

Original Article

Application of continuous nursing intervention for patients with PICC catheterization undergoing tumor chemotherapy

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Abstract: Objective: To explore the effect of continuous nursing service on the self-care agency score, catheter indwelling time, on-time maintenance ratio, and patients' complication rates with tumor chemotherapy PICC catheterization. Methods: According to the nursing methods, a total of 90 cancer patients undergoing chemotherapy in our hospital from July 2018 to July 2020 were divided into an observation group (n=45) and a control group (n=45). The control group received conventional nursing care; which was also given to the observation group in addition to continuous nursing service. The ES-CA score, catheter indwelling time, on-time maintenance ratio, compliance, complication rate, and nursing satisfaction were compared after 3 months. Results: Before care, there was no significant difference in self-care responsibility, self-concept, self-care skills, and health knowledge between the two groups ($P>0.05$), while these indexes of the observation group aftercare were significantly higher than in the control group ($P<0.05$). The catheter indwelling time of the observation group was longer, and its proportion of on-time maintenance was also significantly greater in comparison with the control group. The difference was statistically significant ($P<0.05$). The compliance rate Aftercare in the observation group was 95.6%, substantially higher than that of the control group (77.78%, $P<0.05$). The complication rate of the observation group was 6.67%, significantly lower than 26.67% in the control group, and the difference was statistically significant ($P<0.05$). The nursing satisfaction rate of the observation group was 97.78%, which was significantly higher than that of the control group (80.00%, $P<0.05$). Conclusion: Continuous nursing intervention for patients undergoing tumor chemotherapy with PICC catheterization can promote their self-management agency, prolong the PICC catheterization time, reduce the incidence of complications, improve treatment compliance and nursing satisfaction; therefore, it is worthy of promotion and application.

Keywords: Continuing nursing service, chemotherapy, cancer patients, self-care agency score, catheter indwelling time

Introduction

The malignant tumor is the most common disease endangering human life at present, of which the global morbidity and mortality are increasing annually [1]. In recent years, with continuous clinical research and exploration, peripheral inserted central catheter (PICC) technology has been recognized by a majority of medical workers and widely used in clinical departments of hospitals at all levels [2]. Since this treatment is an invasive operation, there are also certain risks in its implementation [3], such as improper nursing care and easy forma-

tion of deep vein thrombosis in the later stage, which not only affects the health of patients but also causes a specific economic burden on their families. Therefore, it is essential to supplement with necessary nursing intervention. Conventional nursing has been used a lot in past clinical practice, but it can no longer meet the needs of patients. Since long-term hospitalization of patients will increase their psychological burden and economic pressure, most of them are discharged after their condition is stable. Once a patient is released, the nurse-patient relationship ends. Generally, the nursing staff will briefly introduce relevant matters

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for attention, but the patient's eating and living habits after discharge will substantially impact his/her condition [4]. Continuing nursing is mainly performed to extend nursing services from hospitals to patients' families to ensure the continuity and coordination of patients' care and benefits [5]. At present, there are few reports on the application of continuing nursing service in patients with tumor chemotherapy with PICC catheterization. Therefore, 90 tumor patients undergoing chemotherapy in our hospital from July 2018 to July 2020 were selected to observe the application effect of continuing nursing services. The report is as follows.

Material and methods

General materials

A total of 90 tumor patients receiving chemotherapy in our hospital from July 2018 to July 2020 were chosen as study subjects. Inclusion criteria: (1) Patients with malignant tumors diagnosed by imaging and pathological examination; (2) Conscious and able to actively cooperate to complete the catheterization; (3) Complete clinical data; (4) Signed informed consent. Exclusion criteria: (1) Patients with coagulation dysfunction; (2) Patients with other severe organ diseases; (3) Patients with brain metastasis and mental illnesses. This study was approved by the Ethics Committee of our hospital.

According to different nursing methods, the subjects were divided into an observation group and a control group with 45 patients in each group. There were 21 males and 24 females in the observation group aged between 42-72 years, the average age being (57.94 ± 10.13) years. Types of diseases: lung cancer (16 cases), breast cancer (13 cases), gastric cancer (9 cases), cervical cancer (4 cases), and other 3 cases. Education level: 16 cases of junior middle school, 20 cases of senior high school, 9 cases of junior college or above. In the control group, there were 20 males and 25 females aged between 40-70 years, the average age being (57.90 ± 10.16) years. Types of diseases: 15 cases of lung cancer, 15 cases of breast cancer, 9 cases of gastric cancer, 4 cases of cervical cancer, and 2 other cases. Education level: 14 cases of junior high school, 23 cases of senior high school, 8 cases of junior college or above. The compari-

son of general data between the two groups showed no statistically significant difference ($P > 0.05$).

Methods

The control group received routine nursing care and health education when they were in the hospital. Patients were informed regularly and were assisted to go through the discharge procedures. Care workers informed them of relevant matters they need to be aware of. They were guided to follow the doctor's advice to take medicine, have good nutritional support, and pay attention to strengthening exercise, and so on.

The observation group received continuing care services in addition to the care provided in the control group. ① We established a continuing nursing team. The team consisted of 16 members, including 1 physician in charge, 1 leader, 2 nurses, 5 nurses with PICC operation qualifications, and 7 PICC nurses. The group leader carried out clinical nursing and PICC training, and the nurses with PICC operation qualification carried out catheterization. The other nurses were in charge of creating and evaluating information files, health education, catheterization education and catheter maintenance, etc. In this way, patients received more standardized nursing services. ② Whole-course tracking system. The whole process of patient catheterization was determined and tracked, including pre-catheterization consultation, evaluation, health education, PICC catheterization, and knowledge recognition of patients and their families. When the patients were discharged from the hospital, the nursing staff issued the contact information of the competent physician or the nurse to the patients and instructed them to sign the informed consent of follow-up in ways of telephone call and text message. ③ Inpatient care. A sound evaluation system and pre-catheterization consultation system were established to launch the health education during catheterization. Inform patients of the significance and risks, and answer their questions. The group leader arranged the working shifts according to the catheterization situation of the department; the catheter received maintenance at least once a week. The local skin cleaning, application of the catheter, and the depth of the catheter were record-

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ed in detail. ④ Care after catheterization. It was ensured that the catheter fit well and the skin adhesive film was also well fit, and the publicity and education for the patients and their families was strengthened to explain the situation of catheter prolapse and matters to be noted and patients were asked to reduce activities. ⑤ Discharge instructions. In order to understand the patient's physical conditions and uncomfortable symptoms after discharge, telephone follow-up began on the first day after discharge. Then telephone follow-up was conducted every 7 days to understand the adverse reactions of the patients, to solve their questions, and to inform them of the corresponding treatment methods, and to guide the patients in taking their medication regularly and routinely check their blood, etc. ⑥ Outpatient maintenance. Specialized nursing staff in the hospital carried out PICC outpatient maintenance for patients according to their schedules to ensure that patients obtained standard maintenance after discharge. The nursing staff responsible for whole-course follow-up correctly assessed the patient's conditions, and the evaluation content was the same as the follow-up content to correct behaviors of the patient in time. ⑦ Mutual-help groups were founded. Patients with strong self-care ability and ideal recovery were chosen to establish mutual-help groups and hold social meetings regularly to exchange self-care experiences among patients to enhance the overall nursing management level. All patients were followed up for three months.

Observation indexes and efficacy evaluation

(1) Comparison of ES-CA scores between the two groups before and after care. All patients completed the ES-CA scale when they were discharged from the hospital and 3 months after care, respectively, for evaluation [6]. The inventory consisted of the sense of self-care responsibility (6 items), self-concept (8 items), self-care skills (12 items) and health knowledge (17 items), and so on. There were 43 items with a total score of 172 points, each entry scoring 0-4 points. Among which, 11 of them were reverse scoring entries, and the rest were positive scores. The higher the score, the better the self-care ability. (2) Comparison of catheter indwelling time and on-time maintenance ratio between the two groups. The number of patients who returned to our hospital regularly for maintenance during the nursing period of the two groups was counted. (3) Comparison of patients' compliance between the two groups.

Evaluation criteria [7]. ① Full compliance: In the course of treatment, the patient fully followed and carried out the doctor's advice, and received standard treatment. ② Partial compliance: In the treatment, the patients followed and carried out the doctor's advice, and occasionally irregular treatment occurred. ③ No compliance. During the treatment, the patient cannot follow the doctor's advice and cannot adhere to the standard treatment. Compliance rate = (number of complete compliance + number of partial compliance)/total number of cases × 100%. (4) The incidence of complications after catheterization was compared between two groups. (5) The nursing satisfaction was compared between the groups. The nurses' PICC knowledge satisfaction questionnaire designed by our hospital was used for evaluation. The questionnaire consisted of 50 items with a total score of 100. Over 90 points was rated as satisfied, 60-90 points indicated basically satisfied, and less than 60 points was dissatisfied. Satisfaction = (number of satisfied cases + number of basically satisfied cases)/total cases × 100%.

Statistical analysis

The research data were analyzed and processed with SPSS 20.0 software. The measurement data were expressed as n (%) and examined by the chi-squared test. The enumeration data were described as ($\bar{x} \pm sd$) and analyzed by the t-test. $P < 0.05$ was considered statistically significant.

Results

Comparison of ES-CA score before and after nursing care between the two groups

Before nursing care, no statistically significant difference was found in self-care responsibility, self-concept, self-care skills, and health knowledge between the two groups ($P > 0.05$). After care, the observation group had a significantly higher sense of self-care responsibility, self-concept, self-nursing skills, and health knowledge than the control group ($P < 0.05$). See **Table 1** and **Figure 1**.

Comparison of catheter indwelling time and on-time maintenance ratio between the two groups

Catheter indwelling time in the observation group was longer, and its proportion of on-time maintenance was higher compared to the con-

Table 1. Comparison of ES-CA score between the two groups (points, $\bar{x} \pm sd$)

Group	Self-care responsibility		Self-concept		Self-care skills	
	Before care	After care	Before care	After care	Before care	After care
Observation group (n=45)	25.84±3.15	32.77±3.92*	17.62±2.86	23.27±3.71*	16.97±3.43	25.79±4.66*
Control group (n=45)	25.79±3.20	29.21±3.40*	17.58±2.90	20.33±3.25*	17.02±3.45	21.79±3.85*
t	0.074	4.602	0.066	3.999	0.069	4.439
P	0.941	<0.001	0.948	<0.001	0.945	<0.001

Group	Health knowledge		Total score	
	Before care	After care	Before care	After care
Observation group (n=45)	17.40±2.24	22.78±4.08*	90.56±9.77	95.20±10.25
Control group (n=45)	17.42±2.30	19.64±3.33*	91.02±9.86	132.34±11.92
t	0.042	4.000	0.222	15.85
P	0.667	<0.001	0.826	<0.001

*P<0.05.

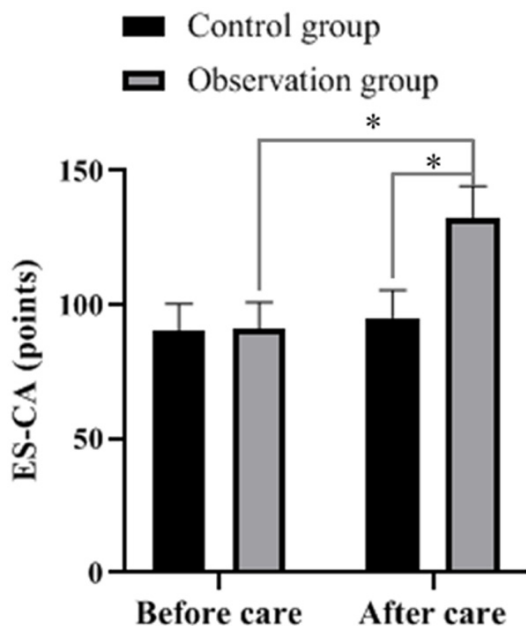


Figure 1. Comparison of ES-CA scores before and after care of the two groups of patients. Note: * represents the comparison with the data Before care, P<0.05.

control group with statistically significant differences (P<0.05). See **Table 2**.

Comparison of patient compliance between the two groups

The compliance rate of the observation group was significantly higher than the control group (95.6% vs. 77.78%, P<0.05). See **Table 3**.

Comparison of complication incidence after catheterization between the two groups

The complication rate of the observation group was significantly lower than the control group

(6.67% vs. 26.67%, P<0.05) (26.67%, P<0.05). See **Table 4**.

Comparison of nursing satisfaction

The nursing satisfaction of the observation group was significantly higher than the 80.00% of the control group (97.78% vs. 80.00%, P<0.05). See **Table 5**.

Discussion

Chemotherapy is the usual method for treating tumors. Traditional drug chemotherapy requires peripheral venous local puncture, resulting in many complications. For instance, frequent vascular punctures in one site can lead to local connective tissue hyperplasia and fibrosis in the vascular wall, resulting in local sclerosis and stenosis [8]. PICC catheterization is a technique in which the catheter tip is positioned on the superior vena cava or subclavicular vein through peripheral veins such as the superior vena cava, the anterior cephalic vein, and the middle vena. It makes use of the characteristics that the proximal venous blood flow is fast and large enough to keep the drug away from the peripheral smaller veins. It can avoid drug stimulation on the skin and blood vessels near puncture to the maximum extent, reduce the occurrence of complications, avoid locally repeated punctures, and are suitable for long-term drug therapy [9, 10]. However, with the expansion of the use of PICC, the occurrence of catheterization complications has also attracted extensive attention from nursing staff. According to the research [11, 12], about 30% of patients with PICC catheterization will have complications after catheterization. The most common complications are phlebitis, catheter

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Table 2. Comparison of catheter indwelling time and on-time maintenance ratio between the two groups ($\bar{x} \pm sd$)

Group	Catheter indwelling time (d)	On-time maintenance ratio (%)
Observation group (n=45)	191.97±40.87	42 (93.33)
Control group (n=45)	116.35±23.42	34 (75.56)
t/ χ^2	10.770	5.414
P	<0.001	0.020

Table 3. Comparison of compliance after nursing care between the groups [n (%)]

Group	Complete compliance	Partial compliance	No compliance	Compliance ratio
Observation group (n=45)	27 (60.00)	16 (35.56)	2 (4.44)	43 (95.6)
Control group (n=45)	19 (42.22)	26 (57.78)	10 (22.22)	35 (77.78)
χ^2				6.154
P				0.013

obstruction, and blood extravasation at the puncture site, and some patients have allergies and thrombosis. Therefore, in order to improve the quality of life of patients with PICC catheterization and reduce the incidence of complications, it is necessary to adopt continuous nursing services for patients.

Continuing nursing service, as a new nursing model, extends the nursing work undertaken by hospital nursing staff to the patient's family and provides them with the same nursing services as those they may receive in the hospital [13]. Continuing nursing service is not only providing nursing care for patients but also can improve patients' self-care agency and reduce complications [14]. Research [15] has shown that among post-discharge patients, tumor patients' the demand for PICC catheter maintenance ranked first while continuing nursing services could improve patients' health outcomes, reduce the number of emergency treatments, and reduce the risk of patient readmission. Self-care agency refers to the behavioral ability of patients to actively undertake the work related to disease treatment under the guidance of nursing staff to coordinate their psychological, physiological, and social interpersonal relationships to maintain health [16]. Many studies [17, 18] have shown that the improvement of self-care agency can help patients avoid abnormal conditions, prolong catheter indwelling time, and better promote patients to master catheter

maintenance knowledge, reduce complications, and improve quality of life. The results showed that the observation group had a higher sense of self-care responsibility, self-concept, self-care skills, and health knowledge compared to the control group aftercare. It indicated that continuing nursing service can effectively improve the self-care agency of tumor patients. The catheter indwelling time in the observation group was longer than that of the control group, and

the proportion of on-time maintenance of the former was also higher. It is suggested that continuous nursing service can prolong the catheterization time of PICC. The reasons for the analysis were as follows: the observation group had regular telephone calls, text messages, and other follow-up visits, had targeted guidance according to the patients' conditions and problems, and improved the patients of catheter maintenance time, and informed patients of the treatment with abnormal PICC conditions. Continuing care was provided through regular telephone follow-up and home visits to keep up on the patient's physical condition and adverse conditions during chemotherapy. Bertoglio et al. [19] showed that the incidence of complications after PICC catheterization was about 24.7%, so the incidence of catheter extraction was approximately 15.1%. According to research data [20], the incidence of complications in tumor patients after PICC catheterization is relatively high, so it is vital to carry out continuing nursing for patients with PICC catheterization after tumor chemotherapy. In this study, the incidence of complications in the observation group was 6.67%, significantly lower than that in the control group (26.67%, $P < 0.05$). Therefore, continuing nursing service in tumor chemotherapy patients with PICC catheterization can effectively reduce the complications of patients, improve the prognosis, and promote the rehabilitation process of patients. Due to the lack of knowledge

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Table 4. Comparison of complication incidence after catheterization between the two groups [n (%)]

Group	Catheter displacement	Catheter obstruction	Puncture site inflammation	Phlebophlogosis	Incidence
Observation group (n=45)	1 (2.22)	1 (2.22)	0 (0.00)	1 (2.22)	3 (6.67)
Control group (n=45)	4 (8.89)	3 (6.67)	2 (4.44)	3 (6.67)	12 (26.67)
χ^2					6.480
<i>P</i>					0.011

Table 5. Comparison of nursing satisfaction [n (%)]

Group	Satisfied	Normal	Dissatisfied	Satisfaction rate
Observation group (n=45)	25 (55.56)	19 (42.22)	1 (2.22)	44 (97.78)
Control group (n=45)	18 (40.00)	18 (40.00)	9 (20.00)	36 (80.00)
χ^2				7.200
<i>P</i>				0.007

Disclosure of conflict of interest

None.

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and weak maintenance awareness of most patients after discharge, catheter maintenance is reduced. Some studies have shown that mental health and family disputes can also affect the patients' care compliance. The results of this study demonstrated that after continuing nursing services, patients' treatment compliance and quality of life were improved as well as their recognition of nursing services and satisfaction.

The limitations of this paper are as follows. Due to the limitations of the design of this study, double-blindness cannot be achieved. During the intervention, researchers may pay more attention to the intervention group subconsciously, resulting in a bias of the results. In addition, the follow-up time should be further extended.

In summary, continuous nursing intervention for patients undergoing tumor chemotherapy with PICC catheterization can improve their self-care agency, extend the duration of PICC catheterization, reduce the incidence of complications, and promote treatment compliance and nursing satisfaction. In consequence, it is worthy of promotion and application.

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