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ORIGINAL RESEARCH

Implementing '6S' Nursing Management in Sterilization and Supply Centers: Enhancing Surgical Instrument Quality and Work Efficiency

Li Fang[1], Kaiping Xiao[1], Hongyu Zhu[1], Mingxia Zhang[2]

[1]Disinfection Supply Center, The Second Affiliated Hospital of Soochow University, Suzhou, Jiangsu, 215004, People's Republic of China; [2]Department of Infection Management, The Second Affiliated Hospital of Soochow University, Suzhou, Jiangsu, 215004, People's Republic of China

Correspondence: Mingxia Zhang, Department of Infection Management, The Second Affiliated Hospital of Soochow University, 1055 Sanxiang Road, Suzhou, Jiangsu, 215004, People's Republic of China, Tel +86-0512-67783321, Email Zhangmingxia7831@163.com

Objective: This study examines the implementation of '6S' nursing management in sterilization and supply centers to evaluate its impact on improving surgical instrument management and overall operational quality.

Methods: The pre-management phase was from January to June 2019, during which the conventional management mode was applied in our hospital's sterilization and supply center, and 100 instrument packs were selected for quality inspection. The post-management phase was from July to December 2019, when the 6S management mode was implemented in the sterilization and supply center, with another 100 instrument packs selected for quality inspection. A total of 20 staff members were involved. The management quality (environmental management, packaging management, cleaning and sterilization, and instrument management), mastery of professional knowledge (theoretical knowledge, practical knowledge, and nursing skill knowledge), incidence of surgical instrument processing errors, quality of work (grooming, problem-solving, sense of responsibility, sense of initiative, and team communication), and work pass rate before and after 6S management were compared.

Results: After 6S management, the management quality scores were higher, the mastery of professional knowledge of personnel was raised, the quality of work was promoted, the overall incidence of errors in surgical instrument processing was reduced to 1%, and the qualification rates for cleaning, sterilization, and issuance were all increased to 100%, with significant differences compared to before the implementation of management measures (all $P < 0.05$).

Conclusion: The application of "6S" nursing management in the sterilization and supply center is an effective approach to addressing the current challenges of enhancing sterilization quality and management efficiency, significantly improving the quality of surgical instruments and work efficiency.

Keywords: sterilization and supply center, "6S" nursing management, quality of work, surgical instruments, quality of surgical instrument management

Introduction

Surgical devices refer to the overall surgical working space and useful tools.[1] Surgical instrument processing is of great significance to safe and high-quality surgical care[2] and is also crucial in the safety improvement of surgical care in hospitals.[3] For optimal patient care, efficient and timely cleaning surgical instruments is paramount.[4] Each hospital ought to set its own standards for disinfection and sterilization of medical devices. Moreover, disinfection and sterilization are two crucial aspects in controlling infection.[5] Surgical instrument management is involved in the security and efficiency of surgical operations, and the application of surgical instruments information management systems can be helpful in the management of surgical instruments, improvement of surgical security and promotion of instrument utilization efficiency.[6]

Sterilization and supply center plays a crucial role in hospitals by guaranteeing the quality of healthcare services and managing infection control. Its primary duties encompass the cleaning, disinfection, sterilization, distribution, recycling,

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and storage of clinical medical items and equipment, while also ensuring the availability of sterile supplies to all hospital departments.[7] Inadequate management of the sterilization and supply center can give rise to nosocomial infections and financial losses. The intricate structures of many medical devices pose challenges in cleaning. Deficient management practices and technological shortcomings may lead to inadequate cleaning, thereby fostering nosocomial infections. These infections can escalate medical costs for patients, prolong hospital stays, and in extreme cases, jeopardize patient lives, causing substantial losses for both hospitals and patients.[7] Recently, a "6S" concept is introduced to the management of environments, safety, and item deposition in the laboratory, which refers to "Seiri", "Seiton", "Seiso", "Seiketsu", "Shitsuke", and "Safety". The application of "6S" management can help maintain a tidy and clean lab environment, facilitate lab skill teaching, and improve teaching quality, together achieving the goal of education with the atmosphere.[8] The "6S" management approach has its roots in the 5S framework developed by Hiroyuki Hirano, a Japanese expert in organizational efficiency. This framework is built on five foundational principles: Seiri, which involves sorting and eliminating unnecessary items; Seiton, focusing on organizing necessary items for efficiency and visibility; Seiso, emphasizing cleanliness and ongoing maintenance of the workspace; Seiketsu, which standardizes the first three practices to integrate them into daily routines; and Shitsuke, ensuring the sustained application of these principles.[9] Building upon the original framework, the "6S" management system enhances the 5S model by incorporating an additional element-Safety. This inclusion is designed to boost operational efficiency, minimize resource wastage, and secure the safety of the workplace environment.[9] The elements of the 6S management framework are interconnected, emphasizing on-site management practices and the standardization of staff procedures to improve operational quality. Through specialized training and a well-defined allocation of responsibilities, the 6S approach can enhance the competencies of nursing personnel, decrease the incidence of errors, and boost both the efficiency and quality of care provided.[10]

As mentioned earlier, the work of the sterilization and supply center involves the management of a large number of medical devices and supplies, with extremely high requirements for work efficiency and safety. The 6S management approach, through comprehensive promotion in six areas: sort, set in order, shine, standardize, sustain, and safety, can significantly improve the work efficiency and safety of the sterilization and supply center. For instance, by sorting, setting in order, and shining, the 6S management makes the workplace tidy and orderly, helping employees find needed items more quickly, reducing search time, and thus enhancing work efficiency. Additionally, the shine and standardize steps contribute to maintaining a clean and hygienic workplace, reducing bacterial and dust contamination, creating excellent conditions for instrument sterilization, and effectively lowering the risk of nosocomial infections. It is reported that a "6S" management can improve not only the work efficiency but also quality of work. The implementation of visual and "6S" management modes in the ward can result in higher satisfaction of medical staff such as nurses and improved quality of clinical nursing management.[9] Furthermore, Wenjun Bu et al indicated that implementing 6S management with a focus on the work of operating room nurses improved nurses' capabilities, enhanced management effectiveness, and ultimately increased patient satisfaction.[10] Inspired by the aforementioned research, we realize that there is scant discussion on the application of "6S" nursing management in the sterilization and supply center, and there is a lack of empirical research in this field. The existence of this research gap not only limits our comprehensive understanding of the application effects of the "6S" management model in the sterilization and supply center but also affects the decision-making and operations of managers and practitioners in practical work. The application of the 6S nursing management model in the sterilization and supply center may have significant advantages and effects. By comprehensively promoting management in the six areas of the sort, set in order, shine, standardize, sustain, and safety, it may significantly improve the work efficiency and safety of the sterilization and supply center, safeguarding medical safety.

Therefore, this study focuses on exploring the application of "6S" nursing management in the sterilization and supply center and its impact on the quality of surgical instrument management, aiming to provide medical managers with a scientific and systematic set of management tools and methods to help them better optimize the workflow of the sterilization and supply center and improve the management quality of surgical instruments; to provide a scientific basis for policymakers to formulate relevant policies and standards; and for frontline employees, the research results will help them better understand the connotation and requirements of the "6S" management model, enhance their work efficiency and sense of responsibility, thereby providing patients with better and safer medical services.

Materials and Methods

Ethics Statement

The study was approved by the Ethics Committee of The Second Affiliated Hospital of Soochow University. All participants provided informed consent.

Clinical Data

The pre-management phase was from January to June 2019, when the conventional management mode was applied in our hospital's sterilization and supply center, with 100 instrument packs (including 32 orthopedic packs, 20 general surgery packs, 12 urology packs, 13 gynecology packs, 7 neurosurgery packs, 8 thoracic surgery packs, and 8 packs from other departments) selected for quality inspection. The post-management phase was from July to December 2019, when the 6S management mode was implemented, with another 100 instrument packs (including 32 orthopedic packs, 22 general surgery packs, 13 urology packs, 12 gynecology packs, 8 neurosurgery packs, 6 thoracic surgery packs, and 7 packs from other departments) selected for quality inspection. A total of 20 staff members were involved, 6 males and 14 females. The staff members included 6 workers, 2 disinfection members and 12 nurses, with an average age of 34.05 ± 7.53 years old. No personnel changes occurred during the study period, meeting the conditions for comparative research. There were no statistically significant differences in the sources, quantities, or types of instrument packs from the operating rooms ($P > 0.05$).

Methods

The control group was managed using routine management practices, with the hospital sterilization and supply center strictly adhering to relevant regulations and industry-published technical operation norms for sterilization, as well as standards for monitoring sterilization effectiveness, in carrying out tasks such as cleaning, sterilization, and organization.

The observation group adopted the "6S" nursing management of Seiri, Seiton, Seiso, Seiketsu, Shitsuke, and Security.

Establishing a 6S management team: The head of the supply room served as the team leader and a deputy leader was selected by vote, with requirements for strong work ability and experience. Nursing staff with more than three years of work experience were selected as team members and received unified professional training. The training content mainly included 6S management theory, practical skills, and operational management skills. Theoretical knowledge covered basic knowledge of disinfection, isolation, prevention, cleaning machines, and sterilizers according to hygiene industry standards, as well as traceability management of packaging materials and sterile items. Practical skills encompassed the recycling, cleaning, disinfection, inspection, packaging, sterilization, storage, and issuance of various instruments and items. The training content for operational management skills focused on the use and maintenance of cleaning, disinfection, and sterilization equipment and water treatment systems. Team members began receiving training on 6S theoretical knowledge on the first day of joining the team, with a one-week learning period for theoretical knowledge. Additionally, they received practical skill training for five days in the installation position, three days in the sterilization position, five days in the issuance position, and three days in the cleaning position. During the training period, reviews and analyses were conducted, with team members discussing and systematically analyzing past work processes. Brainstorming sessions were held to identify problems in the washing, packaging, sterilization, and issuance processes. Through systematic analysis of relevant materials, inspection forms were created to collect and summarize issues, followed by the implementation of 6S management nursing work. Simultaneously, relevant workflows, assessment systems and standards were established, clarifying the responsibilities of team members.

6S management nursing work:

Seiri: Relevant equipment was added based on the needs of the supply room. Operating procedures, usage precautions, and maintenance requirements were formulated for each instrument or equipment, and implemented. Specific and standardized work area regulations were established, dividing staff into cleaning, disinfection, inspection and packaging, and storage and issuance groups, with clear job content and requirements for each group. Quality monitoring was strengthened among groups, with the work quality of the previous link being inspected before the implementation of each subsequent link, ensuring interconnectedness. Meanwhile, systems for cleaning items, unloading inspections of sterilized

items, and quality inspections of sterile items were established and continuously improved. If issues were found, communication was enhanced to seek solutions.

Seiton: Instruments were classified according to the principles of "four easies": easy to find, easy to see, easy to retrieve, and easy to return. Each instrument was processed using separate packaging, numbered, and archived, with prompt signs for the issuance of sterile items established. The principle of first-in, first-out was followed for recently acquired and advanced items, with expired items not allowed for use. Cleaning facilities and contamination area worktables must be used fixedly, maintaining simplicity and rationality in the configuration of items in the clean area. Uncommonly used items in cabinets were promptly cleared out, and single-use items with outer packaging removed were placed in the sterile area. A reasonable layout of the supply room could avoid cross-infections, save manpower and material resources, and improve staff efficiency. The surrounding environment was kept clean and tidy, with clear divisions of three areas: contamination, inspection, packaging, and sterilization, and sterile item storage. Air disinfection was conducted daily in each area to maintain appropriate temperature and humidity.

Seiso: The working environment of each area was cleaned regularly every day, with air disinfection performed simultaneously. Relevant instruments and equipment were cleaned, maintained, and serviced.

Seiketsu: The cleaning process for instruments and items was improved, with appropriate cleaning methods selected based on their specific characteristics. Standardized cleaning and disinfection operating procedures were established for general instruments, small instruments, and trays in the oral supply room, with nursing staff required to strictly follow the procedures for relevant cleaning operations. For small and structurally complex instruments, attention was paid to the threaded gaps on the working surface of mobile phones, drying before and after oil injection, prevention of small instruments from being rinsed away, and needlestick injuries. For instruments that could be disassembled, disassembly was performed before cleaning whenever possible for more thorough cleaning. When cleaning instruments, great care and patience were required, and the cleaning effect could be inspected using a magnifying glass.

Shitsuke: Workflows should be reasonably arranged based on the circulation volume of instruments required daily by each department, including batch issuance and recycling of instruments and items by departments, the cleaning and disinfection process for instruments, and the time required. Proper coordination of work was arranged to ensure that all tasks were carried out in an orderly manner, meeting the needs of each department while ensuring work quality. Additionally, the workload and scheduling of staff in the supply room were reasonably arranged based on clinical demand. Meanwhile, the cultural construction of departments was strengthened, with regular learning and training organized to cultivate the service awareness of nursing staff, continuously improving their comprehensive quality and abilities. Through inspections and enhanced communication, nursing staff could identify issues, conduct self-examination and self-correction, form good work habits and continuously enhance their professionalism.

Security: Risk prevention efforts in nursing management in the supply room needed to be strengthened. Regular risk prevention drills were conducted to enhance the risk prevention awareness of nursing managers. Meanwhile, verification of emergency response plan procedures was strengthened; strict management was implemented for hazardous chemicals and other items; and the quality of single-use sterile items was strictly monitored to improve risk prevention effectiveness.

Observation Indicators

Management quality, including environmental management, packaging management, cleaning and sterilization management, and instrument management, before and after management was compared, and each item scored 0–100 points, taking the integer scores. The scores were positively proportional to the quality of management. All management links complied with WS 310.1–2016 management regulations for hospital sterilization and supply centers, technical operation norms for cleaning, disinfection, and sterilization, and monitoring standards for cleaning, disinfection, and sterilization effects.

The incidence of errors in the processing of surgical instruments before and after management was compared, including lost instruments, recording errors, substandard cleaning, handover errors, and cleaning agent errors.

The quality of work before and after management was compared, including grooming, problem-solving, sense of responsibility, sense of initiative, and team communication. Each aspect was scored with a full score of 100 points, and the score was positively related to the quality of work.

The work pass rate before and after management was compared, including 5 links of surgical instrument recovery, cleaning, sterilization, packaging and distribution. The quality of work in each link was evaluated and the pass rate was counted.

Observers who had undergone unified training assessed the observation indicators before and after management.

Statistics

SPSS 22.0 software and GraphPad Prism 8.0 were applied to process the data. The *t*-test was utilized for measurement data, which were expressed as mean ± standard deviation ($\bar{x} \pm sd$). The chi-square test was taken for numeration data, which were depicted as percentages (%). Differences were considered statistically significant when $P < 0.05$.

Results

Management Quality Prior to and After Management

Prior to management, the scores of environmental management, packaging management, cleaning and sterilization management, and instrument management were 89.20 ± 2.16, 90.10 ± 1.92, 87.60 ± 3.06, and 87.95 ± 2.77, respectively; and after management, the related scores were 93.60 ± 2.20, 94.70 ± 2.22, 93.24 ± 2.10, and 92.15 ± 2.48, respectively. The scores of management quality after management were higher versus those prior to management (95% CI: 2.972–5.828, 3.440–5.760, 3.925–7.175, 2.845–5.555, all $P < 0.001$) (Figure 1).

Professional Knowledge Mastery of Personnel Prior to and After Management

Prior to management, the scores of theoretical, practical and nursing skill knowledge were 78.65 ± 3.95, 80.25 ± 2.51, and 84.35 ± 3.57, respectively; and those scores after management were 89.15 ± 2.37, 92.35 ± 2.71, and 94.00 ± 2.00, respectively. The mastery of professional knowledge of personnel after management was higher versus that prior to management (95% CI: 8.021–12.98, 10.06–14.14, 7.674–11.63, all $P < 0.001$) (Table 1).

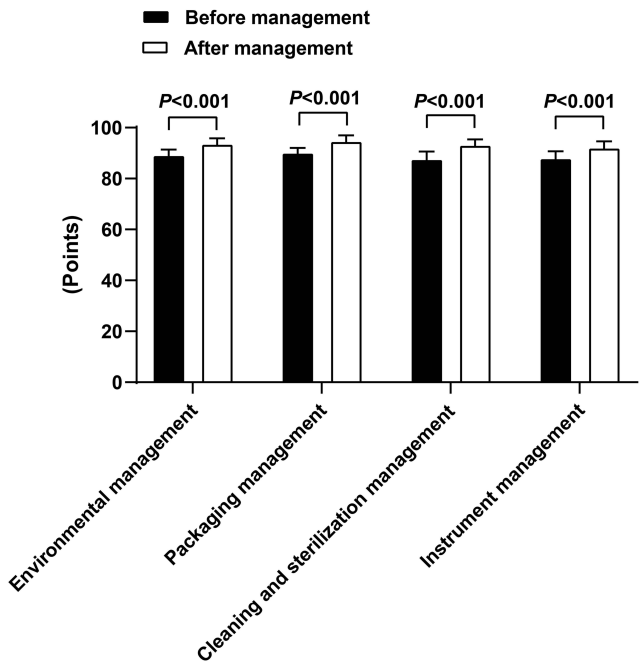

Figure 1 Comparison of management quality scores before and after 6S implementation.

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Table 1 Professional Knowledge Mastery of Personnel Prior to and After 6S Management

Items	Before Management (n = 20)	After Management (n = 20)	P	95% CI
Theoretical knowledge	78.65 ± 3.95	89.15 ± 2.37	< 0.001	8.021–12.98
Practical knowledge	80.25 ± 2.51	92.35 ± 2.71	< 0.001	10.06–14.14
Nursing skill knowledge	84.35 ± 3.57	94.00 ± 2.00	< 0.001	7.674–11.63

Note: The significance level (*P*) was < 0.05; 95% CI, 95% confidence intervals.

Table 2 Quality of Work Before and After 6S Management

Items	Before Management (n = 20)	After Management (n = 20)	P	95% CI
Grooming	89.50 ± 1.99	93.80 ± 1.72	< 0.001	3.056–5.544
Problem-solving	88.40 ± 2.76	93.60 ± 2.45	< 0.001	3.779–6.621
Sense of responsibility	85.85 ± 3.38	92.65 ± 2.57	< 0.001	4.876–8.724
Sense of initiative	91.25 ± 1.87	95.15 ± 1.49	< 0.001	2.725–5.075
Team communication	88.95 ± 2.56	93.40 ± 2.15	< 0.001	3.449–5.451

Note: The significance level (*P*) was < 0.05; 95% CI, 95% confidence intervals.

Quality of Work Before and After Management

Prior to management, personnel's grooming, problem-solving, sense of responsibility, sense of initiative, and team communication scores were 89.50 ± 1.99, 88.40 ± 2.76, 85.85 ± 3.38, 91.25 ± 1.87, and 88.95 ± 2.56, respectively; after management, the related scores were 93.80 ± 1.72, 93.60 ± 2.45, 92.65 ± 2.57, 95.15 ± 1.49, and 93.40 ± 2.15, respectively. The quality of work after management was elevated versus that before management (95% CI: 3.056–5.544, 3.779–6.621, 4.876–8.724, 2.725–5.075, 3.449–5.451, all $P < 0.001$) (Table 2).

Incidence of errors in the processing of surgical instruments before and after management.

Before management, there were 3 record errors, 1 case of substandard washing, 2 handover errors, 1 detergent error, and an overall incidence of errors in surgical instrument processing of 7%. After management, there was 1 handover error and

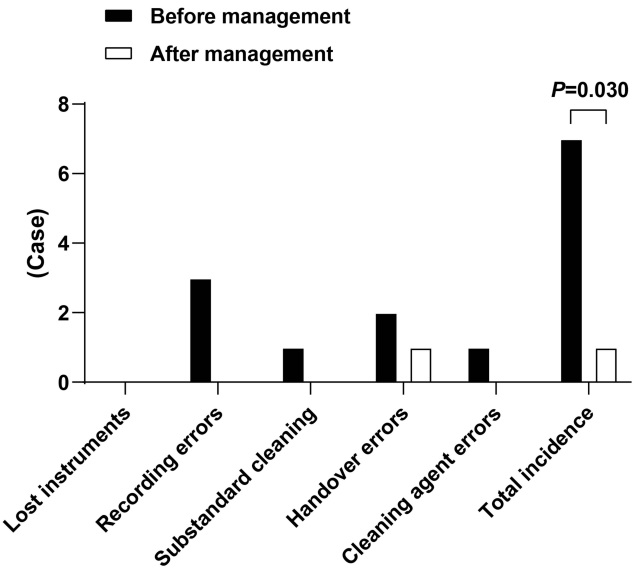

Figure 2 Comparison of incidence rates of errors in surgical instrument processing before and after implementation of 6S Management.

Table 3 Work Pass Rate Prior to and After 6S Management

Items	Before Management (n = 100)	After Management (n = 100)	P
Recovery	98 (98.00)	100 (100.00)	0.155
Cleaning	96 (96.00)	100 (100.00)	0.043
Sterilization	95 (95.00)	100 (100.00)	0.024
Packaging	97 (97.00)	100 (100.00)	0.081
Distribution	96 (96.00)	100 (100.00)	0.043

Note: The significance level (*P*) was < 0.05.

an overall incidence of errors in surgical instrument processing of 1%. The overall incidence of errors in surgical instrument processing after management was significantly lower than before management ($P = 0.030$). (Figure 2).

Work Pass Rate Prior to and After Management

Compared to before management, the qualification rates for cleaning (96.00% vs 100.00%), sterilization (95.00% vs 100.00%), and issuance (96.00% vs 100.00%) were significantly improved after management ($P = 0.043$, 0.024, 0.043). There were no significant differences in the qualification rates for recycling (98.00% vs 100.00%) and packaging (97.00% vs 100.00%) before and after management ($P = 0.155$, 0.081) (Table 3).

Discussion

Managing medical devices is important to secure and high-quality surgical care.[11] This paper was aimed at probing the application of "6S" nursing management in the sterilization and supply center and its impact on the quality of surgical instrument management.

The findings of this study indicated that after the 6S implementation of management, the quality scores for environmental management, packaging management, cleaning and sterilization management, and instrument management were all higher than before the 6S implementation. This suggests that "6S" nursing management has played a positive role in enhancing overall management quality. Through the management of the six aspects of the sort, set in order, shine, standardize, sustain, and safety, the work environment of the sterilization and supply center became more tidy and orderly, and the management processes were more standardized, thereby improving management quality. Furthermore, after the 6S implementation of management, personnel scores for theoretical knowledge, practical knowledge, and nursing skills were all higher than before. This implies that "6S" management not only focuses on organizing and standardizing material aspects but also emphasizes the enhancement of personnel's professionalism and skills. Through targeted training and assessments, employees' professional knowledge and skills were significantly enhanced, empowering them to execute their duties more effectively and minimizing operational errors. Further research findings revealed that after 6S management, personnel's work quality in terms of grooming, problem-solving abilities, sense of responsibility, initiative, and team communication was enhanced. This reflects the positive impact of "6S" management in improving employees' professionalism and work attitudes. Employees paid more attention to details in their work, exhibited greater proactivity, and communication within teams became smoother, thereby improving overall work quality.

Importantly, our study also confirmed that the overall error rate in surgical instrument processing was lower after 6S management than before, thanks to the role of "6S" management in process standardization and quality control. By standardizing operational procedures and implementing strict quality control measures, the processing of surgical instruments became more standardized, reducing the possibility of errors. Additionally, the qualification rates for cleaning, disinfection, and issuance were significantly higher after 6S management than before. This reflects the positive impact of "6S" management in improving the quality of cleaning, disinfection, and issuance processes in the sterilization and supply center. By enhancing cleaning and disinfection efforts, the sterile state of surgical instruments was ensured; by standardizing issuance processes, the accuracy and timeliness of issuance were improved. It is noteworthy that there

were no significant differences in recycling qualification rates and packaging qualification rates before and after management. This may be related to the specificity of recycling and packaging processes. The recycling process involves multiple steps, and its qualification rate may be influenced by various factors such as the responsibility of recycling personnel, operational skills, and the initial state of the instruments. The packaging process, on the other hand, may be affected by factors such as the quality of packaging materials, the shape and size of the instruments, etc. Although "6S" management has played a positive role in overall management quality, more in-depth improvements and optimizations may be needed in these specific areas. Thus, through "6S" management, staff in the sterilization and supply center are able to perform instrument cleaning more standardized, ensuring thorough cleaning and disinfection of instruments. Additionally, the storage and retrieval of instruments become more orderly and convenient, reducing the risk of loss and damage during storage and transportation. Staff in the sterilization and supply center are also able to strictly follow sterilization procedures, ensuring the sterilization quality of instruments.

It is demonstrated that a 4S Intelligent Trauma Care program can promote perioperative management and diminish environmental effects by implementing standardized inventories and sterile implant portfolios. In addition, the application of the 4S program can lead to raised staff satisfaction and positive environmental impact.[12] Moreover, the utilization of the 5S method is proven to be beneficial for safe environment creation and satisfaction.[13] The application of "6S" management strategies can not only improve nursing quality, particularly in workplace stress and medication management, but also lower nursing error rates.[14] It is reported that adopting the 6S management model for nursing management (in terms of material preparation and medication management) in COVID-19 wards can effectively improve nursing quality and enhance nurses' core competencies.[14] When focusing on the implementation of 6S management among operating room nurses, there have been significant improvements in nursing quality scores and nurses' safety awareness.[10] Additionally, research by Xiaoling Guo et al indicates that applying the "6S" management can maintain a tidy experimental environment, promote experimental skills teaching, and improve teaching quality, thereby achieving the purpose of making learning enjoyable.[8] The findings of this study echo those above in terms of creating a safe environment, enhancing nursing quality, and improving personnel's core competencies. However, it is noteworthy that this study not only focuses on the improvement of surgical instrument handling and professional knowledge mastery but also covers multiple aspects such as environmental management, packaging management, cleaning and sterilization management, forming a relatively comprehensive management quality improvement system. Furthermore, beyond traditional nursing quality indicators, this study introduces personnel appearance, problem-solving abilities, sense of responsibility, initiative, and team communication as important dimensions for work quality assessment, providing a new perspective for comprehensive evaluation of operating room management quality. This offers actionable insights for healthcare managers and policymakers. The special focus on employees' professional knowledge and behavioral attributes (such as initiative and team communication) adds a valuable dimension to 6S management research. Similarly, it is worth noting that potential confounding factors may exist during the study period that could affect the research results. For example, personnel turnover in the sterilization and supply center may lead to changes in work proficiency and team collaboration, thereby influencing the implementation effectiveness of 6S management. Additionally, increases or decreases in workload may affect the enforcement and effectiveness of 6S management.

Moreover, the above analysis confirms that the application of 6S nursing management in the sterilization and supply center has a positive impact on the quality of surgical instrument management. The observed improvements have practical significance: by significantly enhancing the cleanliness and disinfection effectiveness of surgical instruments, 6S management effectively reduces the risk of nosocomial infections, which undoubtedly has a potentially positive impact on patient prognosis. However, this positive effect may be constrained by various complex factors, including but not limited to the patient's own immune status, the specific type and complexity of the surgery, and the quality of postoperative care. Additionally, by optimizing workflows, reducing unnecessary inventory and waste, and improving space utilization, 6S management has the potential to bring significant cost savings to hospitals. However, such cost savings may not be immediately apparent in the short term but require long-term implementation and accumulation. At the same time, we must also note the initial investment in 6S management, such as employee training, which may have a certain impact on the hospital's short-term costs.

Limitations and Suggestions

However, this study has several limitations. For instance, it did not conduct a power analysis to determine the sample size, and the sample size was relatively small, which may lead to certain biases and uncertainties in the research results. A small sample size may not fully reflect the characteristics of the population, potentially limiting the broad generalization of the research findings. Additionally, this study was designed as a single-center study, which may be influenced by specific environmental factors such as hospital culture, management policies, and employee quality. These factors may vary across different medical institutions, thereby limiting the generalizability of the research results. Furthermore, the lack of long-term follow-up data in this study restricts our ability to assess the continuous improvement effects of "6S" management. Unfortunately, there are also areas not covered in this study that deserve further investigation or scientific exploration in the future, such as employees' acceptance of "6S" management and the difficulties and challenges encountered during its implementation. In future research, power analysis should be conducted to determine the optimal sample size, thereby improving the accuracy and reliability of the research results. A multicenter study design should be adopted to broaden the scope of the research and enhance the generalizability of the findings. Long-term follow-up studies should be conducted to evaluate the long-term effects of "6S" nursing management in the sterilization and supply center and provide data support for continuous improvement.

Conclusion and Future Prospects

In summary, after implementing "6S" nursing management in the sterilization and supply center, significant achievements have been made in multiple aspects, including improved management quality, enhanced employee professional knowledge and work quality, reduced error rates in surgical instrument processing, and increased qualification rates for cleaning, disinfection, and issuance. Additionally, the implementation of "6S" nursing management in the field of sterilization and supply centers is of great significance. It not only improves management efficiency and quality, enhances employee competence and team collaboration, and ensures medical safety, but also promotes hospital management. Standardized management practices in sterilization centers of different medical institutions can establish more standardized surgical instrument management processes, raise employee awareness of the importance of sterilization and supply center management, optimize resource allocation in sterilization and supply centers, and improve space utilization and work efficiency. In future research, the integration of 6S management with other advanced management methods can be explored to further enhance the management level of sterilization and supply centers. Studies can focus on how these integrated methods interact. Furthermore, future research can conduct long-term follow-up surveys to assess the sustained effects of 6S management over time, including the stability of management quality, the degree of employee competence improvement, and changes in patient satisfaction. Meanwhile, to continuously improve the management level of sterilization and supply centers, continuous training and education on 6S management concepts can be maintained, and an effective feedback mechanism can be established to encourage employees to raise issues and suggestions encountered during the implementation of 6S management.

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Disclosure

The authors declare no conflicts of interest directly related to the contents of this article.

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