollen PJ, Albritton KA, Sennett M, Dillon RL and Godder K. Fatigue, sleep-wake disturbances, and quality of life in adolescents receiving chemotherapy. J Pediatr Hematol Oncol 2011; 33: e17-e25.
[23] Mercadante S, Aielli F, Adile C, Ferrera P, Valle A, Cartoni C, Pizzuto M, Caruselli A, Parsi R, Cortegiani A, Masedu F, Valenti M, Ficorella C and Porzio G. Sleep disturbances in patients with advanced cancer in different palliative care settings. J Pain Symptom Manage 2015; 50: 786-792.
[24] Mercadante S, Girelli D and Casuccio A. Sleep disorders in advanced cancer patients: prevalence and factors associated. Support Care Cancer 2004; 12: 355-359.
[25] Steffen L, Cheavens J, Vowles K and Smith Bw. Goal cognitions, fatigue, pain, and functional wellbeing in lung cancer patients. Ann Behav Med 2018; 50: S214.