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Analysis of the Effect of Clinical Nursing Pathway Applied to Patients Receiving Intravenous Therapy via Peripheral Mid-long Catheters

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Abstract: *Objective*: To observe the intervention effect of clinical nursing pathway on patients receiving intravenous therapy via peripheral mid-long catheters. *Methods*: Ninety patients receiving intravenous therapy via mid-long catheters in the hospital from March 2024 to March 2025 were selected and randomly divided into a control group and an observation group, with 45 patients in each group. The control group received routine nursing intervention, while the observation group received clinical nursing pathway intervention. The nursing risk events, catheter indwelling time, and nursing satisfaction were evaluated in both groups. *Results*: The observation group had a shorter catheter indwelling time, fewer risk events during intravenous therapy (total incidence rate of 2.22%), and higher nursing satisfaction. Additionally, negative emotional feedback was reduced, and the SAS score (31.02 ± 1.12) was lower in the observation group compared to the control group. There were significant differences between the two groups in all indicators ($P < 0.05$). *Conclusion*: Applying the clinical nursing pathway during intravenous therapy via peripheral mid-long catheters can help ensure infusion safety, improve unstable emotional states, and promote high-quality service standards.

Keywords: Peripheral vein; Mid-long catheter; Infusion; Clinical nursing pathway; Random number table method

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1. Introduction

Venous infusion is a common treatment method, especially for patients with certain special diseases, who often require long-term and repeated infusions [1]. However, repeated punctures can invisibly increase patients' pain, affect the efficacy of disease treatment, and hinder harmonious doctor-patient relationships [2]. The use of mid-long catheters placed via peripheral veins for infusion therapy is a highly utilized method in current clinical medical treatment, providing convenience for patients requiring long-term infusion therapy [3]. Nevertheless, the puncture process can still have a negative impact on patients, especially due to risks such as tube blockage or dislocation [4]. Therefore, it is essential to actively adopt reasonable intervention programs to enhance the safety and effectiveness of infusion therapy. This article explores the positive impact of the clinical nursing pathway in intravenous therapy

via peripheral mid-long catheters.

2. Materials and methods

2.1. General information

Ninety patients who underwent peripheral intravenous mid-to-long catheter infusion therapy in the hospital from March 2024 to March 2025 were included in the study. They were randomly divided into two groups with the same number of cases (n = 45) using a random number table method. The control group consisted of 21 males and 24 females, with a maximum age of 61 and a minimum age of 43. The average age was (47.15 ± 5.52) years. The etiologies included traumatic shock (25 cases) and cardiac insufficiency (20 cases). The observation group consisted of 23 males and 22 females, with an age range of 41 to 60 years and an average age of (48.22 ± 5.41) years. There were 27 cases of traumatic shock and 18 cases of cardiac insufficiency. Statistical verification of the basic data between the two groups showed $P < 0.05$, indicating comparability. The following are the inclusion and exclusion criteria considered when selecting patients:

(1) Inclusion criteria: All patients required the administration of stimulative drugs or long-term infusion; the overall treatment duration was ≥ 7 days; patients had complete expression and communication abilities.

(2) Exclusion criteria: Patients with coagulation disorders; patients with a history of thrombosis; patients with previous catheter-related infections.

2.2. Methods

2.2.1. Control group

Routine nursing care was implemented, including careful disinfection before puncture, proper fixation and maintenance of the catheter after puncture, close observation for bleeding during infusion, and continuous health education for patients.

2.2.2. Observation group

A clinical nursing pathway intervention plan was adopted. First, a team was established, and members discussed the patients' basic conditions and disease progression to develop a nursing pathway table. The specific content included two main parts. The first part mainly introduced the to-do items at different time points after admission, such as establishing a channel to monitor patients' vital signs, proactive communication by the responsible nurse to introduce the hospital and department environment and systems, assessing the patient's condition within 8 hours of admission, summarizing potential risks and psychological issues, and providing subsequent nursing care based on these assessments. For example, patients assessed as having psychological barriers received enhanced psychological counseling, were introduced to successful treatment cases, and were provided with emotional support during their complaints.

After 8 hours of admission, the nurse needed to understand the patient's basic medical history, such as hypertension and diabetes, and provide targeted services such as prescribing antihypertensive and hypoglycemic medications, guiding bed rest, informing the patient and their family members about dietary considerations, and introducing the benefits, catheter placement process, precautions, adverse reactions, and other relevant knowledge of the mid-to-long catheter treatment plan. The second part focused on the nursing process plan developed based on the catheter placement operation, which included pre-puncture preparation, such as standardizing surgical

cleaning procedures, fully disinfecting the patient, evaluating blood vessel conditions, and clarifying blood vessel anatomy. If the patient had a history of surgery or was scheduled for surgery, the catheter was placed on the opposite side.

During puncture, a dedicated nurse provided emotional support to the patient, helping them relax their muscles and avoid secondary puncture. The catheter was fixed using a sterile transparent dressing to facilitate observation of the puncture site, and a U-shaped or S-shaped fixation was used to prevent excessive pulling. After puncture, the nurse used a cotton swab or sterile cotton ball to apply pressure to the patient. Team members regularly checked the patency of the catheter within 24 hours, regularly replaced the dressing, and promptly replaced it if it became wet, curled, or contaminated. During infusion, the team observed the infusion rate. For example, if the infusion rate slowed or stopped, the heparin cap or positive pressure connector was immediately unscrewed and retracted to prevent blockage. Patients and their families were instructed to dress slowly on the catheterized side first and to undress later to avoid catching the catheter. The responsible nurse recorded the exposed length of the catheter daily and briefly introduced how to identify abnormalities in the dressing, such as looseness, prolapse, or displacement, and promptly contacted medical staff for treatment.

2.3. Observation indicators

(1) Compare the indwelling time of catheters.

(2) Summarize the risk events of catheter prolapse, catheter blockage, bleeding at the puncture site, and drug extravasation during nursing, and calculate the total incidence rate.

(3) Develop a self-designed nursing satisfaction survey questionnaire, with item types mainly focusing on the image of nursing staff, level of experience, and operational proficiency. Each question has three options: "very satisfied, generally satisfied, and dissatisfied." The formula for obtaining overall satisfaction is: very satisfied rate (%) + generally satisfied rate (%).

(4) Reasonably quantify the psychological state of patients using the Self-Rating Anxiety Scale (SAS). A score of ≥ 53 indicates significant anxiety, and the higher the score, the more severe the anxiety.

2.4. Statistical methods

Data processing should comply with the standards of statistical software SPSS 23.0. Measurement indicators are represented by ($\bar{x} \pm s$) and correspond to the t-value for testing. Count indicators [n(%)] are tested using the chi-square value (X^2). To determine whether the difference is significant, the P-value is measured. If $P < 0.05$, it indicates significance, i.e., statistical significance.

3. Results

3.1. Time indicator

After recording the catheter indwelling time of the two groups of patients (observation group: 8.85 ± 1.32 days, control group: 9.63 ± 1.44 days), it was found that the observation group was significantly shorter than the control group, with a significant difference between the groups (t = 2.6785, P = 0.0088).

3.2. Summary of risk events

As shown in **Table 1**, the total incidence rate in the observation group was lower than that in the control group,

and the difference was statistically significant ($P < 0.05$).

Table 1. Comparison of risk events between the two groups [n(%)]

Group	Cases	Catheter dislodgement n(%)	Catheter occlusion n(%)	Puncture site bleeding n(%)	Medication extravasation n(%)	Total incidence n(%)
Intervention group	45	0 (0.00)	0 (0.00)	1 (2.22)	0 (0.00)	1 (2.22)
Control group	45	2 (4.44)	2 (4.44)	1 (2.22)	1 (2.22)	6 (13.33)
χ^2 value						3.8726
p-value						0.0490

3.3. Nursing satisfaction

The questionnaire data is summarized in **Table 2**. The satisfaction rate of the observation group can reach 97.78%, which is significantly higher than the control group's 84.44%. The difference is statistically significant ($P < 0.05$).

Table 2. Comparison of nursing satisfaction evaluation between the two groups [n(%)]

Group	Cases	Very satisfied n(%)	Somewhat satisfied n(%)	Dissatisfied n(%)	Overall satisfaction n(%)
Intervention group	45	31 (68.89%)	13 (28.89%)	1 (2.22%)	44 (97.78%)
Control group	45	27 (60.00%)	11 (24.44%)	7 (15.56%)	38 (84.44%)
χ^2 value					4.9390
p-value					0.0262

3.4. Psychological state

According to **Table 3**, the anxiety of patients after nursing has improved significantly, and the scores of the observation group are significantly lower than those of the control group ($P < 0.05$).

Table 3. Comparison of SAS scores before and after nursing between the two groups (scores)

Group	Cases	Before care	After care	*t*	*P*
Observation group	45	54.36 ± 3.25	31.02 ± 1.12	45.5465	0.0000
Control group	45	54.23 ± 3.15	34.25 ± 1.02	40.4799	0.0000
t		0.1927	14.3033		
P		0.8477	0.0000		

4. Discussion

The medium-length venous catheter is a common clinical puncture infusion technique. The catheter length is shorter than that of the central venous catheter, and its position is close to the axilla but does not reach the central vein [5]. During clinical infusion, the catheter can be used to achieve the purpose of drug injection, avoiding stimulating the patient's blood vessels due to infusion, and effectively reducing the pain during treatment [6]. Compared with the existing puncture infusion technology, the medium-length catheter has more prominent

advantages, which are specifically manifested in the following two aspects. Firstly, the catheter cost is not high and is compatible with various needs of intravenous infusion [7]. Secondly, the adaptation of the medium-length catheter is relatively convenient and fast [8]. Currently, the application of central venous catheters requires X-ray guidance, which is complex in terms of operation. However, the medium-length venous catheter does not require guidance, saving time and effort [9]. Due to the special nature of their illnesses, most patients require long-term hospitalization and infusion. They face higher risks because of the variety of infusion drug types [10]. If the existing catheter technology is selected, it is necessary to pay high attention to the importance of catheter maintenance to avoid risks as much as possible [11]. The maintenance of medium-length catheters is relatively simple, ensuring the quality and effectiveness of risk prevention. However, this catheter technology still has certain application risks. To further reduce risk hazards, it is necessary to adopt scientific nursing methods [12].

Clinical nursing pathway is a nursing model that takes evidence-based medicine as the starting point, emphasizing nursing collaboration and timing [13]. This nursing plan reduces the randomness of nursing operations through standardized processes, thereby avoiding risk events caused by human factors. When developing a nursing plan, it clarifies key observation points and procedures for handling abnormalities, helping nurses to identify and solve problems in a timely manner [14]. This study shows that the catheter indwelling time of patients in the observation group became shorter after nursing, and the difference between the two groups was statistically significant ($P < 0.05$).

Simultaneously, there was only one risk event in this group, with a high satisfaction rate of 97.78%. During the treatment, the patients' anxiety was significantly reduced. Compared with the actual data of the control group, there was a significant difference between the groups ($P < 0.05$). In analysis, the clinical nursing pathway focuses on the process planning of time nodes, thereby avoiding unnecessary delays and repeated operations. The time node management of the pathway can accelerate patient turnover and reduce catheter indwelling time, which is not only beneficial to promote patient recovery but also has positive significance for improving hospital operation efficiency [15]. Moreover, refining the nursing process into clear steps and time nodes can avoid errors caused by insufficient personal experience or poor planning to a certain extent. Additionally, the clinical nursing pathway can clarify expectations during the actual service process, allowing patients and their families to clearly understand the treatment process, time nodes, and risk management and control, thereby reducing anxiety caused by information asymmetry. Therefore, the SAS score of the observation group in this study was lower.

5. Conclusion

In summary, implementing clinical nursing pathways in the treatment of peripheral intravenous medium-length catheter infusion can fully optimize processes, enhance team collaboration, ensure quality, manage risks, and take into account the individualized needs of patients. This approach improves the satisfaction of patients and their families from multiple dimensions, ultimately achieving a win-win situation for doctors and patients.

Disclosure statement

The author declares no conflict of interest.

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