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Evaluating the Application of the PDCA Cycle Model in Nursing Management of the Hospital Disinfection Supply Room

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Abstract: *Objective:* To study the effectiveness of the PDCA cycle model in the nursing management of the disinfection supply room. Method: From March 2022 to February 2024, the hospital adopted the PDCA cycle model to manage the related work of the disinfection supply room. In this study, 40 nursing staff were selected as the research subjects. Sixty-five sets of data generated during the implementation of the PDCA model were selected, and 65 sets of similar data before the implementation were also selected. The relevant data information was compared and evaluated to understand the changes in work before and after the implementation of the PDCA cycle model management. Meanwhile, twenty departments in the hospital were selected to investigate the satisfaction before and after the implementation of the PDCA cycle model management. Result: After the implementation of the PDCA cycle model, the completion rates of various tasks were improved, and there was a significant difference compared with those before the implementation ($P < 0.05$). The work quality of each working link has also been improved since the implementation. Compared with that before the implementation of the PDCA cycle model, there are significant changes ($P < 0.05$). It can be learned from the comparison of satisfaction among various departments that the satisfaction of departments has improved after the implementation of PDCA, and there is a significant difference compared with that before the implementation ($P < 0.05$). *Conclusion:* The application of the PDCA cycle model in the nursing management of the disinfection supply room can effectively improve the working conditions of the disinfection supply room and provide a basic guarantee for hospital treatment. Therefore, the PDCA cycle management model can be actively adopted in the actual work management.

Keywords: PDCA cycle model; Disinfection supply room; Nursing management

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1. Introduction

The disinfection supply room is an indispensable department in a hospital, specifically responsible for the recovery of various medical devices within the hospital and the disinfection of cleaning agents. It supplies various sterile medical items and equipment to the entire hospital. The task is arduous and the workload is large. Although it does

not directly participate in treatment, it affects the final treatment outcome. The quality of work in the disinfection supply room is the guarantee of patients' safety during illness [1]. With the development of medical technology, the requirements for various departments have gradually increased. For the disinfection supply room, the previous management measures cannot meet the medical rescue needs. Effective management methods should be actively adopted, and a systematic and comprehensive management model should be formulated. The PDCA cycle model was proposed by the American quality management expert Walter Armand Shehart and is also known as the Deming cycle [2]. Comprehensive supervision and management of quality, which can only be carried out according to the plan and the implementation of the plan is inspected and handled, is a complete and systematic management model, often used in enterprise management [3, 4]. In this experimental study, the PDCA management model is applied to the management of the disinfection supply room to investigate its effectiveness in the management of the disinfection supply room.

2. Data and methods

2.1. Clinical data

From March 2022 to February 2024, the hospital adopted the PDCA cycle model to manage the related work of the disinfection supply room. This study selected 40 nursing staff as the research subjects, including 2 males and 38 females. Their ages ranged from 23 to 45 years old, with an average age of (34.25 ± 2.21) years old and working years ranging from 1 to 22 years. Sixty-five sets of data generated during the implementation of the PDCA model are selected, and 65 similar data before the implementation are also selected. The relevant data information is compared and evaluated to understand the changes in the work before and after the implementation of the PDCA cycle model management. Meanwhile, twenty departments in the hospital are selected to investigate the satisfaction before and after the implementation of the PDCA cycle model management.

2.2. Research method

(1) Planning stage

During the planning stage, a quality control team needs to be established as required to supervise and inspect the disinfection supply room and identify any hidden problems. Investigate and analyze the unreasonable work arrangements and systems in the workflow of the disinfection supply room, identify the root causes of the problems, and adjust and optimize them according to actual needs. Operate strictly in accordance with the "Technical Specifications for Disinfection in Medical Institutions" and the "Management Specifications for Hospital Disinfection Supply Centers". In the disinfection supply room, the work content is simple and mechanical, and the comprehensive quality of the operators varies greatly. Due to cognitive differences and a lack of safety awareness, the disinfection of medical devices is not thorough, failing to meet the disinfection supply requirements and posing a huge hidden danger to the lives and health of patients. Improper operation procedures can cause harm to the operators themselves, and situations such as iatrogenic infections or high-temperature scalds occur frequently. Therefore, it is particularly important to formulate a sound and standardized disinfection operation system to promote the standardization, rationalization, and scientification of the operation process.

(2) Implementation stage

During the implementation stage, it is necessary to put the plan into actual work, and more emphasis

should be placed on the importance of "doing" [5]. To comprehensively enhance the technical proficiency and safety awareness of the staff in the disinfection supply room, training measures should be taken for the relevant personnel. Safety protection measures should be implemented in every link of the disinfection management work. Disinfection and cleaning work should be carried out in accordance with the norms. Various medical devices should be cleaned as required and thoroughly disinfected. The quality should be strictly controlled. When disinfection is completed, all kinds of medical devices should be placed separately. In the course of work, monitoring and sampling inspections should be carried out on each link to prevent any omissions and provide guarantees for the cleaning, disinfection and placement of medical devices. Clarifying job responsibilities enables the allocation of work responsibilities to individuals. Each staff member adheres to quality standards, records work content, and optimizes each management link based on feedback from departments. Work is completed to the highest standards to ensure the normal supply of clean and sterile medical devices to all departments.

During the entire implementation process, personnel from relevant departments should do a good job in their own safety protection, keep their hands clean, and collect and organize relevant data. Separate the positions again to prevent the tools for cleaning and disinfection from causing secondary contamination during circulation, which may affect the completion of the final disinfection work. Therefore, after the medical devices are recycled, the person in charge of the contaminated ones should conduct a classified inventory of the medical devices and recheck them after cleaning. Due to the different ways of cleaning medical devices, it is necessary to select devices suitable for machine cleaning and those that require manual cleaning to avoid incomplete cleaning. After the disinfection of medical devices is completed, the corresponding labels should be affixed to the outer packaging of the devices as required to clearly distinguish them. In disinfection work, the concentration of disinfectant is a factor that directly affects the disinfection effect. Therefore, it is also necessary to conduct regular checks to prevent incomplete disinfection when the concentration is too low, leaving an opportunity for the retention of bacteria and viruses. Air can also be a medium for the spread of bacteria and viruses. In the disinfection supply room, the surfaces of items and the air should be disinfected regularly to provide a qualified environment for the disposal of medical devices.

(3) Inspection stage

The inspection stage mainly involves verifying the cleaning, disinfection, and placement work, conducting sampling checks on medical devices to understand whether the disinfection work on that day is carried out following the standards, whether the disinfection effect meets the set requirements, and whether they can be supplied to various departments. Based on daily spot checks, monthly inspection targets should also be set. At the end of each month, a comprehensive inventory of medical devices should be conducted, and the quality of disinfection should be inspected. At the same time, the inspection results should be made public in accordance with the open and fair quality inspection standards. By adopting a combination of work quality and reward and punishment mechanisms, the aim is to change the lax and irresponsible attitude of staff members, encourage them to actively engage in their work, voluntarily abide by all regulations, and complete relevant tasks with both quality and quantity guaranteed. Those with poor work quality should be punished, while those with outstanding performance should be rewarded. This can make the relevant personnel realize the importance of their work attitude, establish the determination to follow the standards, and lay a foundation for the smooth implementation of the work. In addition, relevant staff members working on the front line can offer suggestions based on the actual situation. During the meeting, the

rationality of the personnel's opinions can be discussed and valuable suggestions adopted to optimize the current management status of the disinfection supply room and enhance the management effect.

(4) Processing stage

The quality control team inspects the quality of disinfection work in accordance with relevant regulations, evaluates and summarizes the related work, verifies and discusses the existing problems, formulates corresponding solutions based on the actual situation, widely listens to the opinions of department members, finds effective solutions, optimizes the management process, promotes further reform of management work, and pushes management to a new level.

2.3. Observation index

Compare the completion of disinfection supply room tasks before and after the implementation of the PDCA cycle in the hospital, focusing on work rate and work quality. Work quality is evaluated across five specific aspects, with higher assessment scores indicating better performance. Additionally, assess the satisfaction levels of nursing staff and conduct a departmental survey to collect and analyze satisfaction data.

2.4. Statistical method

This study utilized the software SPSS 25.0 for analysis and processing. When $P < 0.05$, there was a significant difference and it was statistically significant.

3. Result

3.1. Comparison of work completion rates before and after the implementation of the PDCA cycle model

After the implementation of the PDCA cycle model, the completion rates of various tasks were improved, and there was a significant difference compared with those before the implementation ($P < 0.05$). The results can be seen in **Table 1**.

Table 1. Comparison of work completion rates before and after implementing the PDCA cycle model [n (%)]

Group	n	Hand hygiene	Concentration of disinfectant for sterilized items	Rust removal	Breathing tube cleaning and disinfection	Surgical instruments cleaning and disinfection
Before implementation	65	55(84.62)	56(86.15)	54(83.08)	53(81.54)	56(86.15)
After implementation	65	65(100%)	62(95.38)	63(96.92)	64(98.46)	63(96.92)
p		＜0.05	＜0.05	＜0.05	＜0.05	＜0.05

3.2. Comparison of work quality scores before and after the implementation of the PDCA cycle

After the implementation of the PDCA cycle model, the work quality of each working link has been improved. Compared with before the implementation of the PDCA cycle model, there are significant changes ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of work quality scores before and after the implementation of PDCA cycle (x ± s, points)

Group	The quality of instrument disassembly and assembly	Cleaning process	Cleaning quality	Environmental management	Packaging quality
Before implementation	85.83 ± 3.12	86.95 ± 1.43	86.57 ± 1.48	88.72 ± 3.54	91.13 ± 2.88
After implementation	97.96 ± 4.15	97.52 ± 1.36	98.68 ± 2.32	98.61 ± 2.26	99.72 ± 1.37
p	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

3.3. Comparison of departmental satisfaction before and after the implementation of the PDCA cycle model

It can be learned from the comparison of satisfaction among various departments that the satisfaction of departments has improved after the implementation of PDCA, and there is a significant difference compared with that before the implementation ($P < 0.05$). The results are shown in **Table 3**.

Table 3. Comparison of department satisfaction before and after the implementation of the PDCA cycle model [n (%)]

Time	n	Very satisfied	Generally satisfied	Not satisfied	Overall satisfaction
Before implementation	20	10(50.00)	7(35.00)	3(15.00)	17 (85.00)
After implementation	20	12(60.00)	8(40.00)	0	20 (100.0)
P					< 0.05

4. Discussion

Infection is an important reason for the reduced treatment effect in hospitals, posing a threat to the life and health of patients. The recovery time of patients is prolonged. For patients, they have to endure physical pain as well as the psychological torment brought by infection to themselves [6]. Therefore, infection is not beneficial to the treatment effect of hospitals or the recovery of patients, and it may even increase the conflict between doctors and patients. It can be seen from this that it is of great significance for doctors to use clean and sterile medical devices to treat patients. The corresponding disinfection and supply work should keep up with the treatment demands, adopt standardized management, improve management effectiveness, meet the supply and demand requirements of various departments in the hospital, enhance the treatment effect of patients, and reduce doctor-patient conflicts caused by infections [7].

This study examines and discusses the effectiveness of the PDCA cycle model applied in the disinfection supply room, providing a new management approach for improving the working effectiveness of the disinfection supply room and perfecting the working management process of the disinfection supply room [8, 9]. Through the PDCA cycle model, deficiencies in the work can be identified and optimized and improved, thereby enhancing the working level of nursing staff and significantly improving the work completion rate [10, 11]. For instance, in terms of hand hygiene, it has increased from 84.62% before implementation to 100%, and the inspection of disinfectant concentration in sterilized items has received attention, rising from 86.15% to 95.38%. After medical equipment

rusts, it not only affects its use but also carries various bacteria and may remain in the patient's body, causing infection. After the implementation of PDCA, the situation has been effectively improved, rising from the original 83.08% to 96.92%. Clearly, the cleaning and disinfection effect has been enhanced, and more attention has been paid to the cleanliness of medical devices. After the awareness of the nursing staff was enhanced, the quality of work in each link was also improved, and the difference was significant compared with the previous management ($P < 0.05$). Therefore, it can be affirmed that the PDCA cycle model has indeed improved each process of disinfection management. The survey on the satisfaction of 20 departments is also sufficient to confirm that the work of the disinfection supply department has been improved, the satisfaction of the department has increased, and the incidence of adverse events has been effectively controlled[12, 13].

The four stages of the PDCA cycle model are progressive. Through these four stages, the deficiencies and root causes in previous management can be identified, and improvements can be made based on the actual situation [14]. Scientific and reasonable management systems can be formulated to enhance management effectiveness and gradually improve the work management system [15]. Therefore, PDCA is a continuously improving management model. Identifying problems and solving them ensures that management is implemented effectively. As a result, management is in a virtuous cycle, which plays a positive role in the smooth progress of the nursing work in the disinfection supply room.

5. Conclusion

In conclusion, in the nursing management of hospital disinfection supply rooms, the PDCA cycle model should be adopted and promoted to the management of disinfection supply rooms in more hospitals. This is conducive to enhancing the hospital's reputation, improving its social benefits, and providing medical and health security for more patients.

Disclosure statement

The author declares no conflict of interest.

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