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Research Article

Is Blood Transfusion in Anesthesia Based on International Standard?

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ABSTRACT

Background: Blood transfusion is a critical procedure where any error in the transmission chain can jeopardize patient safety. To ensure safe blood transfusions, it is essential to evaluate the performance of all personnel involved in the transfusion process, including anesthesia technologists, whose role has often been overlooked. This study was conducted with the aim of investigating the performance of in com anesthesia technologist plying with safe blood transfusion procedures during anesthesia.

Methods: This cross-sectional study was conducted on 80 Anesthesia technologist s working in Rasoul Akram and Firouzgar hospitals in Tehran. The purpose of this study was to investigate the level of adherence to safe blood transfusion standards by Anesthesia technologist s. The data was collected using a comprehensive and standard questionnaire including two parts: the first part demographic information and the second part focusing on the standards of safe blood transfusion. All completed questionnaires were entered into SPSS software version 27. Descriptive and inferential statistics were used for statistical analysis.

Results: The average age of the participants was 34 ± 10 years. Of the participants, 70% were women and 30% were men. The average score on the 36-question questionnaire was 27.32, corresponding to 73% of the maximum possible score. Performance levels were categorized as follows: good (75–100%), representing 41.25% of participants; moderate (50–75%), representing 58.75% of participants; and poor (<50%), with no participants falling into this category. Overall, the performance of anesthesia technologist in adhering to safe blood transfusion standards was considered average.

Conclusion: Anesthesia technologist performance in safe blood transfusion procedures during anesthesia was evaluated at a moderate level. Addressing these gaps and considering educational programs in health care systems can improve patient safety and improve clinical outcomes during anesthesia and surgical procedures.

Introduction

Administering blood or blood products, while potentially life-saving, may involve irreparable risks if administered incorrectly. As a result, accurate assessment of the patient's clinical condition and weighing the advantages and disadvantages before blood transfusion can lead to better results [1]. The World Health Organization (WHO) has designated blood transfusion as one of the nine crucial life-saving interventions. As per the WHO report, over nine million patients across 90 diverse nations undergo blood transfusions on an annual basis [2]. Patient safety serves

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as the fundamental pillar of high-quality healthcare services, encompassing the prevention of any harm or adverse events to patients during the delivery of medical and nursing care, often referred to as clinical errors [3]. Despite the progress that has been made in the field of blood transfusion, human errors still remain as the main cause of blood transfusion-related complications [4]. According to statistics, about 85% of human errors in the occurrence of blood transfusion reactions have been reported [2]. Proper identification of patients undergoing blood transfusion is necessary to reduce errors related to blood transfusion and prevent patient safety from being compromised [5]. The final verification of patient identification at the bedside prior to blood transfusion initiation serves as the last line of defense against the occurrence of errors in this critical medical procedure [6]. However, despite the importance of this, when patients are unconscious or unable to provide identification, this process can be compromised and potentially lead to errors [7-9].

According to the studies conducted in Iran, more than half of the blood transfusions in the operating rooms are performed by the surgical and anesthesia team [10-11]. One of the sensitive cases in medical care, which is of particular importance and can cause irreparable consequences for the patient in the event of an error, is the time of anesthesia. The risks at this stage can be caused by haste, distraction, or boredom of the anesthesia team [12]. It is critical for medical personnel to adhere to transfusion guidelines and effectively manage adverse events that may occur during the process [13]. In case of non-compliance with the standards of safe blood transfusion, comprehensive and continuous training of health care professionals involved in blood transfusion is necessary to ensure the achievement of safe blood transfusion [14]. Effective and continuous use of checklists, as part of training, can improve performance and reduce clinical errors. Among the checklists used in anesthesia, we can refer to the safe blood transfusion checklist, the checklist for evaluating the guidelines for registration and labeling of anesthetic drugs, and the patient safety checklist [15-18]

Considering the importance of safe blood transfusion and the important role of anesthesia technologists in this process, along with the lack of research on the performance of Anesthesia technologist in the process of safe blood transfusion in the hospitals of Iran University of Medical Sciences, this study aims to investigate the compliance of their performance with Safe blood transfusion guidelines were performed.

Methods

Study design and sample

This study represents a quantitative and semi-experimental intervention with the aim of evaluating the adherence of anesthesia technologists to safe blood transfusion standards. Ethics approval was obtained from Iran University of Medical Sciences with the code IR.IUMS.REC.1402.808. This research was carried out in March 2024 to May 2024 in the operating rooms of Rasul Akram and Firozgar hospitals. The sample size was 80 people who were included in the study based on the entry and exit criteria and were placed in two groups of 40 people from each hospital. Inclusion criteria include: having a bachelor's degree and working as an anesthesia technologist in Rasoul Akram and Firouzgar Medical Research Centers, having at least 2 years of work experience and volunteer consent to participate in the research. Exclusion criteria include: participation in safe blood transfusion training courses and the volunteer's lack of consent to continue cooperating in the research.

The aims and methods of the study were fully explained to the participants and informed consent was obtained from them. The participants evaluated their performance by using a performance self-assessment questionnaire on the level of compliance with the standards of safe blood transfusion.

Data gathering

In this research, we used a researcher-made questionnaire that has reached validity and reliability. The questionnaire has two sections that include demographic characteristics (age, gender, marital status, education level, employment status, work experience) and a section for compliance with blood transfusion standards before, during and after the injection, which contains 36 questions. We extracted the questions of compliance with blood transfusion standards from the checklist prepared by Mr. Mahdizadeh et al. [19], which is in accordance with the most up-to-date protocols of safe blood transfusion. This questionnaire covers areas such as examining the patient's diseases and medications, obtaining informed consent, confirming doctor's orders and blood bags, confirming the patient's identity, managing blood transfusion reactions, and accurately recording cases in appropriate forms. Each question is assigned one point.

Data analysis

The collected data were entered into SPSS software (version 27) and refined. The normality of quantitative variables was evaluated through skewness and kurtosis indices as well as the Kolmogorov Smirnov test. Descriptive statistical techniques, such as frequency distribution tables, descriptive charts, and measures of central tendency and dispersion, were used to describe the data. Performance levels of anesthesia technologist were analyzed using paired t-tests and McNemar's tests, and all analyzes were performed at a significance level of 0.05.

Results

This study was conducted on 80 anesthesia technologist working in Rasoul Akram and Firouzgar hospitals in Tehran, with an average age of 34±10 years. Most of the participants were female (70%) and 30% were male. It is worth noting that 79% of anesthesia technologist had less than 10 years of work experience (Table 1). The average performance score between the two groups did not show a statistically significant difference (P=0.129). The findings showed that the average score of the 37-question questionnaire in the two groups was 27.32, which is equivalent to 73/80% of the total score. Performance levels were classified as follows: good (75-100%), achieved by 42.25% of participants; Average (50-74%), obtained by 58.75% of participants. and weak (<50%), with no participants falling into this category (Table 2). Overall, the performance of was considered anesthesia technologist average. While only 41% of the participants scored above average and none of the participants answered all the questions correctly. This study showed that factors such as age (P=0.059), work experience(P=0.062), gender(P=0.353) and shift work(P=0.131) do not have a significant effect on the performance of anesthesia technologist.

Table 1- Group Statistics

	Group	N	Mean	Deviation Std.	Std. Error Mean
Total	Firuzgar	40	27.30	2.041	0.323
	Rasool Akram	40	27.33	2.635	0.417
Age	Firuzgar	40	31.10	4.771	0.754
	Rasool Akram	40	32.23	5.132	0.811
Work Experience	Firuzgar	40	7.5750	4.18721	0.66206
	Rasool Akram	40	8.6000	4.96036	0.78430
Average work shift	Firuzgar	40	25.9750	4.36470	0.69012
	Rasool Akram	40	27.2750	3.92877	0.62119

Table 2- Results

Hospital name	Weak >50%	Average 50-74%	Good 75%<	Percentage of total score
Firuzgar	0	60% (24)	40% (16)	73/78%
Rasool Akram	0	57/5% (23)	42/5% (17)	73/86%
Total	0	58/75% (47)	41/25% (33)	73/82%

Discussion

Blood transfusion is a critical component in saving lives across various medical scenarios, particularly in emergencies. This encompasses areas such as pregnancy and childbirth, severe pediatric illnesses, trauma, cancer therapy, and diverse hematological disorders [20]. Given the high rate of blood transfusions in operating rooms, Anesthesia technologist play a pivotal role in administering blood products and ensuring patient safety. Consequently, a lack of sufficient expertise in this field can lead to errors, thereby jeopardizing patient safety [2]. Based on the results of our study, overall, the performance of anesthesia technologists was deemed average. Notably, only 41% of participants scored above average, and no participant was able to answer all questions correctly. Considering the central role of Anesthesia technologist in the blood transfusion process, the results of our study underscore the urgent need for targeted educational programs and continuous medical education in blood transfusion. This is crucial for enhancing the expertise of Anesthesia technologist and ensuring the safety of patients during transfusions. The findings of several studies corroborate the results of our research, emphasizing a pervasive gap in knowledge and competence regarding blood transfusion practices among healthcare professionals. For instance, Yami et al. conducted a study in Tehran targeting nurses and discovered a significant lack of knowledge during the pre-transfusion stage. This deficiency underscores the need for enhanced educational interventions to ensure patient safety and optimal outcomes [21]. Similarly, a study by MohdNoor et al. focusing on nurses in Malaysia revealed that their general awareness of transfusion practices was at an average level. This finding suggests that, while some foundational knowledge exists, there is considerable room for improvement to achieve a higher standard of care [22]. Further supporting these observations, Kupesiz et al. found that a substantial proportion of medical students were deficient in both theoretical knowledge and self-assessed practical competence in transfusion medicine. This indicates a critical need for improved curricula and training programs in medical education to address these gaps early in the professional development of healthcare providers [23]. Additionally, research by Fatemeh Babaei et al. on nursing professionals reported that the knowledge and performance of nurses in blood transfusion were at an average to weak level [24]. This

further highlights the widespread issue of inadequate preparation among nurses in this crucial area of patient care. In contrast to the findings of the present study, several other studies have reported higher levels of knowledge and competence in transfusion medicine among healthcare professionals. For example, a study by Adgoy et al. showed that participants had good knowledge about blood groups and Rh factor [25]. Similarly, the research of Kavaklioglu et al. in Turkey showed that the level of knowledge among medical personnel was above average and the participants had a good understanding of transfusion medicine [26]. These results highlight variation in knowledge levels across regions and populations, potentially reflecting differences in educational programs, access to resources, or health care systems. These conflicting findings emphasize the importance of contextual factors in shaping the knowledge and competencies of healthcare professionals in transfusion medicine. While some studies show significant gaps and deficits, others show that targeted interventions can lead to substantial improvements. Therefore, it is crucial that educational strategies and policies are tailored to the specific needs and circumstances of different healthcare settings to ensure that all professionals are adequately prepared to perform safe and effective blood transfusions.

Limitations

In this study, only anesthesia technologists at Rasoul Akram and Firouzgar Hospitals in Tehran were examined. This geographical limitation may confine the findings to the specific conditions and practices of these hospitals, potentially differing from those in other regions or hospitals across the country. Furthermore, while a standardized questionnaire was utilized, it may not comprehensively assess all facets of the anesthesia technologists' performance. Some critical aspects of their duties might have been overlooked. Additionally, responses to the questionnaire could be influenced by subjective and individual factors, leading to potential inaccuracies or incomplete data. Another limitation is the lack of practical evaluation and direct observation of the technicians' performance during the blood transfusion process. This absence of observational data restricts the ability to fully understand and evaluate their practical adherence to safe blood transfusion procedures.

Suggestions

Future studies could include a larger and more diverse sample of anesthesia technologists from multiple hospitals in different regions, and use mixed approaches, such as combining quantitative methods (e.g., questionnaires) with qualitative methods (e.g., interviews and focus groups), as well as direct observations., can provide deeper insight into the performance of anesthesia technologists. This combination helps to capture a more accurate view of the practices and challenges they face and leads to a more comprehensive assessment of their adherence to safe transfusion practices.

Conclusion

Based on our study evaluating the self-assessment of Anesthesia technologists' performance, it was determined that they exhibit an average level of competence in the administration of safe blood transfusions during anesthesia. These findings highlight the need for targeted educational interventions and continuous professional development programs to enhance the proficiency of Anesthesia technologists in this critical area. By addressing these gaps, healthcare systems can ensure higher standards of patient safety and improve overall clinical outcomes during surgical procedures.

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