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Analysis of Risk Factors and Preventive Measures for Catheter Slippage in Surgical Care

Xuan Zhou*
Guanyun County Hospital of Traditional Chinese Medicine, Lianyungang 222200, Jiangsu, China

Author to whom correspondence should be addressed.

Abstract: *Objective:* To analyze the risk factors and preventive measures of catheter slippage in surgical nursing. *Methods:* 68 surgical nursing patients were selected for data analysis in our hospital from July 2024 to June 2025. They were divided into two groups using the random number table method, with 34 cases in each group. The experimental group applied routine nursing, risk factor assessment, and predictive nursing intervention, while the control group applied routine nursing. The data differences between the groups were compared. *Results:* Compared with the control group, the incidence rate of catheter slippage in the experimental group was significantly lower, and the average hospitalization time was significantly shorter, $P < 0.05$. The risk factors for catheter slippage in surgical care were statistically analyzed, specifically 5 cases of impaired consciousness and agitation, 2 cases of improper catheter fixation, and 1 case of patient/family non-cooperation. *Conclusion:* The risk factors for catheter slippage in surgical nursing were clarified, and predictive nursing intervention measures were formulated and applied to achieve ideal application results.

Keywords: Surgical nursing; Catheter slippage; Risk factors; Preventive measures

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1. Introduction

In surgical clinical treatment, the important "life channel" connecting the patient's body is the catheter, which can be used in a variety of scenarios, such as postoperative fluid drainage, gastrointestinal decompression, chest closed drainage, etc. Its function is to drain pathological fluids, monitor changes in disease conditions, and maintain organ function. An adverse event that easily occurs in surgical care is catheter slippage. The incidence of drainage tube slippage in domestic hospitals is very high [1], which can interrupt the patient's normal treatment process, induce serious complications such as bleeding, infection, and organ damage, prolong hospitalization time, increase medical costs, and even threaten the patient's life. At present, the conditions of surgical patients are complex and diverse, the types of indwelling catheters are complex, and multiple factors work together, leading to an increased risk of catheter slippage in patients. Clinical practice has found that factors that may induce catheter slippage are disturbance of consciousness, improper catheter fixation, and inadequate nursing assessment [2]. The current analysis is not complete, and the clinical application effect of targeted preventive measures needs to be further verified, so this study was carried out. This study selected 68 patients to analyze the risk factors and preventive measures for catheter slippage in surgical care.

2. Materials and methods

2.1. Information

In our hospital from July 2024 to June 2025, 68 surgical nursing patients were selected for data analysis. They were divided into two groups using random number tables, with 34 cases in each group. The experimental group had 20 males and 14 females, aged 21–82 (56.39 ± 10.01) years old, and the control group had 21 males and 13 females, aged 22–85 (56.31 ± 10.05) years old. Comparing the two sets of data, $P > 0.05$ was obtained.

Inclusion criteria: meeting the diagnostic criteria for neurosurgery and undergoing surgery or conservative treatment; having one or more catheters (such as endotracheal intubation, gastric tube, urinary catheter, etc.) during hospitalization; complete clinical data and being able to cooperate with observation and evaluation; informed consent.

Exclusion criteria: combined with severe heart, liver, kidney, and other important organ failure, with an expected survival of less than 7 days; a history of mental illness, severe cognitive impairment; transfer, automatic discharge, or death during hospitalization due to factors other than catheter slippage.

2.2. Methods

The control group applied routine care: properly fixing the catheter, regularly observing its patency, implementing basic patient care and health education, and doing bedside handover work for patients in accordance with regulations.

The experimental group applied routine nursing, risk factor assessment, and predictive nursing intervention. The specific contents are as follows: (1) Establish a risk assessment system: A standardized pipeline slippage risk assessment sheet was constructed, with clear assessment dimensions (involving age, state of consciousness, mobility, cooperation, pain level, catheter type, etc.) and scoring standards, and divided them into low risk (≤ 10 points), medium risk (11–14 points), and high risk (≥ 15 points). A warning sign is hung in an obvious place at the head of the bed of high-risk patients to indicate the high risk of catheter slippage. Nurses and patients' families should pay close attention to it and conduct re-evaluations once a day, twice a week for medium-risk patients, and once a week for low-risk patients. If the patient has a change in condition, catheter displacement, change in consciousness, etc., a dynamic assessment will be carried out immediately and the patient's care plan will be adjusted in a timely manner. (2) Patient-specific intervention: Follow the doctor's instructions to use sedative and analgesic drugs for patients with impaired consciousness and agitation. Closely monitor drug efficacy and patient signs to avoid catheter traction and slippage due to agitation. If necessary, use soft and breathable restraint belts to protectively restrain the patient. Fix the limbs on the non-infusion side of the patient and adjust the tightness appropriately so that one finger can be inserted. Loosen the restraints and massage the restrained parts for the patient every 2 hours to prevent pressure ulcers and blood circulation disorders in the limbs. Provide a one-to-one health education model for awake patients, explaining the purpose and importance of catheter indwelling in popular language, emphasizing the serious hazards such as bleeding and infection that may occur to patients after the catheter slips, issuing educational manuals with pictures and texts to patients, and patiently answering patients' questions. At the same time, nurses must also provide psychological care for patients, pay attention to patients' emotional changes, effectively alleviate patients' anxiety and fear, guide patients to actively cooperate with care, and prevent patients from pulling or removing catheters on their own. (3) Standard fixation of the catheter: Determine the special fixator according to the type of catheter, fix it firmly, and be careful not to affect the patient's activities. Use the L-type fixator to fix the gastric tube on the patient's nose and cheek, use the F-type fixator to fix the tracheal intubation on the patient's mandible, and use the C-type fixator to fix the drainage tube on the skin around the patient's drainage port. Every day, if the fixed dressing is contaminated with sweat, oil stains, secretions, or becomes loose or curled, it should be replaced immediately. Use aseptic operation to effectively avoid skin infection in the patient. Nurses on each shift should accurately check and record the depth of catheter insertion in patients. If there are any abnormalities, they should promptly notify the doctor to avoid catheter displacement and slippage in patients. (4) Artificial airway airbag management: Establish an airbag pressure monitoring ledger for patients with indwelling artificial airways. Carry out regular airbag pressure monitoring three times a day (morning, afternoon, and night) and maintain it at 25–30 cm H_2O. If the airbag pressure is too high, the patient will suffer

airway mucosal damage. If the pressure is too low, the patient may suffer from catheter displacement and air leakage. During the monitoring period, if there is air bag leakage or under-inflation, the cause needs to be found immediately, and the gas should be replenished or the catheter replaced in a timely manner. At the same time, the patient's breathing should be closely observed to avoid catheter slippage and suffocation due to an abnormal airway. (5) Transfer and operation specifications: Nurses should accompany the patient throughout the entire outing for inspection, check the catheter fixation again before departure, properly secure the catheter and drainage bag, and appropriately relax the height of the drainage bag to prevent the patient from pulling and twisting the catheter during the transfer. Nurses should use gentle movements to carry out sputum suction, oral care, turning over, and patting on the back of the patient. They should avoid over-stimulation of the airway when suctioning, otherwise the patient will cough violently. When turning over and patting on the back, the nurse should protect the catheter and avoid pulling the catheter. After the operation is completed, check the position and fixation of the catheter again to ensure that there is no displacement or looseness. (6) Optimize nursing schedules and inspections: Combined with the characteristics of periods of high incidence of catheter slippage, optimize the nursing schedule model, increase the number of nurses on duty during high-risk periods such as night and noon when there are relatively few medical staff and patients are prone to restlessness, and clarify inspection responsibilities. High-risk patients are inspected every 30 minutes, medium-risk patients are inspected every 1 hour, and low-risk patients are inspected every 2 hours. They focus on checking the catheter fixation, patient's state of consciousness and cooperation, and implement the bedside handover system and handover in detail to ensure seamless nursing work and timely detection and effective avoidance of the risk of catheter slippage.

2.3. Observation indicators

(1) Compare the incidence rate of catheter slippage and average hospitalization time between the two groups.

(2) Statistics on risk factors for catheter slippage in surgical care.

2.4. Statistics

Use SPSS 28.0 software, use mean ± standard deviation (SD) to describe measurement data, *t*-test; use rate (%) to describe count data, χ^2 test, $P < 0.05$, statistically significant.

3. Results

Compared with the control group, the incidence rate of catheter slippage in the experimental group was significantly lower, and the average hospitalization time was significantly shorter, $P < 0.05$. The risk factors for catheter slippage in surgical care were statistically analyzed, specifically 5 cases of impaired consciousness and agitation, 2 cases of improper catheter fixation, and 1 case of patient/family non-cooperation. See **Table 1**.

Table 1. Comparison of the incidence of catheter slippage and average hospitalization time between the two groups

Group	Incidence of catheter slippage (%)	Average length of stay (d)
Experimental group ($n = 34$)	1(2.94)	11.22 ± 2.74
Control group ($n = 34$)	7(20.59)	14.55 ± 3.27
χ^2/t	5.1000	4.5514
P	< 0.05	< 0.05

4. Discussion

Catheter slippage occurs in the field of surgical care, which significantly increases patient pain and medical expenses,

and can easily lead to doctor-patient conflicts and medical disputes. The results of this study show that the incidence rate of catheter slippage in the experimental group was 2.94%, which was significantly lower than that in the control group. The average hospitalization time in the experimental group was significantly shorter than that in the control group, $P < 0.05$. This confirms that the risk of catheter slippage can be effectively reduced and the recovery period shortened by the application of systematic risk assessment and targeted predictive intervention for patients, which is highly consistent with the conclusions of relevant domestic studies [3,4].

This study collected data from 68 patients with surgical catheterization and found that the core risk factors for catheter slippage in surgical care are disturbance of consciousness and agitation, improper catheter fixation, and lack of cooperation by patients and their families. Postoperative patients are prone to abnormal consciousness and behavior such as drowsiness, restlessness, and delirium [5]. Patients cannot control limb activities autonomously and are prone to unconscious pulling and tearing of the catheter, so the incidence of catheter slippage increases significantly. At the same time, some agitated patients will actively resist nursing operations, further increasing the probability of catheter slippage. Improper fixation of catheters is mainly reflected in unreasonable selection of fixation materials, irregular fixation methods, and untimely maintenance of fixed dressings. In clinical practice, nurses fail to determine a special fixation device based on the type of catheter [6]. Due to interference from factors such as sweating, skin oil secretion, and body position changes of patients, fixation loosening is prone to occur. If high-risk catheters are fixed in an improper position and have inappropriate tightness, continuous traction and displacement will occur during patient activity, which will eventually lead to catheter slippage. The nurse failed to check the fixation situation on time and failed to replace contaminated and curled dressings in time, which affected the fixation effect and easily induced catheter slippage. In addition, if the artificial airway balloon pressure management is not standardized, too high a pressure will cause damage to the patient's airway mucosa, while too low a pressure will easily cause the catheter to loosen, thereby increasing the risk of catheter slippage. Among the risk factors for catheter slippage in surgical care, the lack of cooperation of patients and their families is a man-made risk factor that cannot be ignored [7]. Some awake patients fail to fully understand the necessity and importance of catheter indwelling, and adjust the position of the catheter without authorization or attempt to extubate the catheter. Some patients' family members do not understand the knowledge of catheter care and perform improper nursing operations, resulting in catheter slippage due to excessive traction. Some patients and their families do not pay attention to the nursing education content and change positions at will, resulting in catheter slippage.

In response to the above risk factors, this study constructed a risk assessment + predictive care model, built a prevention and control system from multiple dimensions, and exerted significant application advantages. First, the standardized pipeline slippage risk assessment sheet is used to quantify, classify, and dynamically manage the risk of catheter slippage, and multi-dimensional scores are used to accurately distinguish low, medium, and high-risk patients. Bedside warning signs and dynamic re-evaluation mechanisms are used to guide nurses to pay attention to high-risk objects and high-risk periods, and implement key protections to reduce patients' risk of catheter slippage from the source. Secondly, the smooth implementation of targeted intervention can help patients effectively solve problems such as disturbance of consciousness and poor cooperation. Providing reasonable sedation, analgesia, and protective restraint for agitated patients can effectively prevent patients from complications such as spontaneous extubation, pressure ulcers, and blood circulation disorders [8], and improve the safety and comfort of patient care. Moderate, one-on-one health education and psychological care are provided to awake patients, using popular language and graphic materials to help patients improve their cognitive level. Anxiety and fear can be effectively alleviated. Patients and their families can actively participate in catheter protection and actively cooperate with care to cut off the inducements of catheter slippage from the human factor level. Thirdly, carry out standardized fixation and special management of catheters for patients, determine L-type, F-type, and C-type special fixators based on the type of catheter, regularly replace sterile dressings, and monitor the patient's insertion depth, which can effectively ensure firm fixation and accurate positioning. Carry out standardized monitoring and management of artificial airway balloon pressure for patients, and maintain a safe pressure of 25–30 cm H_2O, which can effectively prevent patients from mucosal damage and catheter loosening, and the risk of slippage related

to technical operations will be significantly reduced. At the same time, in clinical practice, standardize the transfer of patients, strictly implement the nursing operation process, and protect the patient's catheter during high-risk operations such as out-of-town examination, sputum suction, and turning over, which can significantly reduce the patient's slippage due to external force. Finally, optimizing nurses' nursing schedules and strengthening nurses' inspection handovers can fill gaps in manpower and management, increase manpower during high-risk periods such as night and noon when medical staff are weak and patients are agitated, and implement differentiated inspection times based on risk levels. Combined with a strict bedside handover system, seamless catheter care can be achieved throughout the entire process, early hidden dangers such as catheter looseness and displacement can be discovered and dealt with in a timely manner, and the risk of catheter slippage can be kept to a minimum.

5. Conclusion

In summary, the risk factors for catheter slippage in surgical care were clarified, and predictive nursing intervention measures were formulated and applied, which achieved ideal application results. The incidence of catheter slippage was significantly lower, and the average hospitalization time was significantly shorter. It is worthy of clinical promotion and use.

About the author

Zhou Xuan (1993.10-) female, Han nationality, Guanyun, undergraduate, supervisor nurse, Department of Surgery, Guanyun County Hospital of Traditional Chinese Medicine, research direction: surgical nursing.

Disclosure statement

The author declares no conflict of interest.

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