Application of PDCA Cycle Management in Outpatient Blood Collection Room Management

Lu Yan[1], Yujie Gu[2], Chao Zheng[1], Xiaojing Chen[1], Rui Gao[1]*

[1]Blood Collection Center, Affiliated Hospital of Hebei University, Baoding 071000, Hebei Province, China
[2]Endocrinology Department, Affiliated Hospital of Hebei University, Baoding 071000, Hebei Province, China

*Corresponding author: Rui Gao, 493640599@qq.com

Abstract: *Objective:* To explore the application and effectiveness of PDCA cycle management in outpatient blood collection room management. *Methods:* A total of 80 patients in the outpatient blood collection room of the hospital from June 2023 to June 2024 were selected as the study subjects and randomly divided into a control group and an observation group, with 40 patients in each group. The control group implemented conventional nursing management, while the observation group implemented PDCA cycle management on top of routine care. Blood collection outcomes, the incidence of disputes, adverse reactions, blood collection waiting times, nursing quality, and patient satisfaction were compared between the two groups. *Results:* The observation group showed significantly better blood collection outcomes compared to the control group, with a higher success rate of venipuncture ($P < 0.05$). The total incidence of adverse reactions in the observation group was notably lower than in the control group ($P < 0.05$). Additionally, the observation group exhibited shorter blood collection waiting times, higher nursing quality scores, and greater patient satisfaction, with all differences showing high statistical significance ($P < 0.001$). *Conclusion:* The application of PDCA cycle management in the outpatient blood collection room demonstrated remarkable effectiveness. By leveraging the cycle of planning, execution, checking, and action, it optimized blood collection processes, improved efficiency and service quality, and enhanced patient satisfaction, making it highly worthy of clinical promotion and application.

Keywords: PDCA cycle management; Outpatient; Blood collection room; Nursing quality

1. Introduction

The outpatient blood collection room holds a pivotal position in medical services, serving as a key department that directly interacts with patients. However, its unique characteristics present a series of challenges. On one hand, the blood collection room handles a high daily volume of patients with diverse and complex conditions. On the other hand, the relatively short time patients spend in the blood collection room increases the likelihood of nursing errors, highlighting the need to improve nursing quality [1].

With the continuous growth of global healthcare demands, the number of blood samples required for testing has been steadily rising, further intensifying the workload of blood collection rooms [2]. Clinically, blood testing is indispensable for diagnosing and monitoring a wide range of diseases, such as anemia, infectious diseases, liver disorders, and cancer. For diseases like hepatitis, AIDS, and diabetes, frequent blood tests are necessary due to the specific nature of these conditions, ensuring accurate monitoring of disease progression. This underscores the close relationship between blood collection rooms and the diagnosis and treatment of these diseases [3,4].

2. Materials and methods

2.1. General information

This study selected 80 patients from the outpatient blood collection room of the hospital between June 2023 and June 2024 as the research subjects. They were randomly divided into a control group and an observation group, with 40 patients in each group. The inclusion criteria were as follows: (1) age $\geq$ 18 years; (2) patients who provided informed consent and signed the consent form. Exclusion criteria included: (1) patients with hematological diseases; (2) those with consciousness or mental disorders; and (3) those who refused to participate in the study. There were no statistically significant differences in general demographic characteristics such as gender, age, or education level between the two groups ($P > 0.05$), indicating comparability.

2.2. Methods

2.2.1. Control group

The control group received conventional nursing management, which included the following:

(1) Blood collection process management: Strict adherence to the procedures for blood collection. Before collection, meticulous verification of patient information was conducted to ensure accuracy. During the collection process, precise and standardized procedures were followed, including selecting the puncture site, disinfection, needle usage, and controlling blood volume, to ensure safety and accuracy.

(2) Specimen management: Comprehensive regulation of the collection, preservation, and transport of specimens. Specimens were collected following strict operational standards to ensure quality. After collection, appropriate storage measures were implemented, including strict control of temperature and humidity. During transport, timeliness and safety were prioritized to prevent contamination or damage, thereby maintaining specimen quality.

(3) Environment management: Ensuring a clean and comfortable environment in the blood collection room. Regular disinfection was conducted, covering all areas such as collection counters, seating, and floors. Proper ventilation was maintained to create a fresh and safe environment for patients.

(4) Health education: Providing patients with detailed instructions regarding blood collection precautions. The nursing staff explained preparatory measures, such as fasting requirements and attire, as well as post-collection precautions, including pressing duration and puncture site care. Any patient concerns were addressed patiently and clearly to alleviate worries.

2.2.2. Observation group

The observation group implemented PDCA (Plan-Do-Check-Act) cycle management on top of routine nursing care. The process was as follows:

(1) Plan (P):
    (a) Situation analysis: Collecting patient feedback on blood collection room services through surveys, observing daily operations, and reviewing historical data and industry standards.
    (b) Setting goals: Based on the analysis, establishing objectives such as reducing blood collection waiting times, improving nursing quality and service standards, enhancing patient satisfaction, and minimizing post-collection complications.
    (c) Formulating measures: Addressing identified issues and objectives by optimizing collection processes, organizing collection windows, upgrading the queuing system, conducting staff training, improving communication techniques, and enhancing post-collection monitoring and care.

(2) Do (D):
    (a) Implementation: Establishing a PDCA cycle management team to organize and supervise tasks. Responsibilities were assigned, and a detailed work plan and schedule were devised.
    (b) Training and education: Comprehensive PDCA training was conducted for staff, covering concepts, methods, and steps. This included case studies and simulated exercises to improve efficiency and quality.
    (c) Public awareness: Informing patients about the PDCA cycle through bulletin boards and posters, explaining service improvements, and encouraging their cooperation and understanding.

(3) Check (C):
    (a) Data collection: Regularly gathering data, including waiting times, nursing quality scores, patient satisfaction scores, and incidences of post-collection complications such as hematoma and bleeding.
    (b) Effect evaluation: Comparing pre- and post-implementation data to assess whether goals were achieved. Patient feedback was also evaluated to gauge service quality improvements.

(4) Act (A):
    (a) Experience summarization: Summarizing successful practices and identifying areas requiring improvement.
    (b) Continuous improvement: Refining measures based on evaluation results, incorporating effective practices into standardized workflows, and initiating new PDCA cycles to ensure ongoing improvement in outpatient blood collection room management.

2.3. Observation indicators

(1) Blood collection outcomes and incidence of disputes: The incidences of hemolysis, coagulation, platelet damage, successful punctures, and disputes during blood collection were recorded and compared between the groups.
(2) Adverse reactions: Adverse reactions such as subcutaneous bleeding, localized hematoma, significant pain, and bleeding were documented and analyzed for each group.
(3) Blood collection waiting time and nursing quality: Waiting times were recorded from patient registration to the start of blood collection. Nursing quality was evaluated using a self-designed assessment form with a total score of 100, covering procedural compliance, service attitude, communication skills, and environmental hygiene.
(4) Patient satisfaction: Satisfaction was assessed using a self-designed survey with a total score of 100, measuring aspects such as waiting time, blood collection process, staff attitude, environment, and overall

satisfaction with results.

2.4. Statistical analysis

Statistical analysis was conducted using SPSS 25.0 software. Quantitative data were expressed as mean ± standard deviation (SD), and intergroup comparisons were performed using t-tests. Categorical data were expressed as percentages (%), and comparisons were conducted using the χ^2 test. A P-value of < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of blood collection outcomes and incidence of disputes between the two groups

The observation group had lower rates of hemolysis, coagulation, platelet damage, and disputes compared to the control group. Additionally, the puncture success rate was higher in the observation group. These differences were statistically significant ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of blood collection outcomes and incidence of disputes between the two groups [n (%)]

Group	n	Blood collection status				Disputes
		Hemolysis	Coagulation	Platelet damage	Puncture success	
Control group	40	8 (20.00%)	5 (12.50%)	6 (15.00%)	34 (85.00%)	8 (20.00%)
Observation group	40	2 (5.00%)	1 (2.50%)	0 (0.00%)	40 (100.00%)	1 (2.50%)
χ^2 value	-	4.114	7.314	4.505	4.505	4.507
P value	-	0.043	0.007	0.034	0.034	0.034

3.2. Comparison of adverse reactions between the two groups

The total incidence of adverse reactions (subcutaneous bleeding, localized hematoma, significant pain, and bleeding) in the observation group was lower than in the control group, with statistically significant differences ($P = 0.034$), as shown in **Table 2**.

Table 2. Comparison of adverse reaction incidence between the two groups [n (%)]

Group	n	Subcutaneous bleeding	Localized hematoma	Significant pain	Bleeding	Total incidence
Control group	40	2 (5.00%)	5 (12.50%)	1 2.50%)	2 (5.00%)	10 (25.00%)
Observation group	40	2 (5.00%)	0 (0.00%)	0 (0.00%)	1 (2.50%)	3 (7.50%)
χ^2 value	-	-	-	-	-	4.501
P value	-	-	-	-	-	0.034

3.3. Comparison of blood collection waiting time, nursing quality, and patient satisfaction between the two groups

The observation group had shorter blood collection waiting times and higher nursing quality and patient satisfaction scores compared to the control group, with statistically significant differences ($P < 0.001$), as shown in **Table 3**.

Table 3. Comparison of blood collection waiting time, nursing quality, and patient satisfaction between the two groups (mean ± SD)

Group	n	Waiting time for blood collection (min)	Nursing quality (score)	Patient satisfaction (score)
Control group	40	15.25 ± 3.14	85.38 ± 5.17	89.15 ± 4.85
Observation group	40	10.13 ± 2.87	92.63 ± 4.25	95.75 ± 3.91
t value	-	7.612	6.851	6.700
P value	-	< 0.001	< 0.001	< 0.001

4. Discussion

The traditional outpatient blood collection room management model has numerous issues, including unstandardized blood collection processes, insufficient service awareness among nursing staff, prolonged patient waiting times, and high incidence rates of post-collection complications. These problems severely affect the efficiency and service quality of outpatient blood collection rooms. To improve management levels, many hospitals have started exploring new management models. Scientific and rational nursing operations can effectively prevent these issues [5].

Additionally, quality nursing care reduces the incidence of post-collection complications such as subcutaneous bleeding. Proper compression techniques and duration, along with adequate care for puncture sites after blood collection, play critical roles in preventing complications like subcutaneous bleeding. Furthermore, skilled nursing interventions can alleviate patients' pain perception. Nursing staff can ease patient anxiety through proficient technical skills, a gentle demeanor, and effective communication, thus reducing the sensation of pain. Finally, good nursing care improves treatment outcomes and prognosis [6,7].

The PDCA cycle management method is an effective management strategy that facilitates the optimization and improvement of outpatient blood collection room management. It enhances overall hospital service capabilities and patient satisfaction, providing patients with higher-quality, more convenient services [8]. By following the cycle of Plan, Do, Check, and Act, issues are continuously identified and addressed, leading to ongoing improvements in blood collection room management to better meet patient needs and improve healthcare service quality [9,10].

The findings of this study show that the observation group outperformed the control group in several indicators. The rates of hemolysis, coagulation, platelet damage, and disputes were lower in the observation group, while the puncture success rate was higher, with statistically significant differences ($P < 0.05$). These results are attributed to the PDCA cycle management's standardization of blood collection procedures and its training and assessment of nursing staff, which reduced the occurrence of blood collection complications. Additionally, the incidence of adverse reactions, such as subcutaneous bleeding, was lower in the observation group than in the control group ($P < 0.05$). This is because the management approach was patient-centered, improving communication and psychological care to enhance patient cooperation.

Moreover, the observation group experienced shorter blood collection waiting times and higher scores for nursing quality and patient satisfaction ($P < 0.05$). These outcomes are credited to the optimization of blood collection processes, improved service awareness, and enhanced quality of care.

5. Conclusion

In conclusion, the application of PDCA cycle management in outpatient blood collection room management yields significant results. It effectively improves blood collection quality, shortens waiting times, reduces the incidence of post-collection complications, and enhances patient satisfaction, making it worthy of clinical promotion. However, this study has limitations, such as a small sample size and a short research duration. Further studies should expand the sample size, extend the research period, and incorporate both qualitative and quantitative methods for more in-depth research.

Disclosure statement

The authors declare no conflict of interest.

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