Am J Clin Exp Urol 2025;13(3):233-240
www.ajceu.us /ISSN:2330-1910/AJCEU0163955

*Original Article*

# Efficacy and safety of continuous nursing based on the Omaha System in patients with double-J stents after upper urinary tract stones surgery: a prospective study

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Received February 16, 2025; Accepted May 25, 2025; Epub June 15, 2025; Published June 30, 2025

**Abstract:** Objective: To explore the efficacy and safety of continuous nursing based on the Omaha System in patients with double-J stents after upper urinary tract stones surgery. Patients and Methods: A total of 171 patients who underwent upper urinary tract stones surgery in our department from July 2022 to December 2023 were selected. According to the envelope randomization method, patients were divided into a control group (85 cases) and a study group (86 cases). In the control group, we carried out discharge education upon discharge, distributed health education manuals, explained the nursing, diet, daily exercise, and other precautions for indwelling double-J stents outside the hospital. On the basis of the control group, the Omaha System will be used to evaluate nursing issues, including the four aspects with the highest post discharge nursing needs: physiological, psychological, environmental, and health-related behaviors. Then, problem oriented continuous nursing. Results: After nursing intervention, the cognitive score, behavioral score, and condition score of the two groups were separately higher than pre-nursing, and the scores in the study group were all significantly higher than those in the control group ($P < 0.05$). With respect to the secondary important variables, the overall incidence of complications in the study group was significantly lower than that in the control group ($P < 0.05$). Conclusions: The application of continuous nursing based on the Omaha System in patients with double-J stents after upper urinary tract stones surgery can improve nursing outcomes, reduce the incidence of complications, and enhance self-care capabilities.

**Keywords:** Continuous nursing, Omaha System, double-J stents, nursing outcomes, complication

## Introduction

A double-J stent, as already known, is most frequently used in endourological practice, and it has gradually become an indispensable part of many minimally invasive treatment surgeries, for example ureteroscopic lithotripsy (URL), percutaneous nephrolithotomy (PCNL), and retroperitoneal laparoscopic ureterolithotomy [1]. A double-J stent can be beneficial to patients in relieving ureteral obstruction [2]. However, according to the statistics, approximately 80% of patients may develop stent-related symptoms [3, 4]. These symptoms, attributed to lower ureteral and bladder spasm because of bladder irritation, are common and have a negative effect on the quality of life, working ability, and sexual activity of both genders [5, 6]. Therefore, the main aspects of nursing care for patients with a double J stent included improving the quality of life for patients with a double-J stent and reducing stent-related symptoms, such as urinary tract infection (UTI), overactive bladder (OAB) symptoms, stent-related body pain, and hematuria. However, most patients lack a deep understanding of the knowledge related to double-J stents and lack self-care skills, which can lead to serious complications of double-J stents after discharge and readmission for treatment [7]. Continuous nursing is an extension of in-hospital care and a new nursing model that emerged in the context of the

https://doi.org/10.62347/XBFV3220

times to meet the needs of patients and the development of nursing science [8]. The Omaha System originated in the United States and is a standardized, research-based classification and terminology framework designed to document and analyze healthcare services, particularly in community health, nursing, and interdisciplinary care [9]. Developed in the 1970s by the Visiting Nurse Association of Omaha, it refers to a series of nursing measures that continue to provide nursing services to patients after they are discharged from hospital. It was first applied in China by Professor Huang and her team, and it is believed that the Omaha System is suitable for the continuous nursing model in China [10, 11].

Currently, the nursing measures for double-J stents are relatively traditional and have poor therapeutic effects. Hence, we conducted this prospective, randomized trial to explore new continuous nursing model and assess the effectiveness and safety of continuous nursing based on the Omaha System in patients with double-J stents after upper urinary tract stones surgery.

## Methods

### *Patients*

From July 2022 to December 2023, eligible patients who underwent upper urinary tract stones surgery in our department were selected as the subjects of this study. After applying strict inclusion criteria and randomly assigning the patients by the envelope method, 171 patients were finally included: 86 patients in the study group and 85 patients in control group (**Figure 1**). There was no substantial difference between the two groups in terms of demographics and clinical characteristics, including mean age at diagnosis, body mass index, history of hypertension and diabetes and stone locations (All $P > 0.05$). The study was approved by the clinical research ethics committee of the Affiliated Jiangning Hospital of Nanjing Medical University (ethics approval number: 202214289). Written informed consent was obtained from all participants.

### *Inclusion criteria*

The inclusion criteria included: 1) The patient's age was between 18 and 70 years old; 2) The postoperative imaging examination results showed that the double-J stent were put in place and single in the body; 3) The retention time of Double-J stents were all one month. 4) The patient's blood coagulation function was normal; 5) The patient had not performed cardiac and nervous system surgery before; 6) The patient had no visual, auditory, cognitive impairment or mental illness; 7) The patients and their family members were informed about the content of this study and signed an informed consent form. The exclusive criteria included: 1) Combined with BPH, bladder tuberculosis, cystitis, or other diseases that affect urinary function; 2) Patients with obvious lower abdominal, pelvic or perineal pain diseases history; 3) Pregnant and lactating women; 4) Patients with lumbar trauma; 5) Patients with serious diseases of blood system, respiratory system and nervous system; 6) Those with history of serious infectious diseases; 7) There are communication barriers or intellectual impairment, and they cannot cooperate with researchers.

### *Study procedure*

*The control group:* Carry out discharge education upon discharge, distribute health education manuals, explain the nursing, diet, daily exercise, and other precautions for indwelling double-J stents outside the hospital. Verify the patient's contact information, address, and other basic information, and inform the patient to return for consultation on time. The patient will be followed up by phone twice a week in the first week after discharge, and once a week thereafter. During the follow-up, the patient will be asked about their condition and self-care of the double-J stents, and the patient will be informed of the follow-up time. When the patient comes back, relevant knowledge about the nursing of double-J stents will be explained. The nursing cycle is one month.

*The study group:* (1) Screening for double-J stents nursing issues. Led by the head nurse of the department, an Omaha team was established, with three nurses with the title of nurse-in-charge or above professional title as team leaders. The team was accompanied by three nurses with rich nursing experience as team members, and each team was responsible for 10-15 patients. Three days before discharge, each team member will have a one-on-one con-

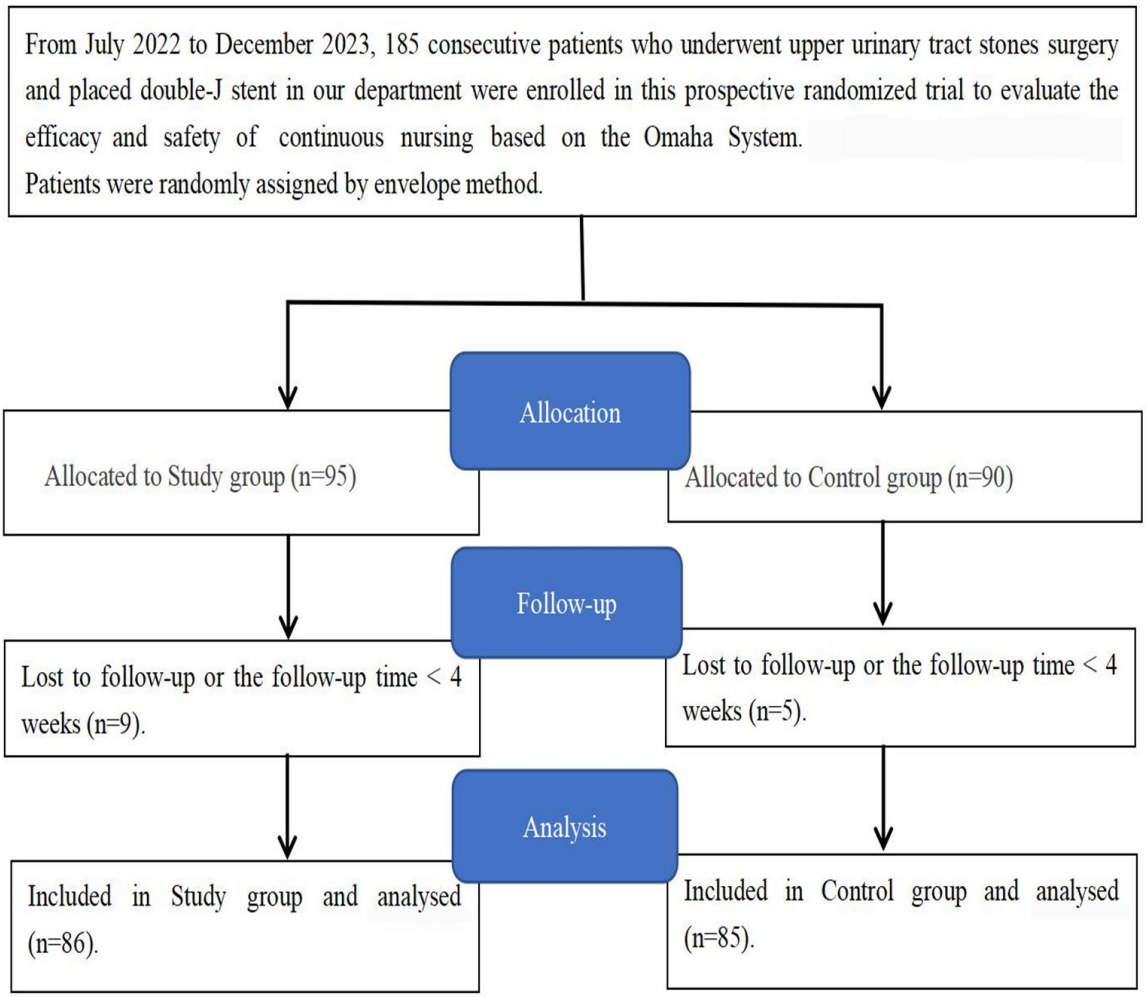


**Figure 1.** Flowchart for case selection.

versation with the patient to understand their post discharge nursing needs. Then, the Omaha System will be used to evaluate nursing issues, including the four aspects with the highest post discharge nursing needs: physiological, psychological, environmental, and health-related behaviors. A meeting will be held to discuss the evaluation issues, and all team members will participate to analyze the problems and develop nursing strategies. (2) Problem oriented continuous nursing. ① At discharge: Conduct one-on-one communication with patients at discharge, determine the order of problem solving after discharge based on Maslow's hierarchy of needs theory [12], and provide targeted intervention for 30 minutes. Maslow's Hierarchy of Needs is a psychological theory proposed by Abraham Maslow in his 1943 paper "A Theory of Human Motivation". It describes human motivation as a five-tiered pyramid of needs, where lower-level needs must be satisfied before higher-level ones become relevant. The effectiveness of the nursing intervention evaluated use evidence-based metrics aligned with Maslow's framework, including physiological outcomes, safety metrics, psychosocial scales, behavioral observations, problem rating scale (Omaha System). ② In the first week after discharge, telephone follow-up was conducted twice. In addition to routine medical inquiries, patients were asked about their nursing compliance, and the importance and skills of double-J stents nursing were reminded. The duration was 20-30 minutes. ③ For the next 3 weeks, a weekly telephone follow-up will be conducted to check patient nursing compliance, evaluate the effectiveness of continuing nursing interventions, inquire about unresolved

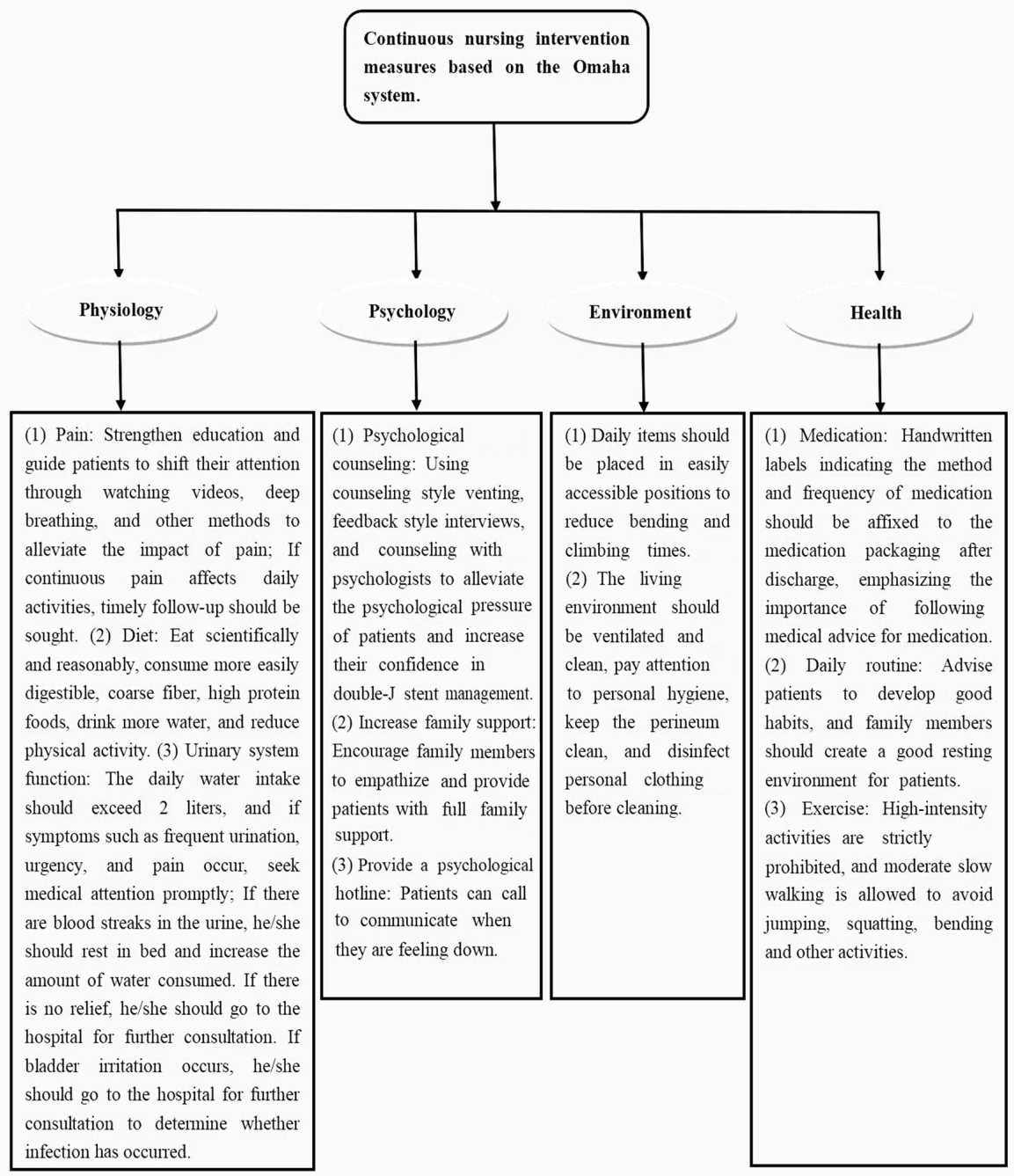


**Figure 2.** Continuous nursing intervention measures based on the Omaha System.

issues, and adjust intervention measures. The duration will be 20-30 minutes. The nursing cycle is one month. The specific continuous nursing intervention measures are shown in **Figure 2**.

*Follow-up*

All patients were followed up within four weeks after discharge. The nursing outcomes and incidence of complications in the two groups were compared. (1) Nursing outcome: The Omaha outcome evaluation system was used for evaluation, which includes three indicators: cognition, behavior, and condition. Each indicator was scored 3-15 points, with 3-6 points being poor, 7-10 points being average, and 11-15 points being excellent. (2) Complications: Record the rates of lower back pain, bladder irritative symptom, hematuria, urinary tract infec-

**Table 1.** Comparisons of patients' demographics and clinical characteristics between two groups

| Variables, mean ± SD or n (%) | Study Group (n = 86) | Control Group (n = 85) | *P* value |
|---|---|---|---|
| Age, year | 44.2 ± 6.3 | 45.1 ± 7.4 | 0.393 |
| BMI, kg/m$^2$ | 23.9 ± 3.1 | 24.3 ± 2.9 | 0.385 |
| Gender | | | |
| Male | 41 (47.7) | 47 (55.3) | - |
| Female | 45 (52.3) | 38 (44.7) | 0.319 |
| Hypertension history | | | |
| No | 59 (68.6) | 62 (72.9) | - |
| Yes | 27 (31.4) | 23 (27.1) | 0.533 |
| Diabetes history | | | |
| No | 65 (75.6) | 61 (71.8) | - |
| Yes | 21 (24.4) | 24 (28.2) | 0.571 |
| Stone location | | | |
| Ureter | 33 (38.4) | 37 (43.5) | 0.493 |
| Renal pelvis | 25 (29.1) | 22 (25.9) | 0.641 |
| Renal calyx | 28 (32.5) | 26 (30.6) | 0.782 |

BMI: body mass index; SD: standard deviation.

**Table 2.** Comparison of nursing outcomes between two groups before and after nursing care

| Variables, mean ± SD | Study Group (n = 86) | Control Group (n = 85) | *P* value |
|---|---|---|---|
| Cognition | | | |
| Pre-nursing | 6.3 ± 1.0 | 6.2 ± 1.1 | 0.535 |
| Post-nursing | 13.7 ± 1.4 | 9.6 ± 1.7 | < 0.001** |
| Behavior | | | |
| Pre-nursing | 6.9 ± 1.3 | 6.7 ± 1.2 | 0.297 |
| Post-nursing | 12.6 ± 0.9 | 9.3 ± 1.1 | < 0.001** |
| Condition | | | |
| Pre-nursing | 6.8 ± 1.2 | 6.6 ± 1.0 | 0.238 |
| Post-nursing | 13.2 ± 1.5 | 9.8 ± 1.3 | < 0.001** |

SD: standard deviation; **$P < 0.01$.

tion, and double-J stents displacement or detachment.

*Statistical analysis*

SPSS v.32.0 for Windows (IBM Corp., Armonk, NY, USA) was used to perform statistical analysis. Continuous variables were presented as mean ± standard deviation. Patient demographics, follow-up time, and nursing outcomes were compared between the two groups using an independent samples t test; Chi-squared test was used to compare other clinical characteristics between the two groups. A $P < 0.05$ was considered statistically significant.

## Results

In this study, 171 patients were randomly assigned to two groups: 86 patients were included in the study group and the other 85 patients were included in the control group. The patients' demographics and clinical characteristics are shown in **Table 1**. The mean age was 44.2 ± 6.3 years in the study group and 45.1 ± 7.4 years in the control group, respectively. There was no significant difference between the two groups in terms of body mass index, gender, history of hypertension and diabetes or stone locations (All $P > 0.05$).

In terms of nursing outcomes, there was no statistically significant difference in the pre-nursing between the two groups ($P > 0.05$). After nursing intervention, the cognitive score, behavioral score, and condition score of the two groups were separately higher than pre-nursing, and the scores in the study group were all significantly higher than those in the control group ($P < 0.05$) (**Table 2**). With respect to the secondary important variables, complications could not be ignored. The overall incidence of complications in the study group was significantly lower than that in the control group (4.6% vs. 14.1%, $P = 0.034$) (**Table 3**). No other serious complications occurred in both groups.

## Discussion

It is common to indwelling double-J stents after upper urinary tract stone surgery. Double-J stents are generally made of polyurethane polymer materials or silicone materials, and their main function is internal drainage, support, and prevention of ureteral adhesion [13]. However, during the indwelling of double-J stents, the

**Table 3.** Comparison of complications between two groups

| Variables, n (%) | Study Group (n = 86) | Control Group (n = 85) | *P* value |
|---|---|---|---|
| Low back pain | 2 (2.3) | 2 (2.3) | - |
| Bladder irritative symptom | 1 (1.2) | 3 (3.5) | - |
| Hematuria | 1 (1.2) | 3 (3.5) | - |
| Urinary tract infection | 0 (0.0) | 2 (2.3) | - |
| Double-J stent displacement or detachment | 0 (0.0) | 2 (2.3) | - |
| Total incidence of complications | 4 (4.6) | 12 (14.1) | 0.034* |

*$P < 0.05$.

patient's activities or nursing operations may cause tube detachment, bleeding, infection, etc., which can have a significant impact on the patient's quality of life [14]. The general retention time for double-J stents is 4-6 weeks. Therefore, most patients are discharged with stents. During the hospital period, patients have medical staff to supervise and guide them, which can effectively carry out the nursing work of indwelling double-J stents. However, after discharge, patients lack medical staff to take care of them, coupled with their own lack of relevant nursing knowledge and skills, which increases the incidence of complications [15]. Thus, it is crucial to provide effective nursing care for discharged patients with indwelling double-J stents. Continuous nursing is an effective extension and continuation of in-hospital care, which can provide relevant health care service needs for patients outside the hospital, help patients timely and effectively deal with related disease needs and problems and assist patients improve their quality of life [16]. Continuous nursing has been carried out in China for many years and has achieved considerable application results [17-19]. The Omaha System can achieve problem analysis, targeted solutions, and precise evaluation through problem classification, intervention, and outcome evaluation. Applying this system to the continuous nursing model can make it more comprehensive and is a new type of nursing model.

The results of our study showed that the cognitive score, behavioral score, and condition score of the two groups after nursing intervention were separately higher than those at pre-nursing, and the scores in the study group were all significantly higher than those in the control group ($P < 0.05$). This was basically consistent with the results reported by Kerr [20]. The application of continuous nursing based on the Omaha System can improve nursing outcomes in patients with postoperative indwelling double-J stents for urinary tract stones. Meanwhile, it revealed that the Omaha System was beneficial to improve the patient's grasp of disease knowledge and help improve patient compliance. Continuous nursing was divided into four aspects: physiological, psychological, environmental, and health. Physiological aspects included pain, diet, and urinary system function. Among them, pain was a problem faced by all patients with indwelling double-J stents. Strengthening education and reducing the impact of pain can alleviate the intensity of pain in patients to some extent. Psychological aspects include psychological counseling, increasing family support, and providing psychological hotlines, which can alleviate patients' psychological pressure and enhance their confidence in self-care. Family support not only provides patients with full understanding and action support, but also harmonizes the family atmosphere. A psychological hotline can help patients seek scientific help in a timely manner when encountering related problems. In terms of environment and health, guidance on home environment and healthy lifestyle habits can effectively ensure the health of patients living at home outside the hospital. Through one-on-one communication in nursing, determine the order of problem-solving for patients after discharge based on Maslow's hierarchy of needs theory [12], and provide targeted interventions. Integrating continuous nursing based on the Omaha System into the daily activities of discharged patients with management can effectively enhance their cognition, improve their behavior and condition.

With respect to the secondary important variables, complications could not be ignored. The overall incidence of complications in the study

group was significantly lower than that in the control group (4.6% vs. 14.1%, $P = 0.034$). The application of continuous nursing based on the Omaha System in patients with double-J stents after upper urinary tract stones surgery can reduce the incidence of complications and improve the patient's self-care ability. Because of the positive nursing effect, we gained trust of patients, and finally their satisfaction with our nursing work. In 2021, Liu J et al reported that the Omaha System-based continuing care has a better nursing effect on patients with retained double J tube after urinary calculus surgery. It can improve patients' compliance with treatment, relieve their anxiety and depression, improve their quality of life, and reduce overall complications incidence rate [21]. However, their sample size was relatively small.

However, this study has some limitations. The time for follow-up was short and it may have affected the outcome. Furthermore, we only counted the relevant symptoms through the patient's main complaint, which may have caused subjective deviation. Finally, the study was based on a single center with a small sample size, and there may have been a certain amount of sampling error. Therefore, large-scale, multicenter, prospective studies are required to further prove the above conclusions. It is likely that the ideal procedure will be formulated through a long period of clinical application and observation.

## Conclusions

The application of continuous nursing based on the Omaha System in patients with double-J stents after upper urinary tract stones surgery can improve nursing outcomes, reduce the incidence of complications, and enhance self-care capabilities, thus improving their satisfaction with nursing. In our opinion, this method is safe and reproducible in clinical practice; however, large-scale, multicenter, prospective studies are required to further prove the above conclusions.

## Disclosure of conflict of interest

None.

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