

The Impact of Quality Nursing on Instrument Quality Management and Department Satisfaction in the Management of Reusable Instruments in the Central Sterile Supply Department

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Abstract: *Objective:* To evaluate the effectiveness of quality nursing in the management of reusable instruments in the Central Sterile Supply Department (CSSD). *Methods:* Eleven nurses from the CSSD department were selected from January to October 2024, and quality nursing activities were implemented in the management of reusable instruments. The completion of quality indicators was analyzed. The instrument quality management scores, department satisfaction, and nurses' professional ability scores before and after nursing management were compared. *Results:* After nursing intervention, the qualified rates of initial cleaning and final cleaning of sterilization instruments were 99.66% and 100%, respectively. The qualified rate of packaging was 99.97%, the wet package rate was 0.1‰, the loading qualified rate was 99.88%, and the qualified rate of distribution was 99.99%. After nursing intervention, the nurses' instrument quality management scores, department satisfaction, and nurses' professional ability scores were all higher than those before nursing intervention ($P < 0.05$). *Conclusion:* Quality nursing activities can improve the cleaning, packaging, and sterilization qualified rates of reusable instruments in the CSSD, enhance the effect of instrument quality management, obtain higher department satisfaction from nurses, cultivate their professional abilities, and possess significant nursing management advantages.

Keywords: Quality nursing; Central Sterile Supply Department; Reusable instrument management; Instrument quality management; Department satisfaction

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1. Introduction

The Central Sterile Supply Department (CSSD) is responsible for providing treatment instruments or sterile items to different departments. It also handles the recovery, unified cleaning, packaging, and sterilization of reusable instruments to ensure their sterility^[1]. Due to the wide range of reusable instruments and the complexity of operational procedures, any issues in a certain link can reduce the quality of instrument management and increase the incidence of nosocomial infections. Therefore, it is necessary to strengthen the

comprehensive and standardized management of reusable instruments. Quality nursing activities optimize conventional instrument management measures, with comprehensive nursing management content that can deeply analyze the management issues of reusable instruments and maximize the effectiveness of instrument management ^[2]. Based on this, this study selected 11 nurses to evaluate the implementation effect of quality nursing activities on the management of reusable instruments in the CSSD department.

2. Materials and methods

2.1. General information

From January to October 2024, a total of eleven nurses were selected from the CSSD department, all of whom were female. Their ages ranged from 24 to 42 years, with a mean age of 35.02 ± 3.12 years. The group included 1 associate chief nurse, 6 nurse practitioners, and 4 staff nurses. In terms of educational background, 7 held bachelor's degrees and 4 held college degrees.

2.2. Methods

Routine nursing management measures for CSSD reusable instruments include:

- (1) Equipment management: Enhance equipment management systems and emergency response plans to ensure operational readiness. Conduct comprehensive skill assessments for nurses, ensuring they are fully qualified before assuming their duties. Perform thorough equipment inspections before and after each shift, supported by weekly cleaning, maintenance, and routine checks to promptly detect and address any malfunctions. Verify safety valves annually, inspect sterilizer equipment gauges biannually, and test both sterilizer effectiveness and sealer performance once per year. Monitor equipment cleaning procedures twice annually and conduct monthly drills focused on responding to equipment failures to strengthen staff preparedness and minimize risk.
- (2) Quality management system: Reasonably optimize the management organizational structure, implement flat management, clearly delineate the job responsibilities of each nurse, and refine corresponding assessment criteria. Based on the current situation of nursing management, optimize the specialized management system, quality control evaluation criteria, and quality monitoring indicators. Arrange nursing management matters reasonably by week and month, organize monthly meetings, screen for nursing defects, provide immediate feedback on nursing issues, and make immediate corrections.
- (3) Key link management: Conduct monthly screenings of typical cases to support safety warning education. Organize one to two safety hazard inspections each month to promptly identify and address potential issues. Perform weekly inspections of fire protection systems as well as water and electrical facilities. Ensure that hazardous chemicals and explosives are securely managed in designated storage cabinets. Nurse scheduling should be flexibly adjusted to accommodate special circumstances, such as temporary leave or increased surgical volume during holidays. In such cases, allocate nursing staff reasonably and enhance supervision of intern and rotating nurses to ensure safe and compliant operations.
- (4) Continuing education: Organize monthly theoretical study and practical skills training activities, provide four continuing education sessions per month, participate in training courses on new management developments, continuous improvement training courses, etc., to provide a learning platform for nurses.

Based on the above nursing management, from January to October 2024, we will combine high-quality

nursing activities:

- (1) Equipment pretreatment: Equip the operating room with a special enzymatic hydrolysis moisturizing solution, indicate the expiration date and proportion of the moisturizing solution, and place it at the equipment collection point. Draw a pretreatment flowchart in graphic and text form, showing the spraying time and amount of moisturizing solution to prevent blood stains from drying and affecting the disinfection and sterilization effect.
- (2) Endoscopic equipment system training: The sterilization and supply specialist nurses are responsible for endoscopic equipment training activities, such as lumen brushing operation, endoscopic equipment disassembly operation, and visual inspection methods for key points. Establish an endoscopic equipment management group, invite operating room nurses to join the WeChat group, and encourage them to communicate equipment issues at any time.
- (3) Surgical observation: Organize nurses to enter the operating room for observation once a week to learn about the operation process of surgical instruments, common usage issues, and precautions. Nurses are required to record the frequency of use and severity of contamination of each surgical instrument during the operation, clarify the priority of contaminated instrument processing, and improve the professional skills of nurses.
- (4) Respiratory circuit management training: Invite neonatal nurses to demonstrate the connection method of the respiratory circuit on site, and clarify the highly contaminated areas, such as Y-shaped bifurcations. Select cleaning tools such as slender brushes based on the size of the lumen to ensure the rationality and pertinence of the cleaning plan.
- (5) Color marking management: Categorize equipment based on its purpose and belonging department. Emergency equipment can use red labels, high-risk equipment can use orange labels, and ordinary departments can choose green labels. Divide low-temperature or high-temperature sterilized products by different colors.
- (6) Making equipment package lists: Create visual equipment package lists that include information such as equipment name, quantity, and specifications, and place them in the equipment package. Using an electronic scanning system, scanning the equipment package barcode can provide detailed information about its contents.
- (7) Increase the number of daytime equipment collections: Reasonably adjust the frequency of equipment collections based on peak surgical periods, such as multiple collections at 11 am or 4 pm daily during peak hours.
- (8) Optimizing the collection and delivery process: Establish a dedicated team to draw up a route map based on the specific needs of the department to ensure that the daily collection and delivery process is meticulous and standardized. Utilize an information system or phone to open an urgent channel, respond within 10 minutes, and deliver immediately when needed.

2.3. Observation indicators

- (1) Completion of quality indicators: Statistical indicators include the qualification rates of equipment cleaning, packaging, sterilization, wet package rate, monitoring qualification rate, equipment loading qualification rate, and distribution qualification rate.
- (2) Equipment quality management score: A self-made equipment quality management evaluation scale includes quality supervision and management, disinfection and sterilization processes, quality

inspection, implementation of sterile principles, etc. Each item is worth 25 points, totaling 100 points, scored in a positive direction.

- (3) Department satisfaction: A self-made department satisfaction scale includes equipment recovery process, delivery and collection process, operational convenience, etc. The total score is 100 points, with high satisfaction > 85 points, satisfaction between 50–85 points, basic satisfaction between 25–49 points, and dissatisfaction < 25 points.
- (4) Nurse professional ability score: A self-made questionnaire on nurses' professional abilities includes basic knowledge, sterilization and storage, cleaning and packaging, delivery and collection, self-protection, etc. Each item is worth 100 points, scored in a positive direction.

2.4. Statistical analysis

Data processing software is SPSS 28.0. Measurement data is expressed as $[\bar{x} \pm s]$, using t-value comparison and test. Count data is expressed as $[n/\%]$, using χ^2 value comparison and test. The criterion for statistical significance is $P < 0.05$.

3. Results

3.1. Analysis of the completion of quality indicators

A total of 882,240 reusable equipment items were processed. After high-quality nursing, the initial cleaning qualification rate of disinfection equipment was 99.66% (879,240/882,240); the final cleaning qualification rate was 100%. There were 50,346 disinfection packages and 140,947 sterilization packages, with a packaging qualification rate of 99.97% (191,235/191,293). Among all the equipment, there were 8 wet packages, with a wet package rate of 0.1%. High-temperature sterilization was performed 1,581 times, with a sterilization qualification rate of 99.99% (882,151/882,240). B-D experimental monitoring was performed 589 times, biological monitoring 88 times, and batch monitoring 1,581 times, with a monitoring qualification rate of 100%. Low-temperature sterilization was performed 1,228 times, with a sterilization qualification rate of 100% for items. Biological monitoring was performed 269 times, and batch monitoring 1,228 times, with a monitoring qualification rate of 100%. The equipment loading qualification rate was 99.88% (881,181/882,240); the distribution qualification rate was 99.99% (882,152/882,240).

3.2. Comparison of equipment quality management scores before and after nursing

After nursing, the nurses' equipment quality management scores were higher than before the implementation of high-quality nursing ($P < 0.05$). The results are shown in **Table 1**.

Table 1. Comparison of equipment quality management scores before and after the implementation of high-quality nursing $[\bar{x} \pm s, \text{scores}]$

Time	Number	Quality supervision	Sterilization process	Quality inspection	Aseptic principle implementation
Pre-care	11	16.98 $\pm$ 2.41	18.21 $\pm$ 2.45	16.35 $\pm$ 2.74	17.52 $\pm$ 2.33
Post-care	11	23.71 $\pm$ 3.98	23.06 $\pm$ 2.37	23.36 $\pm$ 2.81	23.14 $\pm$ 1.86
<i>t</i>	-	4.797	4.719	5.924	6.252
<i>P</i>	-	< 0.001	< 0.001	< 0.001	< 0.001

3.3. Comparison of department satisfaction before and after nursing

After nursing, the department satisfaction of nurses was higher than before the implementation of high-quality nursing ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of department satisfaction before and after the implementation of high-quality nursing [n/%]

Time	Number	Highly satisfied	Satisfied	Basically satisfied	Dissatisfied	Satisfaction rate
Pre-care	11	2(18.18)	2(18.18)	1(9.09)	6(54.55)	45.45(5/11)
Post-care	11	4(36.36)	3(27.27)	3(27.27)	1(9.09)	90.91(10/11)
χ^2	-	-	-	-	-	5.238
P	-	-	-	-	-	0.022

3.4. Comparison of nurses' professional ability scores before and after the implementation of high-quality nursing

After nursing, the nurses' professional ability scores were higher than before the implementation of high-quality nursing ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of nurses' professional ability scores before and after the implementation of high-quality nursing [$\bar{x} \pm s$, scores]

Time	Number	Basic knowledge	Sterilization & storage	Cleaning & packaging	Distribution & collection	Self-protection
Pre-care	11	80.65 $\pm$ 4.53	85.11 $\pm$ 4.24	87.16 $\pm$ 4.50	88.52 $\pm$ 3.56	85.45 $\pm$ 4.13
Post-care	11	93.56 $\pm$ 3.74	95.02 $\pm$ 3.15	96.57 $\pm$ 4.63	95.14 $\pm$ 3.60	90.97 $\pm$ 4.27
t	-	7.289	6.223	4.834	4.337	3.082
P	-	< 0.001	< 0.001	< 0.001	< 0.001	0.006

4. Discussion

The work content of CSSD includes cleaning, disinfection, packaging, and sterilization of various instruments. The focus is on preventing nosocomial infections and improving the quality of instrument management through standardized and scientific nursing management methods [3]. In routine nursing management measures, attention is paid to the disinfection and sterilization processes of instrument management, which can reduce the occurrence of unqualified instruments and improve the safety of instrument use. However, for reusable instruments, their high frequency of use makes them more prone to complications such as infections, thus requiring optimization of nursing management content [4].

The high-quality nursing activities can implement responsibility-based nursing management, improve and deepen the nursing content of the CSSD department, and continuously cultivate the professional level of nurses, thereby improving the effectiveness of instrument management [5]. The diversified nursing management content meets the work requirements of the CSSD department, enabling predictive evaluation of common problems in instrument management and targeted development of nursing management plans.

The results showed that after the implementation of high-quality nursing, the quality indicators were

excellently achieved. The nurses' instrument quality management scores, department satisfaction, and nurses' professional ability scores were all higher than before the implementation of high-quality nursing ($P < 0.05$). The reason for this improvement is that instrument pretreatment can reduce the large-scale generation of biofilms on the instrument surface, making it easier to clean the instruments and prolonging their service life ^[6]. Systematic training on endoscopic instruments can reduce nurses' operational errors and prevent instrument damage, thereby improving the qualified rate of instrument cleaning. Surgical observation and learning can enhance nurses' understanding of the usage procedures and performance of operating room instruments, preventing missed cleaning of areas such as joint gaps during the cleaning process ^[7]. Respiratory tubing management training can improve the rate of qualified cleaning, prevent nosocomial infections, and ensure the safety of instrument use ^[8]. Color-coded management can reduce instrument distribution errors and accurately identify emergency instruments, thereby improving instrument usage efficiency. Creating an instrument pack list can prevent missing instruments and shorten preoperative preparation time. Increasing the frequency of daytime instrument collection can improve instrument turnover efficiency, prevent long-term accumulation of contaminated instruments, and meet the demand for instruments in emergency surgeries. Optimizing the collection and delivery process can reduce labor consumption and maximize closed-loop management ^[9, 10].

5. Conclusion

In summary, adopting high-quality nursing activities in the instrument management of the CSSD department can improve the quality of instrument management, department satisfaction, and optimize nurses' professional abilities. The nursing management approach demonstrates strong scientific validity.

Disclosure statement

The author declares no conflict of interest.

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