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The Final Safeguard: Nurses' Knowledge Regarding Safe Blood Transfusion and its Determinants – An Analytical, Cross-Sectional Study

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ABSTRACT

Background: Blood transfusion is a life-saving but inherently risky intervention, and nurses represent the final safeguard against transfusion-related errors at the bedside. Despite this critical role, knowledge gaps among nursing staff remain a persistent concern, particularly in resource-strained healthcare settings such as Pakistan.

Objectives: This study aimed to assess the level of knowledge regarding safe blood transfusion among nurses working in the medical and surgical wards of Fauji Foundation Hospital, Kallar Kahar, and to determine the association between nurses' knowledge and their demographic characteristics.

Methods: An analytical, cross-sectional study was conducted among 110 nurses, selected through convenience sampling, using a structured, self-administered questionnaire covering demographic variables and transfusion-related knowledge. Data were analyzed using SPSS version 26. Statistical significance was set at $p < 0.05$.

Results: Most nurses (60.0%) demonstrated good knowledge, 16.4% demonstrated excellent knowledge, and 23.6% demonstrated poor knowledge; combining the good and excellent categories, 76.4% of nurses had an acceptable overall level of knowledge. Age ($p = 0.276$, $p = 0.041$), level of education ($H(2) = 9.86$, $p = 0.007$), and years of experience ($p = 0.389$, $p = 0.002$) were each significantly associated with knowledge scores. Gender could not be examined, as the entire sample (100%, $n = 110$) was female.

Conclusion: Nurses generally demonstrated an acceptable level of knowledge regarding safe blood transfusion, though meaningful gaps remained, particularly among younger, less experienced, and less formally educated nurses. Targeted, experience- and qualification-informed training programs are recommended to strengthen transfusion safety practices.

Introduction

Blood transfusion is a fundamental and often life-saving medical intervention integral to modern healthcare, supporting therapeutic strategies ranging from managing acute blood loss in trauma and surgery to providing palliative care in chronic hematological conditions such as thalassemia and sickle cell anemia (Booth et al., 2021). The ability to replace lost blood components, red cells for oxygen transport, platelets for hemostasis, and plasma for coagulation factors, has dramatically improved patient outcomes across numerous medical and surgical disciplines (Schack et al., 2022), and its universal presence in hospital settings, from emergency rooms to specialized wards, underscores its indispensable role (Bansal et al., 2025).

The history of blood transfusion reflects considerable scientific progress, evolving from the often-fatal experiments of the 17th century to the sophisticated, evidence-based practice of today (Yazer, 2021). This journey is marked by pivotal discoveries, most notably the identification of the major ABO blood groups by Karl Landsteiner in 1901, which provided the scientific foundation for safe compatibility testing (Kvržić, 2024; Noor & Asmaa, 2024), followed by the development of anticoagulants, component separation techniques, and screening protocols for transmissible diseases (Belousov, 2024). This evolution transformed transfusion from a high-risk gamble into a relatively routine, though never risk-free, clinical procedure governed by a complex framework of standards and regulations (Farrugia, 2023).

Despite these advances, blood transfusion remains fraught with potential hazards, spanning immunological reactions, infectious disease transmission, and metabolic disturbances (Buerger & Jain, 2023). Acute hemolytic reactions can lead to disseminated intravascular coagulation, renal failure, and death (Panch & Montemayor, 2022), while febrile non-hemolytic and allergic reactions still cause significant patient discomfort (Yıldız et al., 2024). The risk of transmitting pathogens such as hepatitis B and C, HIV, and emerging infectious agents, further emphasizes that blood transfusion is never a wholly benign act (Obeagu et al., 2024).

In response to these risks, the international medical community has developed a comprehensive paradigm of "safe blood transfusion," extending far beyond the act of infusing blood into a patient. This multi-step process begins with the clinical decision to transfuse and continues through post-transfusion monitoring (Nayeri et al., 2022), involving accurate patient identification, correct sample collection and labeling, stringent laboratory testing and cross-matching, secure storage and transport, and meticulous bedside administration (Bediako et al., 2021). A breach at any single point in this chain can nullify all other safety measures, potentially leading to catastrophic outcomes.

Within this chain, the role of the ward nurse is particularly critical and vulnerable. Nurses are the first and final custodians of the transfusion process, directly responsible for pre-transfusion assessment and consent, final bedside identity checks, correct-rate administration, vigilant monitoring for adverse signs, and appropriate documentation (AlAwam et al., 2024). It is at this final juncture that most serious errors are known to occur, making the nurse's knowledge, vigilance, and adherence to protocol the ultimate safeguard against preventable transfusion-related harm (Alshehri et al., 2024).

This complexity demands specialized knowledge i.e. a firm understanding of blood group compatibility, indications and contraindications for specific components, signs and symptoms of transfusion reactions, and immediate management protocols (Soliman & Elhapashy, 2021). Any gap between this theoretical knowledge and actual bedside practice represents a significant vulnerability in the patient safety net. In Pakistan, ensuring safe transfusion practices is further complicated by a healthcare system often strained by high patient loads, resource limitations, and workforce shortages (Ghafoor, 2024), and studies conducted across various Pakistani healthcare settings have highlighted persistent knowledge deficits and deviations from established international standards among healthcare staff (Emmanuel et al., 2024; Shoukat et al., 2025). Therefore, there remains a lack of conclusive local data specifically evaluating this knowledge, and the factors that shape it, within the medical and surgical wards of Fauji Foundation Hospital, Kallar Kahar, necessitating the present study.

Objectives

- To assess the level of knowledge regarding safe blood transfusion among nurses working in the medical and surgical wards of Fauji Foundation Hospital, Kallar Kahar.
- To determine the association between nurses' knowledge regarding safe blood transfusion and their demographic characteristics.

Methodology

This study employed an analytical, cross-sectional design and was conducted in the medical and surgical wards of Fauji Foundation Hospital, Kallar Kahar. Medical and surgical wards were purposively selected as the study setting given their high transfusion volume i.e. medical wards frequently manage patients with chronic anemias and hematological malignancies, while

surgical wards routinely manage acute perioperative blood loss, making the transfusion-related knowledge of nurses working in these units a particularly relevant determinant of patient safety outcomes. The sample size was calculated using Slovin's formula, yielding a minimum sample of 110 nurses. Participants were recruited using a convenience sampling technique. Eligible participants were registered nurses involved in direct patient care, currently working at the hospital, with a minimum of six months of clinical experience, who provided written informed consent. Nursing students, interns, and nurses working in administrative or managerial roles were excluded, as these roles do not typically involve direct bedside transfusion administration.

Data were collected using a structured, self-administered questionnaire adapted from a previous study (Panchawagh et al., 2020), comprising two sections: demographic variables (age, gender, level of education, and years of experience) and a 25-item knowledge assessment. Responses were scored as correct or incorrect, and total scores were categorized as excellent ($\geq 80\%$ correct), good (60-79% correct), or poor ($< 60\%$ correct) knowledge. After collection, data were analyzed using SPSS version 26. Descriptive statistics, including frequencies and percentages, were used to summarize demographic characteristics and knowledge scores. To test for associations, Spearman's rank correlation was used to examine the ordinal variables of age and experience, the Kruskal-Wallis H test was used for the categorical variable of level of education, and Point-Biserial correlation was planned for the dichotomous variable of gender. Statistical significance was set at $p < 0.05$ for all tests.

Results

A total of 110 nurses completed the questionnaire, a 100% response rate. All participants (100%, $n = 110$) were female. The majority of nurses were aged 31-35 years (30.9%, $n = 34$), held a Diploma in General Nursing (47.3%, $n = 52$), and had 7-10 years of clinical experience (31.8%, $n = 35$) (Table 1).

Table 1. Demographic Characteristics of Participants

Variable	Category	n	%
Age (years)	25-30	24	21.8
	31-35	34	30.9
	36-40	27	24.5
	41-45	15	13.6
	Above 45	10	9.1
Gender	Female	110	100.0
Level of Education	Diploma in General Nursing	52	47.3
	Post RN	33	30.0
	BSN	25	22.7
Experience (years)	1-3	33	30.0
	4-6	26	23.6
	7-10	35	31.8
	More than 10	16	14.5

Table 2 presents nurses' responses on each of the 25 knowledge items. Correct response rates were highest for items like identification of the universal donor blood group (96.4%), recognition of transmissible diseases (90.0%), and the need for informed consent (90.9%). Correct response rates were lowest for more technical and emergency-oriented items, including RBC storage temperature (38.2%), and blood irradiation for chemotherapy patients (32.7%).

Table 2. Distribution of Accuracy of Responses to Knowledge Items

Knowledge Item	Correct (%)	n	Incorrect (%)	n	Don't Know (%)	n	Mean	SD
1. Universal donor blood group	106 (96.4%)		3 (2.7%)		1 (0.9%)		0.96	0.19
2. Blood donation frequency	92 (83.6%)		10 (9.1%)		8 (7.3%)		0.84	0.37
3. RBC shelf life after collection	58 (52.7%)		29 (26.4%)		23 (20.9%)		0.53	0.50
4. RBC storage temperature	42 (38.2%)		46 (41.8%)		22 (20%)		0.38	0.49
5. Pre-transfusion patient instructions	95 (86.4%)		11 (10%)		4 (3.6%)		0.86	0.34
6. Diseases transmissible via transfusion	99 (90%)		8 (7.3%)		3 (2.7%)		0.90	0.30

7. Pre-transfusion checks	90 (81.8%)	15 (13.6%)	5 (4.5%)	0.82	0.39
8. Most common cause of transfusion reactions	74 (67.3%)	26 (23.6%)	10 (9.1%)	0.67	0.47
9. Self-protective precautions before transfusion	80 (72.7%)	24 (21.8%)	6 (5.5%)	0.73	0.45
10. Monitoring during transfusion	87 (79.1%)	19 (17.3%)	4 (3.6%)	0.79	0.41
11. Monitoring frequency	52 (47.3%)	30 (27.3%)	28 (25.5%)	0.47	0.50
12. Patient within eyesight during transfusion	78 (70.9%)	26 (23.6%)	6 (5.5%)	0.71	0.45
13. Time limit for administering issued blood	56 (50.9%)	35 (31.8%)	19 (17.3%)	0.51	0.50
14. Re-refrigeration of issued blood bag	66 (60%)	28 (25.5%)	16 (14.5%)	0.60	0.49
15. Transfusion rate	63 (57.3%)	27 (24.5%)	20 (18.2%)	0.57	0.49
16. Blood treatment for chemotherapy patients	36 (32.7%)	38 (34.5%)	36 (32.7%)	0.33	0.47
17. Transfusion to HIV-positive patients	85 (77.3%)	18 (16.4%)	7 (6.4%)	0.77	0.42
18. Response to fever and chills	84 (76.4%)	20 (18.2%)	6 (5.5%)	0.76	0.42
19. Response to tachycardia, hypotension, dyspnea	44 (40%)	48 (43.6%)	18 (16.4%)	0.40	0.49
20. Commonest cause of mismatched transfusion	70 (63.6%)	30 (27.3%)	10 (9.1%)	0.64	0.48
21. Need for informed consent	100 (90.9%)	6 (5.5%)	4 (3.6%)	0.91	0.29
22. Final step to ensure ABO compatibility	76 (69.1%)	27 (24.5%)	7 (6.4%)	0.69	0.46
23. Response to cloudy/foamy blood bag	82 (74.5%)	21 (19.1%)	7 (6.4%)	0.74	0.44
24. Response to leaking blood bag	102 (92.7%)	5 (4.5%)	3 (2.7%)	0.93	0.26
25. Management of itching and rash post-transfusion	48 (43.6%)	44 (40%)	18 (16.4%)	0.44	0.50
Mean $\pm$ SD (Overall)	0.68$\pm$0.19	0.22$\pm$0.11	0.11$\pm$0.08		

Overall, 60.0% (n = 66) of nurses demonstrated good knowledge, 16.4% (n = 18) demonstrated excellent knowledge, and 23.6% (n = 26) demonstrated poor knowledge regarding safe blood transfusion. Combining the good and excellent categories, 76.4% of nurses had an acceptable overall level of knowledge (Table 3).

Table 3. Overall Knowledge Level of Nurses Regarding Safe Blood Transfusion

Knowledge Category	Score Range	n	%
Excellent Knowledge	$\geq 80\%$	18	16.4
Good Knowledge	60–79%	66	60.0
Poor Knowledge	< 60%	26	23.6

To determine the association between overall knowledge scores and demographic variables, Spearman's rank correlation was used for the ordinal variables of age and experience, the Kruskal-Wallis H test was used for the categorical variable of level of education, and Point-Biserial correlation was planned for the dichotomous variable of gender. As shown in Table 4, age ($\rho = 0.276$, $p = 0.041$), level of education ($H(2) = 9.86$, $p = 0.007$), and years of experience ($\rho = 0.389$, $p = 0.002$) were each significantly associated with overall knowledge scores. Gender could not be examined, as the entire sample was female, providing no variability for correlation analysis.

Table 4. Association Between Overall Knowledge Score and Demographic Variables

Demographic Variable	Statistical Test	Test Value	p-value
Age	Spearman's rho	$\rho = 0.276$	0.041*
Level of Education	Kruskal-Wallis H	$H(2) = 9.86$	0.007**
Experience (years)	Spearman's rho	$\rho = 0.389$	0.002**

Note. * $p < 0.05$ (statistically significant); ** $p < 0.01$ (highly statistically significant).

Discussion

The present study found that most nurses (76.4%) demonstrated an acceptable overall level of knowledge regarding safe blood transfusion, comprising 60.0% with good knowledge and 16.4% with excellent knowledge, while 23.6% demonstrated poor knowledge. This level of knowledge is broadly comparable to that reported by Khowaja et al. (2024) in a multi-site Pakistani study, where nurses similarly demonstrated strong knowledge on specific, frequently reinforced items despite an overall moderate classification, and by Mohd Noor et al. (2021), who reported an overall knowledge score of 54.9%. In contrast, Shaikh et al. (2023) reported a considerably lower overall knowledge level, with only 25% of nurses achieving a high knowledge classification and 35% classified as having poor knowledge. This disparity may reasonably be attributed to institutional differences in training infrastructure; as a military-affiliated tertiary care facility may provide more structured and consistent continuing nursing education opportunities than are available in some private-sector settings, potentially accounting for the comparatively stronger overall knowledge observed in the present sample.

Consistent with the pattern reported by Panchawagh et al. (2020), nurses in the present study performed considerably better on routine, frequently applied knowledge domains than on technical or emergency-oriented ones. While awareness of informed consent (90.9%) and basic transfusion safety principles was strong, only 38.2% of nurses correctly identified the appropriate RBC storage temperature, and just 40.0% could identify the correct initial response to a severe transfusion reaction presenting with tachycardia, hypotension, and dyspnea. This gap between routine and emergency-specific knowledge is a recurring finding in the transfusion safety literature and suggests that standard orientation training may adequately cover every day protocol but leave nurses under-prepared for rarer, high-acuity events, where the consequences of a knowledge gap are most severe.

Age was significantly, though modestly, associated with overall knowledge scores ($p = 0.276$, $p = 0.041$), with older nurses tending to score somewhat higher. A similar association was reported by Emmanuel et al. (2024) in a Pakistani tertiary care setting, where increasing age was linked to greater accumulated exposure to clinical transfusion scenarios and, correspondingly, stronger transfusion-related understanding. This pattern shows that older nurses have typically had more opportunities to encounter, and learn from, transfusion-related clinical events over the course of their careers, even in the absence of formal refresher training. However, the modest strength of this correlation suggests that age alone is an incomplete predictor, and that structured educational interventions remain necessary to ensure that younger nurses are not left to rely solely on accumulated incidental exposure to develop adequate transfusion safety knowledge.

A statistically significant association was also found between level of education and overall knowledge ($H(2) = 9.86$, $p = 0.007$), with BSN-qualified nurses tending to outperform those holding a Diploma or Post-RN qualification. This finding aligns with Yami et al. (2021), who reported that educational attainment was a meaningful predictor of transfusion-related knowledge, and with Rakhi et al. (2022), who similarly identified educational qualification as a significant factor shaping nurses' transfusion knowledge in a comparative Indian study. Given that the Diploma in General Nursing remained the most common qualification in the present sample (47.3%), reflecting the continued dominance of diploma-level entry into the nursing profession in Pakistan, this finding reinforces the practical value of encouraging and facilitating degree-level nursing education as a route to strengthening transfusion-related competence at the bedside.

Years of clinical experience showed the strongest association with overall knowledge among all demographic variables examined ($p = 0.389$, $p = 0.002$), with more experienced nurses scoring notably higher than their less experienced colleagues. This finding parallels that of Dahal and Khanal (2022), who reported that more experienced nurses demonstrated superior knowledge of transfusion-related complications, and is further supported by Khowaja et al. (2024), who observed a comparable relationship between years in practice and transfusion safety knowledge. Taken together with the age-related finding above, this suggests that sustained clinical exposure, rather than age itself, may be the more direct driver of transfusion-related competence, underscoring the particular importance of targeted, structured training for early-career nurses who have not yet accumulated this exposure.

Conclusion

This study found that nurses at Fauji Foundation Hospital, Kallar Kahar generally possessed an acceptable level of knowledge regarding safe blood transfusion, but specific gaps persisted in technical, storage-related, and emergency-response domains, areas where knowledge deficits carry the greatest risk to patient safety. Age, level of education, and years of clinical experience were each significantly associated with overall knowledge, with younger, less experienced, and diploma-level nurses scoring comparatively lower.

These findings are interpreted despite of certain limitations, including that the study was conducted at a single hospital using convenience sampling, which may limit the generalizability of the findings to nurses working in other healthcare settings across Pakistan. The cross-sectional design captured knowledge at only a single point in time and cannot establish causality between

demographic characteristics and knowledge, and reliance on a self-administered questionnaire, without an accompanying observational component, limited insight into how this knowledge translates into actual bedside practice.

Based on these findings, hospital administration should organize regular in-service training sessions. Nursing administration should also encourage and facilitate continuing education and degree advancement among diploma- and Post-RN-qualified nurses, given the demonstrated link between higher qualification and stronger knowledge. Future studies should be conducted across multiple hospitals and, ideally, incorporate an observational or practice-based component to validate these findings and clarify the practical barriers nurses face in applying safe transfusion knowledge at the bedside.

References

- AlAwam, H. A., AlShehri, K. A., Alaryani, M. S., Alotaibi, R. K., Isa, E. M., Aloryani, A. S., Miqdam, W. H. E., Sfiani, R. A., Alhwsawi, K. Z., & Alanazi, A. H. (2024). Ensuring patient safety: The nurse's responsibilities in blood transfusion. *Journal of International Crisis and Risk Communication Research*, 7(S8), 75.
- Alshehri, F. D., Alshehri, F. W., Alshehri, M. A., Alshehri, K. D., & Alshehri, A. M. (2024). The role of nurses in ensuring safe and efficient blood donation practices. *Journal of International Crisis & Risk Communication Research*, 7.
- Bansal, N., Raturi, M., Singh, C., & Bansal, Y. (2025). Immunological complications of blood transfusion: Current insights and advances. *Current Opinion in Immunology*, 96, Article 102617.
- Bediako, A. A., Ofosu-Poku, R., & Druye, A. A. (2021). Safe blood transfusion practices among nurses in a major referral center in Ghana. *Advances in Hematology*, 2021(1), Article 6739329.
- Belousov, A. (2024). Modern strategies of anticoagulant and antiplatelet therapy: Novel approaches to diagnosing the hemostatic system using laboratory and instrumental methods. *Journal of Vascular Medicine & Surgeries*, 5(2), Article 105.
- Booth, C., Allard, S., & Robinson, S. (2021). Blood transfusion. *Medicine*, 49(4), 238–242.
- Buerger, C. S., & Jain, H. (2023). Infectious complications of blood transfusion. In StatPearls [Internet]. StatPearls Publishing.
- Dahal, S., & Khanal, S. (2022). Assessing the level of knowledge and practice regarding blood transfusion and its complications among staff nurses working at B & C Teaching Hospital and Purbanchal Cancer Hospital, Birtamode, Jhapa, Nepal. *Medical Journal of Eastern Nepal*, 1(1), 25–31.
- Emmanuel, A., Junejo, Z., Paul, A., Shahzadi, A., & Nadeem, K. (2024). Nurses' knowledge and practices regarding blood transfusion safety at Isra University Hospital, Hyderabad. *Pakistan Journal of Multidisciplinary Innovation*, 3(2), 9–19.
- Farrugia, A. (2023). The evolution of the safety of plasma products from pathogen transmission—A continuing narrative. *Pathogens*, 12(2), Article 318.
- Ghafoor, M. B. (2024). Challenges in safe blood transfusion: An experience at a tertiary care hospital of Pakistan. *Annals of PIMS-Shaheed Zulfiqar Ali Bhutto Medical University*, 20(Suppl. 2), 911.
- Khowaja, A. J., Jummo, S., Aman, A. M., Nabi, S., Kamran, A., & Shah, M. A. (2024). Assessment of nurses' knowledge regarding safe blood transfusion protocols in diverse tertiary healthcare settings. *Pak-Euro Journal of Medical and Life Sciences*.
- Kvržić, Z. (2024). The discovery of blood groups in the twentieth century. In *History of blood donation and transfusion medicine* (pp. 57–77). Springer.
- Mohd Noor, N. H., Saad, N. H., Khan, M., Hassan, M. N., Ramli, M., Bahar, R., Mohamed Yusoff, S., Ibrahīm, S., Wan Ab Rahman, W. S., & Zulkafli, Z. (2021). Blood transfusion knowledge among nurses in Malaysia: A university hospital experience. *International Journal of Environmental Research and Public Health*, 18(21), Article 11194.
- Nayeri, N. D., Nadali, J., Divani, A., & Hatefimoaddab, N. (2022). Ways to enhance blood transfusion safety: A systematic review. *Florence Nightingale Journal of Nursing*, 30(3), 288–297.
- Noor, N. H. M., & Asmaa, M. J. S. (2024). Karl Landsteiner (1868–1943): A versatile blood scientist. *Cureus*, 16(9).
- Obeagu, E., Anyanwu, C., & Obeagu, G. (2024). Challenges and considerations in managing blood transfusion for individuals with HIV. *Elite Journal of HIV*, 2(2), 1–7.
- Panch, S. R., & Montemayor, C. (2022). Hemolytic transfusion reactions. In *Rossi's principles of transfusion medicine* (pp. 543–552).

- Panchawagh, S. J., Melinkeri, S., & Panchawagh, M. J. (2020). Assessment of knowledge and practice of blood transfusion among nurses in a tertiary care hospital in India. *Indian Journal of Hematology and Blood Transfusion*, 36(2), 393–398. <https://doi.org/10.1007/s12288-019-01244-0>
- Rakhi, G., Mudgal, S. K., Suyal, N., Sharma, S. K., Agarwal, R., Ritu, R., & Jitender, C. (2022). Nurses and nursing students' knowledge regarding blood transfusion: A comparative cross-sectional study. *Journal of Integrative Nursing*, 4(3), 137–144.
- Schack, A., Ekeloef, S., Ostrowski, S. R., Gögenur, I., & Burcharth, J. (2022). Blood transfusion in major emergency abdominal surgery. *European Journal of Trauma and Emergency Surgery*, 48(1), 121–131.
- Shaikh, M. H., Bibi, A., & Ali, R. (2023). Nurse's knowledge regarding blood transfusion in a tertiary care hospital Karachi, Pakistan. *NURSEARCHER (Journal of Nursing & Midwifery Sciences)*, 19–23.
- Shoukat, S., Hussain, A., Ali, H., Talib, A., Ahmad, T., Sajjad, L., & Shahzad, N. (2025). Assessing nurses' knowledge of safe blood transfusion practices in a tertiary care hospital in Peshawar Pakistan: A cross-sectional study. *The Research of Medical Science Review*, 3(2), 254–260.
- Soliman, H. M., & Elhapashy, H. M. (2021). Nurses' competence in safety blood transfusion: The impact of a training module. *International Journal of Nursing Education*, 13(3).
- Takona, J. P. (2024). Research design: Qualitative, quantitative, and mixed methods approaches. *Quality & Quantity*, 58(1), 1011–1013.
- Yami, A., Darbandi, A., Saber, E., Tabrizi Namini, M., & Gharehbaghian, A. (2021). Assessment the knowledge of blood transfusion in Iranian nurses of Tehran's hospitals. *Transfusion Medicine*, 31(6), 459–466.
- Yazer, M. H. (2021). The evolution of blood product use in trauma resuscitation: Change has come. *Transfusion Medicine and Hemotherapy*, 48(6), 377–380.
- Yiadom, A. K. B., Opoku, A., Oppong, A. A., Druye, A. A., & Mensah, O. N. (2021). Knowledge and practice of blood transfusion by nurses at Komfo Anokye Teaching Hospital, Kumasi, Ghana. *Asian Journal of Research in Nursing and Health*, 4(4), 170–185.
- Yıldız, A., Evren, G., Zihar, B., & Yaman, S. (2024). Non-hemolytic acute transfusion reactions: The impact of patient and blood product characteristics. *Postgraduate Medicine*, 136(7), 726–730.



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