Scientific and Social Research, 2025, Volume 7, Issue 9
https://ojs.bbwpublisher.com/index.php/SSR
Online ISSN: 2981-9946
Print ISSN: 2661-4332

The Role of Error Management in Improving Service Level and Blood Quality in Blood Collection and Supply at Blood Stations

Yumiao Zhang, Han Zou*

Blood Station of Wujiang District, Suzhou City, Suzhou 215200, Jiangsu, China

**Author to whom correspondence should be addressed.*

Abstract: *Objective*: To evaluate the effectiveness of error management in the management of blood collection and supply at blood stations. *Methods*: 35 blood donors and 18 staff members who participated in blood collection and supply at the blood station from January 2021 to January 2022 were selected as the control group and received routine management. 35 blood donors and the same staff members who participated in blood collection and supply from February 2022 to February 2023 were selected as the observation group and received error management. The management effects were compared between the two groups. *Results*: The service level scores of the staff in the observation group were higher than those in the control group ($P < 0.05$). The blood quality (unqualified rate of blood tests) of the blood donors in the observation group was lower than that in the control group, the blood scrap rate was lower than that in the control group, the incidence of error events was lower than that in the control group, and the management satisfaction was higher than that in the control group ($P < 0.05$). *Conclusion*: Error management can improve the service level of blood station staff, enhance blood quality, reduce blood scrap situations and error events, and achieve high management satisfaction.

Keywords: Error management; Blood collection and supply at blood stations; Service level; Blood quality

Online publication: September 9, 2025

1. Introduction

The work function of blood stations is blood collection and supply, which can meet the development needs of transfusion medicine. Blood is a special medical resource, mostly obtained through voluntary blood donation. However, at this stage, there is an imbalance between blood supply and demand in China, so the service pressure of blood stations is relatively high [1]. In addition, the blood collection and supply process in blood stations is complex, and medical disputes may arise due to errors, which can even affect the health of blood donors. Error management is a newer management model that aims to reduce the probability of errors, optimize work processes, continuously monitor key points of management quality, and thereby improve blood quality [2].

Under this premise, this study selected 70 blood donors and 18 staff members to evaluate the implementation effect of error management.

2. Materials and methods

2.1. General information

The study was conducted from January 2021 to February 2023, involving 70 blood donors and 18 blood station staff members. Among the 35 blood donors in the control group, there were 19 males and 16 females, aged from 21 to 47 years, with a mean age of 32.15 ± 2.41 years. Among the 35 blood donors in the observation group, there were 18 males and 17 females, aged from 22 to 48 years, with a mean age of 32.31 ± 2.48 years. Comparison of data between groups showed no significant difference ($P > 0.05$). Among the same batch of staff members, there were 3 males and 12 females, aged from 22 to 41 years, with a mean age of 30.26 ± 2.47 years, and a work experience ranging from 2 to 18 years, with a mean of 10.26 ± 1.34 years.

2.2. Methods

The control group implemented routine management, following standardized procedures for blood collection and supply, preparing corresponding equipment or instruments, providing targeted guidance to blood donors, screening for high-risk factors of blood donation, and conducting predictive management.

The observation group implemented error management: (1) Collecting error information: Organize the incidence of error events in the blood station over the years, summarize the error links, including verification and initial screening before blood collection, operational errors during blood collection, and other aspects. Summarize unqualified test results, such as inaccurate blood samples and inaccurate blood type screening, and analyze common reasons for disqualification. (2) Staff management: Clearly divide the responsibilities of the staff in the blood station, enumerate their responsibilities, authorities, and service scope, regularly assess the management quality of blood collection and supply links, and improve staff self-correction awareness through reward and punishment mechanisms, performance-related pay, and other ways. Organize a weekly employee meeting to explain blood collection and supply management knowledge, update staff knowledge reserves, and conduct skill training, such as blood collection operations, adverse reaction monitoring, and error event control, to gradually cultivate innovative thinking among staff and enhance their sense of responsibility. (3) Optimizing work processes: Standardize key operation points such as blood donor physical examinations, blood testing, and blood sample preservation, and propose quality standards. Standardize the writing content of infectious disease reports, disinfection operations, instrument quality control, and other aspects. Register errors in blood collection and supply, as well as work schedules, regularly organize registration forms, and dynamically draw control charts for error events. (4) Blood donation care: (1) Environmental management: Post promotional posters in the rest area, place water dispensers, and arrange potted plants or flowers to create a relaxing environment. Manage the blood collection room by zones, arrange corresponding materials in an orderly manner, clean indoor items regularly every day, and use UV disinfection lamps. Staff should have a kind attitude, dress appropriately, and actively communicate with blood donors to improve their sense of tension. (2) Knowledge education: Provide educational videos and brochures to blood donors, explaining the blood donation process, cooperation points, and precautions, so that blood donors can understand relevant knowledge. Guide blood donors to ask questions and answer them one-on-one to eliminate their cognitive blind spots. (3) Nursing during blood collection:

Check the blood donor's age, name, blood type, and other information, review the results of their initial screening and physical examination, and ensure that they meet the indications for blood donation. Before blood collection, open the disposable blood collection bag in front of the blood donor, check for any abnormalities such as omissions in the transfer bag, and adjust the relevant parameters of the blood collection equipment. Patiently explain the cooperation method during blood collection, improve the one-time puncture rate, and reduce the pain of blood collection for blood donors. Observe changes in the blood donor's complexion during the process, and provide symptomatic treatment if they experience palpitations or dizziness. (4) Post-donation care: Explain the precautions that need to be taken after blood donation, such as the pressing method and time for disposable band-aids, exercise precautions, diet and sleep precautions, etc. Give verbal affirmation to blood donors or distribute souvenirs.

2.3. Observation indicators

(1) Service level: Examination questions were issued to the staff, including theoretical knowledge, blood station quality management, and operational skills. Each item was scored out of 100 points, with positive scoring. (2) Blood quality: The failure rate of blood tests was recorded. Alanine aminotransferase (ALT) was determined by the Reitman-Frankel method. Syphilis, hepatitis C virus (HCV) antibodies, human immunodeficiency virus (HIV) antibodies, and hepatitis B surface antigen (HBsAg) were determined by enzyme-linked immunosorbent assay (ELISA). The evaluation of the failure rate was based on the "Quality Requirements for Whole Blood and Blood Components". (3) Blood scrap rate: Scrap due to blood clots, transportation scrap, and centrifugal bag breakage was recorded as physical scrap; scrap due to inspection factors was recorded as inspection scrap. (4) Error events: The incidence of events such as thawing and bag breakage, fatty blood, verification errors, blood leakage, sample retention errors, service complaints, labeling errors, accidental injuries, and initial blood type screening errors was recorded. (5) Management satisfaction: A self-made questionnaire was issued to blood donors, including workflow, blood donation care, service attitude, etc. The total score was 100 points. Very satisfied was defined as a score above 80, basically satisfied was between 45 and 80 points, and unsatisfied was below 45 points.

2.4. Statistical analysis

The data was processed using SPSS 28.0 software. Measurement values were compared/tested using t-values, and count values were compared/tested using chi-square values. Statistical significance was defined as a *P*-value less than 0.05.

3. Results

3.1. Comparison of service levels between the two groups of staff

The service level scores of the observation group staff were higher than those of the reference group ($P < 0.05$).

Table 1. Comparison of service levels between the two groups of staff [Mean ± SD/points]

Group	n	Theoretical knowledge	Blood center quality management	Operational skills
Observation group	18	92.56 ± 3.84	93.55 ± 3.78	94.75 ± 3.05
Reference group	18	87.18 ± 3.75	89.14 ± 3.70	90.17 ± 3.02
t-value	-	4.253	3.537	4.527
P-value	-	0.000	0.001	0.000

3.2. Comparison of blood quality between the two groups of blood donors

The unqualified rate of blood tests in the observation group was lower than that in the reference group ($P < 0.05$).

Table 2. Comparison of blood quality between the two groups of blood donors [n/%]

Group	n	ALT Abnormal	Syphilis Abnormal	HCV Antibody Abnormal	HIV Antibody Abnormal	HBsAg Abnormal
Observation	35	1 (2.86)	0	0	0	1 (2.86)
Reference	35	6 (17.14)	4 (11.43)	4 (11.43)	4 (11.43)	6 (17.14)
x^2 value	-	3.968	4.242	4.242	4.242	3.968
P-value	-	0.046	0.039	0.039	0.039	0.046

3.3. Comparison of blood discard rate between the two groups of blood donors

The blood discard rate in the observation group was lower than that in the reference group ($P < 0.05$).

Table 3. Comparison of blood discard rate between the two groups of blood donors [n/%]

Group	n	Physical discard			Testing discard	Total discard rate
		Clotted blood	Transport damage	Centrifugation damage		
Observation	35	1 (2.86)	0	0	1 (2.86)	5.71 (2/35)
Reference	35	2 (5.71)	1 (2.86)	2 (5.71)	3 (8.57)	22.86 (8/35)
x^2 value						4.200
P-value						0.040

3.4. Comparison of the incidence of error events between the two groups of blood donors

The incidence of error events in the observation group was lower than that in the reference group ($P < 0.05$).

Table 4. Comparison of the incidence of error events between the two groups of blood donors [n/%]

Group	n	Thawing Bag Breakage	Lipemic Blood	Verification Error	Blood Leakage	Sampling Error	Service Complaint	Labeling Error	Accidental Injury	Blood Type Screening Error	Incidence Rate
Observation	35	1 (2.86)	1 (2.86)	0	1 (2.86)	0	0	0	0	0	8.57 (3/35)
Reference	35	2 (5.71)	2 (5.71)	1 (2.86)	0	1 (2.86)	1 (2.86)	1 (2.86)	1 (2.86)	1 (2.86)	28.57 (10/35)
x^2 value											4.629
P-value											0.031

3.5. Comparison of management satisfaction between the two groups of blood donors

Management satisfaction in the observation group was higher than that in the reference group ($P < 0.05$).

Table 5. Comparison of management satisfaction between the two groups of blood donors [n/%]

Group	n	Very satisfied	Satisfied	Dissatisfied	Satisfaction rate
Observation	35	20 (57.14)	14 (40.00)	1 (2.86)	97.14 (34/35)
Reference	35	15 (42.86)	13 (37.14)	7 (20.00)	80.00 (28/35)
x^2 value					5.081
P-value					0.024

4. Discussion

Blood collection and supply in blood stations are important channels for blood sources in major hospitals. Quality control of blood collection and supply can ensure blood quality and improve the efficiency of blood stations. However, during the collection, testing, and preservation of blood, errors can easily occur, which may even lead to medical disputes [3]. Therefore, it is necessary to implement nursing management during blood collection and supply in blood stations.

The service level of each link in blood collection and supply is a common indicator to evaluate the management quality of blood stations, while blood quality is one of the indicators to evaluate the work accuracy of blood stations. Previous studies have found that the low service level of blood station staff is a common cause of error events, which can significantly reduce blood quality [4]. Therefore, it is crucial to efficiently control the quality of each link in blood collection and supply at blood stations, which can improve the safety and effectiveness of blood collection and supply [5]. Error management is a relatively new management approach, and its management purpose is to reduce error events and eliminate the hidden dangers of errors, with strong scientificity, standardization, and rigor. In the error management measures for blood collection and supply at blood stations, screening and analyzing error information, sorting out the causes of errors, and drawing up rectification plans are the keys to successful management [6]. The essential reason for error events is that the current blood collection and supply quality management system has defects, which are prone to unplanned events due to factors such as human operation errors and improper equipment use. Therefore, the focus of error management is to optimize the blood collection and supply work process of staff, implement position management, strengthen skill training, ensure that staff clearly grasp the nursing management plan, skillfully carry out blood collection and supply operations, and fully stimulate their autonomy, so that they can efficiently complete blood collection and supply tasks [7].

The results showed that the service level scores of the observation group staff were higher than those of the reference group, the blood quality (blood test failure rate) of the blood donors in the observation group was lower than that of the reference group, the blood scrap rate was lower than that of the reference group, the incidence of error events was lower than that of the reference group, and the management satisfaction was higher than that of the reference group ($P < 0.05$). The reason is that the workflow of error management is more standardized and normalized, and the management procedures are more flexible. It can improve the management efficiency of each link in the blood station through various forms such as responsibility division, skill training, and blood collection and supply registration, dynamically analyze the management problems of

blood collection and supply in the blood station, and continuously improve management measures [8]. Collecting error information can provide a comprehensive understanding of common types of error events and analyze their causes, ensuring the operability and timeliness of management plans. The collection of error information needs to be dynamic, regularly gathering common error events from blood stations, or organizing error event registration forms to record new types of error events, causes of errors, relevant responsible persons, and other information for staff to refer to at any time. This allows staff to grasp the occurrence trends and common causes of error events and to timely revise error management measures to ensure their effectiveness. Cultivating staff's self-correction awareness and implementing reward and punishment mechanisms can continuously screen staff with limited work capabilities and a weak sense of responsibility. Utilizing training and assessment formats can improve staff's professional level, stimulate their work enthusiasm, significantly enhance service levels, and maximize blood quality [9]. In staff management, continuing education is highly valued, requiring a weekly employee meeting focused on knowledge dissemination and education. This enables staff to receive skills training, continuously optimizing their adverse reaction monitoring abilities and error event control capabilities. More importantly, continuing education can enhance staff's innovation abilities, making them dare to question current error management plans and propose effective corrective measures. Workflow optimization can refine quality standards, clarifying various aspects such as physical examination, blood testing, and quality control for staff, and recording work schedules in detail to visually reflect the effectiveness of current error management. Additionally, orderly nursing during blood donation can improve blood donors' cooperation during blood collection, flexibly carrying out nursing management according to the situation on site. This allows for controlled management quality in various aspects of blood collection and supply, reducing blood waste and actively preventing error events. Based on the above nursing management plan, the blood collection and supply process for blood donors becomes safer and more humane, alleviating their fear or anxiety and improving their satisfaction with error management. However, in practical operations, it is necessary to continuously identify potential risk factors for error events, maintain vigilance, and actively improve the error management system to continuously optimize management quality.

5. Conclusion

In summary, error management can reduce the incidence of errors in blood collection and supply at blood stations, improve the service level of staff, ensure blood quality, and achieve high management satisfaction.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Yi R, 2023, Analysis of the Impact of Environmental Intensive Disinfection Quality Management on the Disinfection Quality of Blood Collection and Supply Processes in Blood Stations. Chinese Journal of Disinfection, 40(9): 708–710.

[2] Jiang BY, Liu Q, 2021, The Significance of Critical Control Point Management in the Blood Collection and Supply Process for Blood Quality Management in Blood Stations. Laboratory Medicine and Clinic, 18(23): 3453–3456.

[3] Liang RH, Lv JF, Liang YL, et al., 2021, The Impact of an "Internet-based" Blood Station-Hospital Information Management System on Blood Collection and Supply. Chinese Journal of Blood Transfusion, 34(7): 767–769.

[4] Song Z, Li X, Guo N, et al., 2020, Application of Quality Risk Management in Blood Collection and Supply Institutions. International Journal of Blood Transfusion and Hematology, 43(3): 272–276.

[5] Chen JT, Yu L, Han WJ, et al., 2020, Dilemmas and Solutions for Human Resource Allocation in Blood Collection and Supply Institutions. Journal of Clinical Blood Transfusion and Laboratory Medicine, 22(2): 135–137 + 180.

[6] Xie WM, 2022, The Role of Error Management in Improving Blood Collection and Supply Service Levels and Blood Quality in Blood Stations. China Health Standard Management, 13(13): 186–189.

[7] Duan YX, 2022, The Impact of Implementing Error Management in Blood Collection and Supply Services on Improving the Standardization of Blood Station Management and Blood Quality. China Standardization, 2022(20): 257–260.

[8] Xu SD, Huang SB, 2020, The Impact of Implementing Error Management in Blood Collection and Supply Services on the Level of Blood Station Quality Management and Blood Quality. China Healthcare Nutrition, 30(20): 375.

[9] Lu Y, Lu Y, You J, 2020, Application of Error Management in Improving Blood Collection and Supply Service Levels and Blood Quality. Qilu Nursing Journal, 26(6): 125–127.