ORIGINAL RESEARCH ARTICLE

Effects of cluster six nursing on catheter-associated urinary tract infection in critically ill patients

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Abstract

The objective of this study was to assess the impact of cluster nursing on catheter-associated urinary tract infection (CA-UTI) in critically ill patients. Sixty critically ill patients with CA-UTI admitted to Affiliated Hospital of Beihua University from January 2020 to December 2021 were randomly separated into observation group (OG) and control group (CG). The CG accepted routine intensive care unit (ICU) nursing. The OG accepted cluster nursing management in addition to ICU nursing. Relative to the CG, the OG had lower mortality rate, shorter hospitalization time, lower incidence of complications, better improvements of the levels of serum creatinine (Scr), urine creatinine (Ucr) and blood urea nitrogen (BUN), higher satisfaction score, lower Acute Physiology and Chronic Health Evaluation (APACHE) II score, higher scores of quality of life and Barthel Index (BI) , and lower depression and anxiety scores. We conclude that cluster nursing can improve the renal function, and improve the prognosis, psychological status, and the quality of life in critically ill patients with urinary tract infections. *(Afr J Reprod Health 2026; 30 [2]: 53-60).*

Keywords: Urology surgery; Critical; Cluster nursing; Urinary tract infection

Résumé

L'objectif de cette étude était d'évaluer l'impact des soins infirmiers en groupe sur les infections urinaires associées aux cathéters (IUAC) chez les patients en soins intensifs. Soixante patients en soins intensifs atteints d'IUAC, admis à l'hôpital universitaire de Beihua entre janvier 2020 et décembre 2021, ont été répartis aléatoirement en deux groupes : un groupe d'observation (GO) et un groupe témoin (GT). Le GT a bénéficié des soins infirmiers de routine en unité de soins intensifs (USI). Le GO a bénéficié d'une prise en charge par soins infirmiers en groupe, en plus des soins de USI. Comparativement au GT, le GO a présenté un taux de mortalité plus faible, une durée d'hospitalisation plus courte, une incidence de complications plus faible, une amélioration plus marquée des taux de créatinine sérique (Scr), de créatinine urinaire (Ucr) et d'urée sanguine (BUN), un score de satisfaction plus élevé, un score APACHE II plus faible, des scores de qualité de vie et d'indice de Barthel (IB) plus élevés, ainsi que des scores de dépression et d'anxiété plus faibles. Nous concluons que les soins infirmiers en groupe peuvent améliorer la fonction rénale, le pronostic, l'état psychologique et la qualité de vie des patients en soins intensifs atteints d'infections urinaires. *(Afr J Reprod Health 2026; 30 [2]: 53-60).*

Mots-clés : Chirurgie urologique ; Soins intensifs ; Soins infirmiers en groupe ; Infection urinaire

Introduction

Catheter insertion is an invasive operation frequently used in clinical practice, especially for some patients with urinary incontinence, urinary retention and coma, and its main purpose is to accurately observe and record the urine volume and urine proportion of critically ill patients and prevent surgical complications.[1] However, it has been reported in the literature that the longer the duration of catheter indentation, the higher the incidence of catheter-associated urinary tract infection (CA-UTI) in patients, and the incidence of CA-UTI increases by 5% after catheter indentation for 1 day.[2] CA-UTI is a common type of infection in clinic. It has been reported that 40% of nosocomial infections are urinary tract infections, 80% of which are caused by indignant catheters.[3] Most of intensive care unit (ICU) patients are seriously ill, and once CA-UTI occurs, it may induce a variety of complications, increase the difficulty of treatment of basic diseases, and even threaten the life safety of patients.[4] Therefore, taking effective measures to prevent CA-UTI in ICU patients is a hot issue in clinical nursing

today. Cluster nursing is a comprehensive care model that integrates multidisciplinary expertise and skills to provide patients with comprehensive, personalized care services.[5] The application of cluster nursing has been reported to reduce the incidence of post-complications and promote the quality of life of patients.[6] At present, there are few studies on the prevention of CA-UTI based on cluster nursing in China.

Therefore, the objective of this study was to assess the impact of cluster nursing on catheter-associated urinary tract infection (CA-UTI) in critical patients. Our study indicated that cluster nursing could improve the renal function, and improve the prognosis, psychological status, and the quality of life in critically ill patients with urinary tract infections, which might provide a clinical reference for nursing of critical patients with CA-UTI.

Methods

Materials

Sixty critically ill patients with CA-UTI admitted to Affiliated Hospital of Beihua University from January 2020 to December 2021 were randomly divided into an observation group (OG) and a control group (CG) using the random number table method. Each group had 30 cases. The basic information of 2 groups were comparable (P>0.05, Table 1). All critical patients with urinary tract infection were informed and consented to this study, and all of them actively cooperated with the study. Inclusion criteria: (1) Indwelling catheter; (2) There was no urinary tract infection before indwelling catheter; (3) Length of stay in ICU ≥24 h; (4) Infection met the "Diagnostic Criteria of Urology" and "Hospital Infection", that was, pathogenic bacteria of the midstream urine was cultured, Gram-negative bacteria $\geq 1\times10^5$ CFU/ml, fungi and Gram-positive bacteria $\geq 1\times10^4$ CFU/ml, and urinary sediment white blood cell count > 10/HP. (5) There were no infectious diseases or antibiotics taken before operation. (6) The tumor stage was within T2. (7) Expected survival time > 6 months; (8) Complete surgical records and antimicrobial application records. (9) Complete medical records and strong compliance. (10) Patients agreed to participate voluntarily. Exclusion criteria: (1) Mental disorders, cognitive decline, inability to communicate; (2) Severe abnormalities of heart, lung, liver and kidney function. (3) Patients transferred from other hospitals to our hospital after surgery. (4) Abnormal immune function. (5) Unable to complete the study due to death or other events.

Procedure

The CG accepted routine ICU nursing.

(1)In addition to ICU nursing, the OG accepted cluster nursing management, and the specific methods were as follows: (1) The monitoring staff of patients with severe infection analyzed the emergency situation which included assessment of indwelling catheter, and the evaluation of the patients in line with the hospital's infection control processes, and clarified the monitoring measures.

(2) Relevant nursing staff were trained to strengthen their nursing operation skills, so as to meet the actual nursing needs of patients with catheterization. After catheterization, the operation was performed in strict accordance with the aseptic principles to ensure the safety of catheterization. The indications for catheterization were clarified, and the appropriate catheter were selected. This includes the selection of the appropriate diameter of the catheter. Additionally, during catheterization, it was necessary to ensure the closure of the urinary drainage system to decrease the incidence of adverse events.

(3) For patients with long-term indwelling catheter, urine samples were collected at the same time of catheterization to determine whether patients had urinary tract infection before catheterization, so as to avoid misjudgment as catheter-associated urinary tract infection. In addition, the patients were evaluated for the presence of catheterization, and if not required, the patient would choose to wear a diaper.

(4) Health education: health education for patients and their families through various methods. After the patients were admitted in hospital, the environment was introduced to them to familiarize them with the features of the hospital. Health education prescriptions were issued to each patient, disease-related knowledge was carried out , which the patients or their family members were required to read them carefully. If there was anything they did not understand, they would ask nursing staff at anytime, and the nursing staff would assist the patient. Before treatment, patients were introduced to the purpose of care in order to obtain their cooperation.

Table 1: General data of patients in both groups

Items	Control group (n=30)	Observation group (n=30)	χ^2/t	P
Gender			0.28	0.59
Male	18 (60.00)	20 (66.67)		
Female	12 (40.00)	10 (33.33)		
Age (years)	42.5±6.5	43.1±5.8	0.37	0.70
Type of disease			0.07	0.78
Bladder cancer	21 (70.00)	20 (66.67)		
Other diseases	9 (30.00)	10 (33.33)		
Degree of urinary tract infection			0.09	0.95
Mild	12 (40.00)	11 (36.67)		
Moderate	10 (33.33)	11 (36.67)		
Severe	8 (26.67)	8 (26.66)		

Health lectures were given once a month, while 10 minutes were reserved for each health lecture for discussion and mutual encouragement between patients, so that patients could learn from each other's experience and understand the knowledge of the disease.

(5) Diet nursing: for patients with dysphagia, enteral support or parenteral support wre given as required. When the patient's condition became stable, the patient was guided to take liquid diet, and then they were gradually transitioned to semi-liquid food, and finally to normal food.

(6)Psychotherapy:the nurses actively communicated with the patients, encouraged them understood the patients' personality characteristics in the process of communication, and guided the patients' negative emotions. Meanwhile, nursing staff improved the mentality of patients' family members and requested them to influence the patients from their own perspectives to ensure that they maintained an optimistic attitude.

(7) Limb: Evaluation of the patient's limb function, reasonable massage, and then combination with patient's subjective consciousness to formulate a limb rehabilitation training plan. The patients as well as their families were informed of the precautions of the limb training plan, so that the patients and their families could understand the importance of active and passive training. The patients were helped to turn over and stretch according to the training plan. In general, an exercise lasted for 15 minutes, twice a day.

Observed indices

(1) The Acute Physiology and Chronic Health Evaluation (APACHE) II score was used as an indicator of the prognosis treatment and nursing of critical patients[7]. The APECHE II score ranged from 0 to 71, and the higher score represented worse prognosis of the patients.

(2) The Barthel Index (BI)[8] was used to assess the activities of daily living of patients. The full score was 100 points, the higher score represented higher activities of daily living.

(3) Quality of life included physiological function, emotional function, physical function as well as social function were compared between the two groups.

(4)Using the hospital's self-made nursing satisfaction questionnaire[9], the satisfaction of patients and their families with nursing was assessed.

(5) The changes of renal function indexes were compared between the two groups, including serum creatinine (Scr), urine creatinine (Ucr), and urine nitrogen (BUN).

(6) The mortality rate, length of hospital stay, as well as incidence of complications of patients in the two groups were compared and recorded in detail.

(7) Using the self-rating depression scale (SDS) and self-rating anxiety scale (SAS)[10], patients' psychological state was assessed. The SDS scale contained 20 questions that covered common symptoms of depression, such as low mood, insomnia or too much sleep, and lack of interest in life. Each question offered four options ranging from "almost never" to "most or all of the time", on a scale of 1-4. The SAS scale usually contained a series of questions that described the symptoms of anxiety, such as nervousness, worry, fear, and panic. Each question provided multiple options representing different levels of anxiety. While the exact number

of options may vary from version to version, usually the score range for each question was between 0 and 4 points. The higher score represented more severe depression and anxiety.

Statistical analysis

SPSS 20.0 software was adopted for data processing. Measurement data exhibited as (x ± s) were compared using t test. Enumeration data exhibited as n (%) were compared using χ^2 test. P<0.05 was considered statistically significant.

Ethical consideration

Our study was approved by the Ethics committee of Affiliated Hospital of Beihua University.

Results

Comparison of prognosis between the two groups

As shown in Figure 1, the hospitalization time of the OG was (15.42 ± 2.52) d, which was shorter than (19.58 ± 2.71) d of the CG. The mortality rate of the OG was 6.67%, which was lower than 20.00% of the CG. The incidence of complications was 6.67 % in the OG, which was lower than 16.67 % in the CG (P<0.05).

Indices of renal function between the two groups

As shown in Figure 2, the renal function indices exhibited no difference between the two groups prior to nursing (P>0.05). The renal function indices of the two groups declined after nursing (P<0.05). However, , relative to the CG, the OG had lower renal function indices after nursing (P<0.05).

Nursing satisfaction between 2 groups

As illustrated in Figure 3, the satisfaction score of the OG was (94.32±7.56) points, and that of the CG was (83.34±6.23). Relative to the CG, the OG had higher satisfaction score (P<0.05).

APECHE II score between the two groups

It was displayed in Figure 4 that, the APECHE II score showed no differences between the two roups before nursing (P>0.05). After nursing, the APECHE II score of the two groups declined (P<0.05). However, relative to the CG, the OG had lower APECHE II score after nursing (P<0.05).

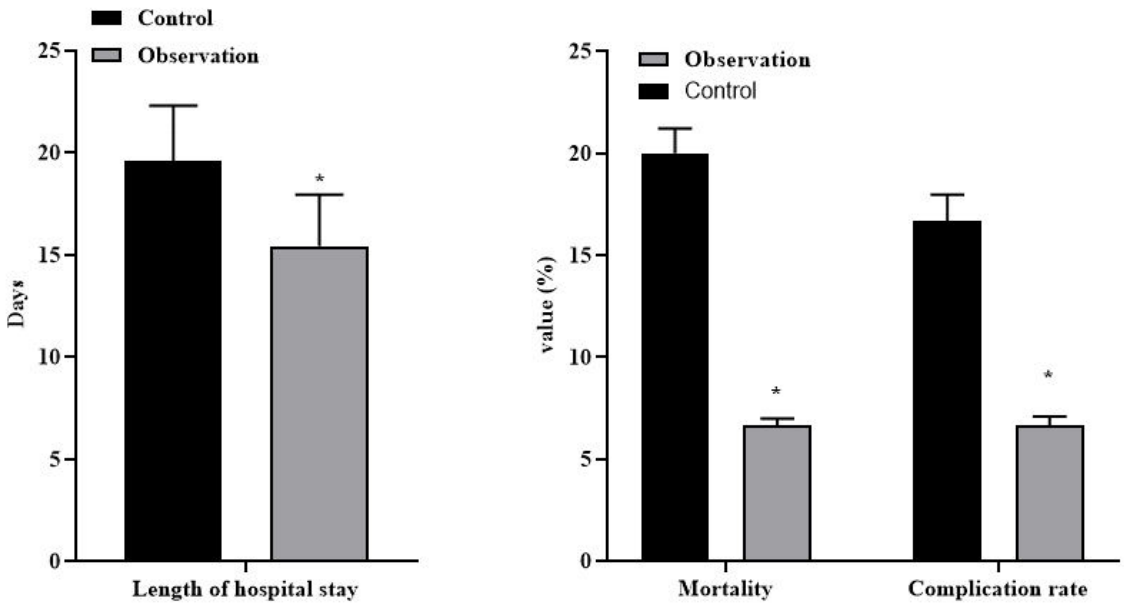

Figure 1: Prognosis between 2 groups. *P<0.05, compared with CG

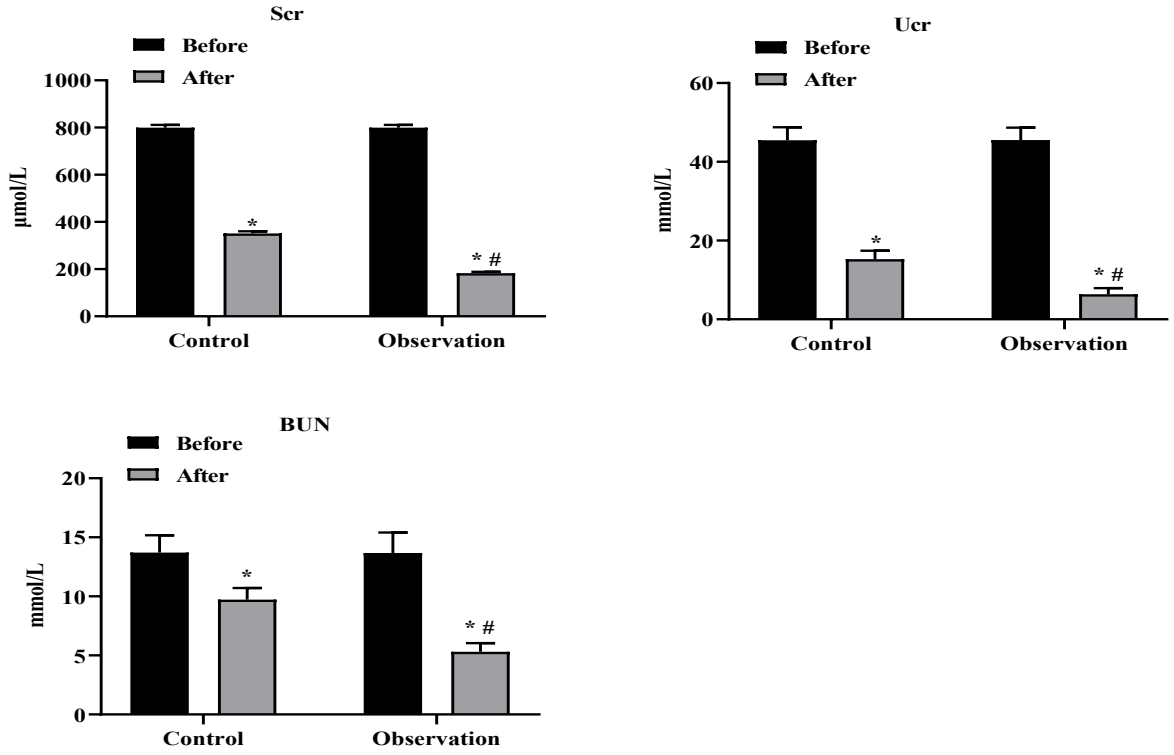

Figure 2: Renal function indicators in 2 groups. *P<0.05, compared with pre-treatment, and #P<0.05, compared with CG

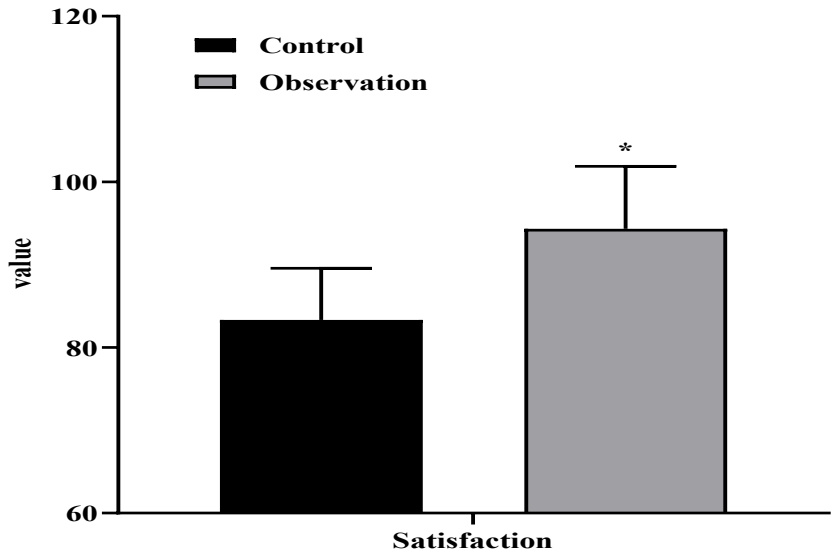

Figure 3: Nursing satisfaction scores of patients in 2 groups. *P<0.05, compared with CG

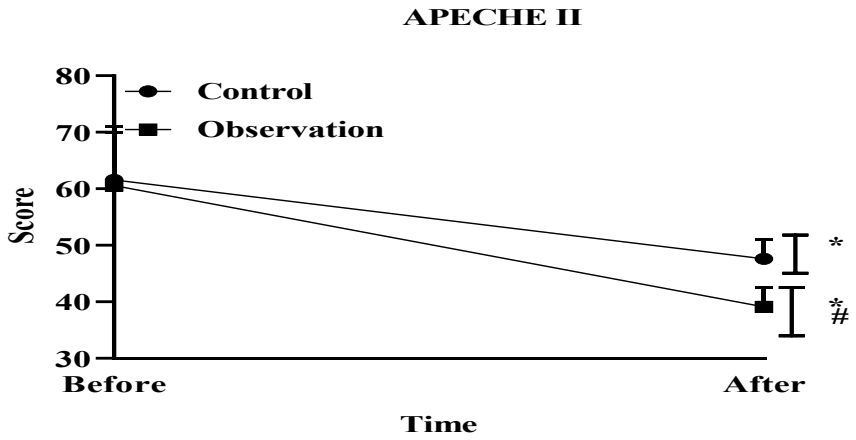

Figure 4: APECHE II scores in 2 groups. *P<0.05, compared with pre-treatment, and #P<0.05, compared with CG

Table 2: Quality of life scores between the two groups

Groups	n	Physiological function	Emotional function	Physical function	Social function
Control group	30	70.16±5.23	71.16±5.67	73.85±5.06	70.08±5.01
Observation group	30	87.46±6.48	88.19±6.824	90.35±5.49	86.15±6.49
P		<0.05	<0.05	<0.05	<0.05

Figure 5: BI scores between 2 groups. *P<0.05, compared with pre-treatment, and #P<0.05, compared with CG z

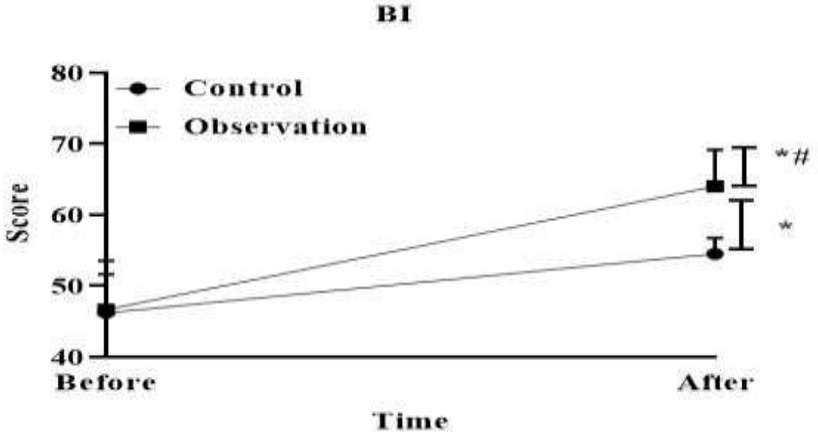

Figure 5: BI scores between 2 groups. *P<0.05, compared with pre-treatment, and #P<0.05, compared with CG

Quality of life scores between 2 groups

Relative to the CG, the OG had higher quality of life scores in the aspects of physiological function, emotional function, physical function as well as social function (P<0.05, Table 2).

BI scores between 2 groups

As shown in Figure 5, the BI scores exhibited no difference between the two groups prior to nursing (P>0.05). The BI scores of the two groups were elevated after nursing (P<0.05). However, relative to

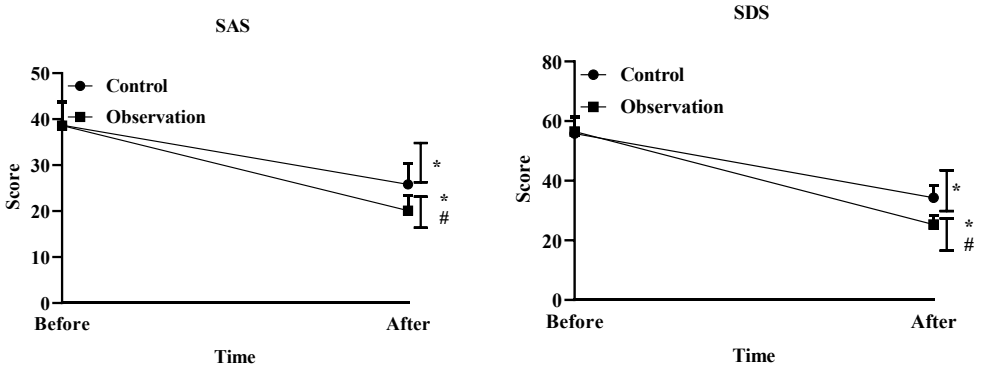

Figure 6: Psychological status scores of 2 groups. *P<0.05, compared with pre-treatment, and #P<0.05, compared with CG

the CG, the OG had higher BI scores after nursing (P<0.05).

.Psychological status scores between the two groups

As shown in Figure 6, the SAS and SDS scores exhibited no difference between 2 groups prior to nursing (P>0.05). The SAS and SDS scores of the two groups were declined after nursing (P<0.05). Importantly, relative to the CG, the OG had lower SAS and SDS scores after nursing (P<0.05).

Discussion

Recently, the incidence of urinary system diseases has continued to rise. The common diseases of the urinary system seen in urology clinics include prostatic hyperplasia, urinary system stones, and prostate cancer. The treatment of these diseases easily predisposes the patients to serious urinary infection, which increases the difficulty of treatment.[11] During treatment, the nutritional status of the patients is often severely affected, which have adverse effects on the outcome of treatment. Therefore, more attention has been paid to the rehabilitation nursing of urinary patients.

Relevant studies have shown that cluster nursing management of urologic patients can promote their rehabilitation, significantly improve their prognosis, and reduce the occurrence of urinary tract infection.[12] However, the in the application of cluster nursing management in severe infection, the monitoring personnel need to analyse the emergency situation, formulate nursing plans, and carry out health education for the patients together with their families to increase the patients' understanding of urinary tract infection, so as to improve the patients' compliance with nursing.[13] Diet nursing can help the patients to develop good eating habits:

The conventional principle is to give priority to low-oil and low-salt diet and not to eat spicy food, so as to improve the malnutrition state of patients.[14] In addition, psychological nursing and rehabilitation training can improve patients' mood and life ability.[15] The results of this work indicated that relative to the CG, the OG had higher nursing satisfaction, lower incidence of urinary tract infection, higher BI score and higher quality of life score. The reason may be that the application of cluster nursing management can improve the limb damage function of urinary patients, decrease the degree of limb disorder and disability, and greatly improve the ability of daily living as well as the quality of life of patients.

In addition, this study found that relative to the CG, the OG had lower APECHE II score, suggesting that cluster nursing could improve the prognosis of critical patients with CA-UTI. The reason may be that cluster nursing takes corresponding treatment measures to reduce the incidence of infection in critically ill patients, promote the physical function of patients, and improve the prognosis. In terms of psychological state, the depression and anxiety scores in the OG were lower than those in the CG after nursing, indicating that cluster nursing could relive the anxiety and depression of critical patients with CA-UTI.

Study strengths and weaknesses

The study shows a clear effect of cluster nursing on improving renal function, prognosis, psychological status and promote the quality of life in critical patients with CA-UTI, which provide a clinical reference for nursing in critical patients with CA-UTI. However, the small sample size and short time of the study are the main limitations.

Conclusion

Cluster nursing can improve renal function, improve the prognosis, improve psychological status as well as promote the quality of life in critical patients with CA-UTI.

Authors' contributions

Ran Zhao and Jibin Sui: conceived and designed the study as well as collected and analysed the data. Ran Zhao and Jibin Sui: prepared the manuscript. All authors mentioned in the article approved the manuscript.

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