

ORIGINAL RESEARCH

A Novel Model to Prevent Venous Thromboembolism in Patients with Lung Cancer

Xinni Wu, BM; Biling Lin, BM; Haiyi Zhu, BM

ABSTRACT

Objective • To observe the effect of nurse-patient co-management mode on preventing venous thromboembolism (VTE) in lung cancer patients with carboplatin and gemcitabine chemotherapy after peripheral venipuncture central venous catheterization (PICC).

Methods • 100 patients with lung cancer admitted to the 2nd Affiliated Hospital of Hainan Medical University from April 2020 to April 2022 were selected. All patients received a combination chemotherapy of carboplatin and gemcitabine and PICC catheterization. The patients were divided into an observation group and a control group by 1:1 simple random method, with 50 cases in each group. Patients in the control group were given routine nursing for lung cancer, and patients in the observation group were treated with nurse-patient co-management mode, and nursing intervention lasted for 2 months. General Comfort Questionnaire, self-management ability, quality of life, Self-care ability Scale, self-rating Anxiety Scale (SAS), and self-rating depression Scale were compared before and after intervention between the two groups. The recovery of immune ability indices (CD3+, CD3+CD4+, CD3+CD8+, CD3+CD4+/CD3+CD8+) in 2 groups were detected. Complications after PICC catheterization were recorded in the two groups.

Results • After nursing, self-rating depression Scale and self-rating Anxiety Scale scores in both groups were significantly decreased, which were lower in the observation group than the

control group ($P < .001$). After nursing, scores of self-concept, self-responsibility, self-care skills, and health knowledge level were significantly increased in both groups, which were higher in the observation group than control group ($P < .001$). After nursing, scores on the General Comfort Questionnaire, self-management scale, and quality of life were increased in both groups, which were higher in the observation group than control group ($P < .0501$). After nursing care, the immune competence indices of both patients increased significantly, and the immune indexes of CD3+, CD3+CD4+, and CD3+ CD4+/CD3+CD8+ in the observation group were significantly higher than those in the control group ($P < .05$). The total incidence of complications in the observation group was significantly lower than that in the control group (8.00% vs. 26.00%, $P < .001$), and the incidence of venous thromboembolism was significantly lower than that in the control group (2.00% vs. 14.00%, $P < .001$).

Conclusion • The nurse-patient co-management model has shown to be effective in reducing the incidence of venous thromboembolism in patients who have undergone PICC catheterization while receiving carboplatin and gemcitabine chemotherapy. This model also helps patients improve their self-care and self-management abilities, alleviates adverse psychological effects, and contributes to the recovery of their immune system. (*Altern Ther Health Med.* [E-pub ahead of print.]

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INTRODUCTION

Lung cancer is often characterized by cough, expectoration, hemoptysis, shortness of breath, and other symptoms, with high morbidity and high mortality.¹ For some patients, the disease has developed into the middle and

late stage when they are diagnosed, and the best time for surgery has been missed. Therefore, chemotherapy is needed to prolong the survival period of patients.² The combination of carboplatin and gemcitabine is a first-line treatment for lung cancer, which has the advantages of precise curative effect with less toxicity and side effects.³ But studies have shown that⁴ the infusion of chemotherapy drugs will stimulate blood vessels, causing phlebitis and affecting the prognosis of patients. Peripherally Inserted Central Catheter (PICC) is usually performed through the peripheral elbow vein, and the catheter is inserted so that it can reach the large vein close to the right atrium, and then the catheter is used for infusion, which can prevent drugs contact with the surface patient's vein causing vein damage. It has the advantages of simple operation, safety, and low cost, and has been widely used in oncology.^{5,6} However, due to a lack of relevant nursing knowledge, some patients are prone to

infection and venous thromboembolism (VTE), which not only increases the medical cost of patients but also seriously delays the chemotherapy process of patients. Therefore, in order to reduce the occurrence of related complications, PICC catheterization management should be strengthened. Nurse-patient co-management mode is a mode in which nurses and patients participate in management, which can improve patients' enthusiasm for treatment and self-care ability.⁷ "Management" refers to the management and care of PICC catheters. Specifically, it refers to the clinical management and care of an inserted central venous catheter (PICC). Lung cancer's severity and the need for chemotherapy are compelling reasons to enhance the management of complications like phlebitis arising from chemotherapy infusion. Peripherally Inserted Central Catheter (PICC) insertion offers a safer alternative, but lacks nursing expertise can lead to infections and VTE, disrupting treatment.

Despite advancements in carboplatin and gemcitabine chemotherapy for lung cancer, complications like venous thromboembolism (VTE) during PICC catheterization remain challenging. This study investigates the impact of nurse-patient co-management on preventing VTE in carboplatin and gemcitabine-treated patients with PICC catheters, aiming to enhance patient safety and care.

PATIENTS AND METHODS

Patients

A total of 100 lung cancer patients admitted to our hospital from April 2020 to April 2022 were selected. The 1:1 simple randomization method was used to divide into observation and control groups, with 50 cases in each group. In the observation group: the ratio of male to female was 28:22, the age was (57.26±4.35) years, the ratio of adenocarcinoma, squamous carcinoma, and small cell carcinoma in the tumor type was 15:26:9, and the ratio of stage I, II, III, and IV in the tumor staging was 8:10:19:13. In the control group: the ratio of male to female was 30:20, the age was (57.37±4.41) years, the ratio of adenocarcinoma, squamous carcinoma and small cell carcinoma was 14:24:12, and the ratio of stage I, stage II, stage III and stage IV in the tumor was 7:12:21:10. There was no significant difference in the comparison of age, gender, disease stage and type between the two groups ($P > .05$). The hospital ethics committee reviewed and approved the content of this study.

Inclusion and Exclusion criteria

Inclusion criteria set as follows: 1) all met the relevant diagnostic criteria for lung cancer⁸; 2) All patients were treated with carboplatin + gemcitabine regimen and PICC catheterization chemotherapy; 3) The expected survival after chemotherapy ≥ 6 months; 4) Patients and their families agreed with the content of this study.

Exclusion criteria set as follows: 1) Patients combined with malignant tumors other than lung cancer; 2) There were liver and kidney function lesions; 3) There was infection at the puncture site; 3) Patients with blurred consciousness and

communication difficulties; 4) Abnormal coagulation function existed; 5) There were patients with a history of VTE.

Methods

Patients in both groups received a combination of carboplatin (manufacturer: Qilu Pharmaceutical Co., LTD., Approval No: National Drug Approval H20020181) and gemcitabine [manufacturer: Qilu Pharmaceutical (Hainan) Co., LTD., Approval No.: National drug Approval H20113285] chemotherapy. Carboplatin was administered via intravenous drip after being dissolved in 5% glucose solution (250-500 ml). The dosage was determined based on body surface area, with a range of 200-400 mg/m². This administration was repeated every 3-4 weeks for a total of 2 cycles. For gemcitabine, the dosage was 1000 mg/m² and it was administered through intravenous infusion over a period of 30 minutes. This infusion was conducted once a week for 3 consecutive weeks, followed by a one-week rest period. This entire cycle was repeated every four weeks.

The control group received routine nursing for lung cancer. (1) At admission, the nurses introduced the causes of lung cancer, chemotherapy methods, purposes, nursing, and the necessity of PICC catheterization in detail in the form of multimedia, pictures, and manuals, and informed the patients of the specific operation process of PICC catheterization to relieve their tension. When catheterization was implemented, the patient was instructed to take the position of leaning head to shoulder to assist the nurse in catheterization. (2) After catheterization, the patient was informed to reduce activities within 4 hours, avoid using the arm for vigorous activities, and the patient was instructed to observe whether the skin at the puncture site was bleeding, exudation, swelling, and other phenomena. Before and after the infusion of carboplatin + gemcitabine, 20 ml of normal saline was used to flush and seal the tube. (3) Psychology: nurses should pay close attention to patients' mental health and provide timely support and intervention for those experiencing negative emotions. They can share their anti-cancer experience with patients who had recovered well in the past to relieve the negative emotions of patients. (4) Discharge: The nurse instructed the patient to maintain the PICC regularly, observe the skin condition at the puncture site, and seek medical advice in case of any abnormality.

The observation group received nurse-patient co-management mode. (1) Nurse-patient co-management team was established: the team members included an attending doctor, a charge nurse, a nurse, and a responsible nurse, with the head nurse as the leader. Team members jointly developed targeted nursing programs according to the characteristics of patients' conditions, and informed patients and their families. If there is dissatisfaction, the program can be adjusted and replaced after friendly communication to ensure the nursing effect and recognition of patients. During the whole nursing period, the responsible nurse was responsible for the daily nursing work, assisted by the head nurse, and the head nurse checked irregularly. (2) Before

catheterization: The responsible nurse actively communicated with patients and their families. They explained the purpose and significance of the nurse-patient co-management mode, and instructed them on how to participate. If there were any questions during the period, patients or their families could directly raise them to ensure their willingness to participate and promote active cooperation throughout the process. After assessing the mental health level of the patients, the nurse timely eliminated anxiety and depression. They encouraged patients to face their illness positively and maintain a good attitude. By doing so, the nurse was able to establish a good relationship with the patient and their family. Patients and their families were guided to build confidence in disease recovery through video treatment and typical case presentations, and patients' families were encouraged to actively participate in chemotherapy. Lung cancer related knowledge education, introducing the pathogenesis of lung cancer, clinical symptoms, chemotherapy drugs, plans and nursing, the importance of PICC catheter, answering questions raised by patients. (2) During catheterization: The operation was conducted strictly according to the technical specifications of catheterization, the puncture vessels were rationally selected, psychological counseling to patients was provided. (3) After catheterization: individual nursing plans were discussed with patients and their families, such as complications, diet, and posture guidance, and patients were informed to directly raise questions to team members if they had any questions. After catheterization, the catheter tip was determined by X-ray film. If there was an ectopic, it should be adjusted in time. Family members were instructed to massage the patient's lower limbs from bottom to top, each leg was massaged for 5 min, and it was performed every 30 min within 3 hours after catheterization. The patient was instructed to perform deep breathing exercises every 10 minutes. one day after catheterization, the dressing was changed at the puncture site, and blood ooze was observed at the site. Meanwhile, patients were instructed to clench their fists, which were held for 5-10 s and released 15-20 min/time. two days after catheterization, the fist-clenching time was extended, and wrist rotation training was increased at the same time, 15 min/ time, twice/day. On the third day, the puncture site was gently pressed of the patient to perform flexion and extension training of the elbow joint, bending and extension in groups, 10 groups/time, 2 times/day. Ankle pump exercise, quadriceps femoris exercise, and straight leg raising exercise were performed twice a day within one week. During the period, the position of patients was adjusted with limited activities in time, and attention was paid to the warmth of limbs. PICC maintenance was routinely performed once a week, with pipes properly fixed and patients instructed to measure bilateral arm diameters regularly. Patients were told to eat a light diet, eat more fresh fruits and vegetables, and drink more water if the condition permits; repeated puncture of the same vessel was avoided. The head nurse asked the opinions of patients and family members from time to time,

communicated with doctors on time, managed and improved relevant measures together under the premise of ensuring patient safety. (4) Upon discharge: The responsible nurse set up a WeChat group chat, invited patients and their families to join in, pushed one piece of relevant knowledge about lung cancer or PICC care every week, and encouraged patients to share better lateral limb exercise methods to prevent complications. At the same time, the patient was instructed to regularly flush, seal and maintain the PICC, the local skin status was observed, whether there was rash, redness, etc., the family members were told to supervise, give feedback on the relevant content of the patient through WeChat group. During the period, if there was any problem that was difficult to solve, the nursing staff was asked for help in time, and the doctor's advice was followed to take medicine on time and return visit on time.

Both groups continued nursing intervention for 2 months.

Observation Indicators

To assess changes in mental health, self-protection ability, comfort, self-management, and quality of life, the following observational measures were used. Mental station: Self-rating Anxiety Scale (SAS) and self-rating Depression Scale (SDS) were used before and 2 months after intervention, respectively.⁹ SAS includes 20 items, which were divided into 50 points based on the scoring method of 1-4 points. The higher the score was, the more serious the anxiety degree was. SDS included 20 items and used a scale of 1 to 4, with 53 being the borderline. The higher the score, the more severe the depression. The Cronbach's α of the scale were 0.777 and 0.782, respectively

Self-protection ability: Exercise of Self-Care Agency Scale (ESCA)¹⁰ was used to evaluate the self-care ability of patients before intervention and 2 months after the intervention, the scale included 9 items, 8 items, 12 items, and 14 items of self-concept, self-responsibility, self-care skills, and health knowledge level respectively, all using 0-4 points scoring method, the total score was 0-172 points, the higher the score, the stronger the self-care ability of patients. The Cronbach's α of the scale was 0.950.

Comfort, self-management, and quality of life: Before and 2 months after intervention, the General Comfort Questionnaire (GCQ) was taken.¹¹ Self-management Scale and Life Quality Score (QOL) made by our department¹² in order to assess patient comfort, self-management, and quality of life. GCQ consisted of 28 items, including physical, psychological, social, and environmental aspects. They were scored by 1-4 grading method, representing "strongly disagree" to "strongly agree" respectively, with a full score of 112. The higher the score, the higher the comfort level of patients. Cronbach's α of this scale was 0.881. Self-management scale: 10 aspects including disease symptom management, cognitive behavior management, and exercise management were scored by 0-5 points. The higher the score was, the stronger the patient's self-management was.

Cronbach's α of this scale was 0.724. QOL: including 12 items, 0~5 points scoring method, full score was 0~60 points, score was positively correlated with patient's quality of life. The Cronbach's α of the scale was 0.922.

To assess the effectiveness of the nursing intervention on the immune recovery of patients, the following indices were measured. Index of immunity recovery: 2~4 mL of peripheral blood were collected before and after different nursing interventions. 100 uL of peripheral blood was taken, human lymphocyte subsets were incubated for 30 min to detect antibodies, and 1mL of erythrocyte lysate was added to lysate erythrocytes. After centrifugation and washing, cells were collected, and the proportion of immune T lymphocyte subsets in the peripheral blood of each patient was detected by flow cytometry: T lymphocyte (CD3+), helper/inducer T lymphocyte (CD3+ CD4+), inhibitory/cytotoxic T lymphocyte (CD3+CD8+), and the ratio of CD3+CD4+/CD3+CD8+ was used to reflect the level of immune ability of the patient.

In addition to the primary outcome, the following complications were recorded during the intervention period. Complications: VTE, infection, catheter displacement, and bleeding at puncture site were recorded during the intervention.

Statistical analysis

SPSS version 22.0 statistical software was used for data processing in this study. Statistical data, such as complications, gender, disease type and stage, were presented as [cases (%)], and χ^2 was used. GCQ, QOL, SDS, ESCA, SAS, CD3+, CD3+CD4+, CD3+CD8+, AND CD3+CD4+/CD3+CD8+ all met the normal distribution, expressed as mean \pm variance ($\bar{x} \pm s$). Two-sample independent t test was used to compare the differences between the two groups. Paired t -test was used to compare the differences between the two groups before and after the intervention, and $P < .05$ was used to indicate statistically significant differences.

RESULTS

Comparison of mental states between the two groups

Compared with before nursing, SDS and SAS scores of the two groups after nursing were significantly decreased, and the observation group was lower than the control group ($P < .05$). See Table 1.

Comparison of self-care ability between the two groups

After nursing, the scores of self-concept, self-responsibility, self-care skills, and health knowledge in the 2 groups were

Table 1. Comparison of psychological state scores between the two groups ($\bar{x} \pm s$, points)

Group	Number of cases	SDS		SAS	
		Pre-nursing	Post-nursing	Pre-nursing	Post-nursing
Observation group	50	55.32 \pm 5.21	26.75 \pm 3.82 ^a	52.34 \pm 5.28	23.19 \pm 3.17 ^a
Control group	50	55.48 \pm 5.15	31.69 \pm 3.50 ^a	52.71 \pm 5.39	35.24 \pm 3.22 ^a
t		0.154	6.742	0.347	18.857
P value		.878	<.001	.730	<.001

^a $P < .05$, compared with the group before nursing

Table 2. Comparison of self-care ability between the two groups ($\bar{x} \pm s$, points, n=50)

Group	Self concept		Sense of self		Self-care skills		Health knowledge level	
	Pre-nursing	Post-nursing	Pre-nursing	Post-nursing	Pre-nursing	Post-nursing	Pre-nursing	Post-nursing
Observation group	21.36 \pm 3.71	30.76 \pm 2.18 ^a	18.63 \pm 2.94	27.45 \pm 2.31 ^a	26.33 \pm 2.61	35.09 \pm 3.27 ^a	30.39 \pm 3.41	44.37 \pm 3.28 ^a
Control group	21.71 \pm 3.42	25.84 \pm 2.11 ^a	18.55 \pm 2.87	23.16 \pm 2.25 ^a	26.85 \pm 2.54	30.48 \pm 3.60 ^a	30.44 \pm 3.08	40.51 \pm 3.07 ^a
t	0.490	11.467	0.138	9.408	1.010	6.703	0.078	6.075
P value	.625	<.001	.891	<.001	.315	<.001	.939	<.001

^a $P < .05$, compared with the group before nursing

Table 3. Comparison of comfort, self-management and quality of life between the two groups ($\bar{x} \pm s$, score, n = 50)

Group	GCQ		Self-management scale		QOL	
	Pre-nursing	Post-nursing	Pre-nursing	Post-nursing	Pre-nursing	Post-nursing
Observation group	64.58 \pm 5.23	86.94 \pm 6.54 ^a	21.07 \pm 2.56	32.19 \pm 2.75 ^a	32.89 \pm 3.06	46.71 \pm 2.18 ^a
Control group	64.47 \pm 5.12	73.59 \pm 6.17 ^a	21.01 \pm 2.43	28.95 \pm 2.64 ^a	32.65 \pm 3.82	41.87 \pm 2.39 ^a
t	0.106	10.499	0.120	6.010	0.347	10.580
P value	.916	<.001	.905	<.001	.730	<.001

^a $P < .05$, compared with the group before nursing

significantly increased, and the observation group was higher than the control group ($P < .05$). See Table 2.

Comparison of comfort level, self-management, and quality of life between the two groups

Initially, both groups demonstrated similar levels of comfort, self-management, and quality of life. Before nursing, there were no significant differences in GCQ, self-management scale, and QOL score between 2 groups ($P > .05$), after nursing, GCQ, self-management scale, and QOL score in 2 groups were increased, and the observation group was higher than the control group ($P < .05$). See Table 3.

Comparison of the recovery of immune capacity between the two groups

Before nursing, there was no significant difference in immune function indexes (PROPORTION of CD3+, CD3+CD4+, CD3+CD8+ cell subsets and ratio of CD3+CD4+/CD3+CD8+) between 2 groups ($P > .05$). After nursing, proportion of CD3+, CD3+CD4+, CD3+CD4+ cell subsets and ratio of CD3+CD4+/CD3+CD8+ in 2 groups were increased, and the proportion of CD3+CD4+ cell subsets and ratio of CD3+CD4+/CD3+CD8+ in observation group were higher than those in control group ($P < .05$). The nursing intervention resulted in significant improvements in self-concept, self-responsibility, self-care skills, and health knowledge among participants. See Table 4 and Figure 1.

Table 4. Comparison of the recovery of immune cell subsets between the two groups ($\bar{x} \pm s$, n = 50)

Group	CD3+T lymphocytes		CD3+CD4+T lymphocytes		CD3+CD8+T lymphocytes		CD3+CD4+ / CD3+CD8+	
	Pre-nursing	Post-nursing	Pre-nursing	Post-nursing	Pre-nursing	Post-nursing	Pre-nursing	Post-nursing
Observation group	50.45±5.52	75.85±6.37 ^{ab}	28.75±3.85	45.05±4.24 ^a	24.64±2.83	33.84±3.82 ^a	0.85±0.21	1.32±0.13 ^{ab}
Control group	51.66±4.98	66.44±5.86 ^a	28.06±3.11	35.10±4.61 ^a	25.15±2.67	30.23±3.79 ^a	0.88±0.18	1.21±0.12 ^a
t	0.338	7.275	0.257	6.141	0.454	6.157	0.467	5.462
P value	.427	<.001	.136	<.001	.422	<.001	.158	<.001

^aP < .05, compared with the group before nursing

^bP < .05, compared with the control group

Comparison of complication rate between the two groups

The incidence of complications in the observation group was lower than that in the control group (8.00% vs. 26.00%) (P < .05), and the incidence of VTE was 2.00%, which was significantly lower than that in control group (14.00%) (P < .05). See Table 5.

DISCUSSION

Carboplatin + gemcitabine is often used in clinical chemotherapy for lung cancer patients. The use of PICC can prevent the direct contact of chemotherapy drugs with blood vessels, which increases safety and has been widely used in clinical practice.¹³ However, improper maintenance of PICC will lead to phlebitis, VTE, infection, and other complications, causing great pain to patients. The nurse-patient co-management model can formulate the corresponding nursing plan according to the actual situation of patients, and guide the patients’ families, so as to mobilize the enthusiasm and initiative of patients, give full play to the potential of patients and their families so that patients can obtain self-care skills to the greatest extent, and promote health recovery.¹⁴

Due to patients’ lack of knowledge of PICC catheterization, concerns about the operator’s skills, pain during the puncture, and the need for long-term indwelling, patients will be overly nervous, resulting in anxiety and depression.¹⁵ In this study, SAS and SDS scores of the observation group after nursing were lower than those of the control group, suggesting that the nurse-patient co-management mode can improve the adverse psychological state of patients with PICC catheterization after carboplatin and gemcitabine chemotherapy. It may be because the nursing staff explained the knowledge related to lung cancer and PICC catheterization to patients, so as to reduce the patients’ bad mood due to the lack of understanding of nursing knowledge; and help patients and their families to build confidence in good recovery through video therapy and typical cases. Patients were kept in positive and optimistic state of mind despite their illness. At the same time, nursing staff paid attention to patients’ mental health levels from time to time, timely relief and counseling are conducive to the elimination of bad emotions. Research shows that ¹⁶ the improvement of the self-care ability of tumor patients has a positive effect on improving their quality of life. In this study, the score of the self-care ability of patients in the observation group was significantly higher than that in the control group, suggesting that the nurse-patient co-management model can improve the self-care ability of patients with lung cancer. This

Figure 1. Flow cytometry was used to detect the recovery of immune T cell subsets in peripheral blood of each group before and after nursing

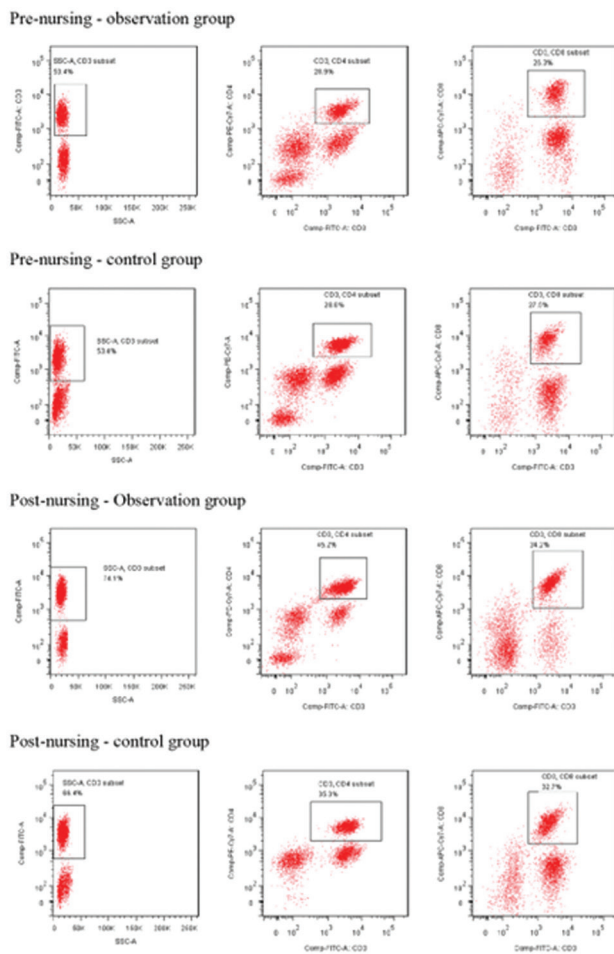


Table 5. Comparison of incidence of complications between the two groups [Cases (%), n = 50]

group	The puncture site oozes blood	Catheter displacement	VTE	infective	Complication rate
Observation group	0 (0.00)	1 (2.00)	1 (2.00)	2 (4.00)	4 (8.00)
Control group	2 (4.00)	1 (2.00)	7 (14.00)	3 (6.00)	13 (26.00)
t					5.741
P value					.017

may be due to the fact that nursing methods are jointly formulated and implemented by patients and group members, which can increase daily nursing interaction, establish a good nurse-patient relationship, and enhance self-care skills. During the nursing period, patients participated in the whole

process, deepened their cognition of the disease, and had a deep understanding of the purpose and significance of each operation step, understood the necessity of PICC catheterization and nursing, and improved their self-care skills. In addition, the group members timely adjusted and modified the nursing method according to the opinions of patients, which was conducive to the enhancement of patients' self-concept.

In this study, the GCQ, self-management scale, and QOL score of the observation group were significantly higher than those of the control group, suggesting that this model was conducive to the improvement of patients' comfort level, self-management ability, and quality of life. It may be because the nurse-patient co-management mode arouses the subjective initiative of patients and their family members, which helped patients to establish the awareness of mutual cooperation and improve their self-management ability.¹⁷ Nursing staff guided patients to observe the condition of skin puncture, regularly measured the diameter of bilateral arms, and carried out tube washing, sealing, and maintenance of PICC. This active participation helped improve patients' self-management ability and quality of life. In addition, proper storage of catheters and reasonable selection of puncture vessels played a positive role in improving the comfort level of patients. When lung cancer patients receive chemotherapy, their immunity will be significantly affected, and the recovery of patients' immunity will contribute to the therapeutic effect, studies have proved that reasonable nursing is more conducive to the recovery of patients' immune ability. In this study, the proportion of CD3+, CD3+CD4+ cell subsets and the ratio of CD3+CD4+/CD3+CD8+ in the observation group were significantly higher than those in the control group, indicating that the immune capacity of patients in the observation group had better recovery effect, which may be related to the nurse-patient co-management mode in the observation group is more conducive to improving patients' confidence and psychological state. After PICC catheterization, patients' activities are reduced and blood flow slows down, which increases the risk of VTE.¹⁸ In this study, the incidence of VTE in the observation group was 2.00%, which was significantly lower than that in the control group (14.00%), and the incidence of total complications was also significantly lower than that in the control group, suggesting that the nurse-patient co-management mode can reduce the incidence of complications such as VTE, possibly by instructing patients to conduct fist clenching training, wrist rotation training, ankle pump exercise, quadriceps femoris exercise, straight leg raising exercise and limb massage, and low and light diet during the nursing period, which can effectively promote the systemic blood circulation of patients and improve the blood hypercoagulability state to prevent THE occurrence of VTE and reduce the risk of complications.

CONCLUSION

In conclusion, in lung cancer patients who received PICC catheterization of carboplatin and gemcitabine

chemotherapy, the adoption of nurse-patient co-management mode for prevention can improve patients' self-care ability and quality of life, enhance their self-management ability, promote the recovery of immune ability, and reduce the incidence of VTE.

CONFLICT OF INTERESTS

The authors declared no conflict of interest.

AUTHOR CONTRIBUTIONS

XW and BL contributed equally to this work. XW, BL and HZ designed the study and performed the experiments, XW and BL collected the data, HZ analyzed the data, XW, BL and HZ prepared the manuscript. All authors read and approved the final manuscript.

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This study did not receive any funding in any form.

ETHICAL COMPLIANCE

This study was approved by the ethics committee of the 2nd Affiliated Hospital of Hainan Medical College. Signed written informed consents were obtained from the patients and/or guardians.

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