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Critical Care Nurses' Compliance with Blood Transfusion Guidelines in Gastrointestinal Intensive Care Units

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1.ABSTRACT

Background: For critically ill patients undergoing gastrointestinal surgery, blood transfusions are frequently necessary to correct anemia or replace significant blood loss from related trauma or surgical operations. Ensuring the safety of blood transfusion procedures is the role of critical care nurses in the intensive care unit (ICU). **Aim**: The current study aimed to investigate critical care nurses' compliance with blood transfusion guidelines in Gastrointestinal ICUs. **Method**: A descriptive observational research design was used to conduct this study with a convenience sample of 49 critical care nurses working in three ICUs affiliated with a university hospital in Egypt. Critical care nurses' compliance with the blood transfusion practice tool was used to collect data for this investigation. **Results**: Most of the participant nurses (81.6%) had satisfactory practice levels regarding their compliance with blood transfusion guidelines with a total mean practice score of 86.5±2.1. All participant nurses showed a satisfactory level of practice regarding patient identification, and collection, delivery, and administration of blood components. However, 91.8% of the participant nurses had unsatisfactory practice levels regarding checking blood requests and documentation. **Conclusion and Recommendations**: The study highlights the need for periodic refresher training sessions for critical care nurses on updated blood transfusion guidelines with a specific focus on checking blood requests and documentation of blood transfusion. This will enhance nurses' practice, optimize patient safety and reduce blood transfusion-related complications in ICUs.

Keywords: *Critical Care Nurses, Compliance, Blood Transfusion, Guidelines.*

2.Introduction:

Globally, acute gastrointestinal (GIT) bleeding is a common medical emergency that causes significant morbidity and mortality. The incidence of GIT ranges from 50 to 150 per 100,000 adults per year (**Olynyk & Khoo, 2017**). Critical ill patients with gastrointestinal surgery frequently need blood transfusions to correct anemia or replace excessive blood loss from associated trauma or surgical procedures (**Shah, Parma & 2013**). To create a safe environment for patients and healthcare professionals, the patient safety culture in Arab nations, particularly in Egypt, still needs to be continuously assessed and monitored. (**Ali, Hadad & Ahmed, 2022**).

From the early 19th century to date, millions of patients have been eligible to receive blood components annually (**Bediako, Ofosu-Poku & Druye, 2021**). Although blood transfusion enhances a patient's life, it is associated with hazards (**Robinson et al., 2018**). The practice of safe blood transfusions is disrupted by human errors, mostly due to the failure of healthcare providers to comply with proper transfusion guidelines (**Kavaklioglu et al., 2017**).

It estimated that out of every 13.000 blood transfusions, one error occurs most often due to human errors which can be avoided by proper education and development/implementation of transfusion protocols (**Holmberg, 2015**). According to the Serious Hazards of Transfusion Survey, 87.3% of total serious adverse blood reactions and events in the United Kingdom are due to human errors like "near miss events" and

"right blood right person" issues **(Serious Hazards of Transfusion (SHOT), 2018)**. Close collaboration between healthcare providers is essential for the safe use of blood products and blood transfusion as there is a chance for error at each step of the blood transfusion procedure **(Freixo et al., 2017)**.

Human blood transfusions can save lives, but there are risks involved. The most significant deadly agents in transfusion-transmitted illnesses include syphilis, human immune deficiency virus, hepatitis B virus, and hepatitis C virus **(World Health Organization (WHO), 2010)**. Due to the asymptomatic and latent nature of these diseases, it is difficult to assess the incidence rates of blood transfusion infections. **(Bhawani, Rao, & Sudhakar, 2010)**. Other complications of blood transfusion include transfusion-associated circulatory overload, transfusion-related acute lung injury, transfusion-associated dyspnea. and severe adverse reactions such as allergic, and delayed hemolytic reactions **(Kato et al., 2013; Politis et al., 2016)**. An Egyptian study done at El Fayoum University reported that the most common reaction observed in recipients was the allergic reaction (47.2%) followed by febrile non-hemolytic transfusion reaction (36.1%) **(Ezzat, Abdelrazik, Elshafei, Abbas, & El Hassan, 2019)**.

In all stages of the blood transfusion procedure, nurses assume various roles and responsibilities. Nurses must take into consideration the four basic elements of blood transfusion including appropriate blood, the right patient, the proper procedure, and the right timing **(Kavakliogu et al., 2017)**. The **WHO (2020)** recommends that the training of healthcare professionals be the cornerstone of an integrated approach to enhance the quality and safety of blood transfusion procedure.

The safety of blood transfusion depends greatly on nurses' knowledge and skills which can lower the risks of this procedure **(Elhy & Kasemy, 2017)**. Recent investigations on nurses' knowledge and practice concerning blood transfusion showed inadequate nurses' experience with safe blood transfusion techniques, prevention of potential adverse reactions, and blood transfusion standards **(Ali, El Hadad & Ahmed, 2022; Bediako, Ofosu-Poku & Druye, 2021; Soliman & Elhapashy, 2021)**. These findings highlighted the urgent need for assessing critical care nurses' compliance with blood transfusion guidelines at the Gastrointestinal ICUs which deal with blood transfusion at a much higher frequency than any other hospital to ensure optimal safety during the blood transfusion procedure. Hence, this study was carried out to address this issue.

2.1Aim of the Study

This study aimed to investigate critical care nurses' compliance with blood transfusion guidelines in Gastrointestinal ICUs.

2.2Research Question:

What is the extent of nurses' compliance with blood transfusion guidelines in Gastrointestinal ICUs?

3.Method

3.1Design

A descriptive observational research design was used to conduct the current study. This design is concerned with describing a phenomenon of interest, and it focuses on the characteristics, attributes, and experiences of a single group. It does not answer questions about how, when, or why the characteristics occurred; rather, it addresses the what question **(Siedlecki, 2020).**

3.2Setting

This study was conducted in three ICUs located in the Gastrointestinal Surgery Center in a University Hospital in Egypt. These include surgical, liver transplantation, and middle ICUs. The surgical ICU involves seven beds, and it provides care to post-operative patients (e.g. gallbladder stone removal surgery, Whipple's operation, cancer colon surgery…). The liver transplantation ICU includes seven beds, and it provides pre and post-operative care for patients/donors undergoing liver transplantation. The middle ICU contains four beds and provides care for post-operative patients who had a short ICU stay. The three ICUs are well equipped with

advanced technology and health care professionals required for patient care.

3.3Participants

A convenience sample of 49 critical care nurses with at least one year of work experience in the previously selected ICUs. They were involved in providing patient care and were willing to participate in the current study.

3.4Data Collection Tool

One tool called **"Critical Care Nurses' Practice of Blood Transfusion"** was used to collect the data. It included two main parts as follows:

Part 1: Demographic Characteristics of Participant Nurses

This part addressed participant nurses' demographic characteristics, including age, gender, workplace, level of education, years of ICU work experience, attended previous educational or training programs on blood transfusion guidelines, and the number of education sessions in case of training attendance.

Part 2: Blood Transfusion Practice Observation Checklist

The primary investigator (PI) developed this part after reviewing the relevant literature **(Australian and New Zealand Society of Blood Transfusion Australian College of Nursing, 2018; Encan & Akin, 2019; Silva et al., 2017; Robinson et al., 2017)**. It aimed to assess critical care nurses' compliance with blood transfusion guidelines. It involved three main care categories: before transfusion, during transfusion, and after transfusion.

- **Nursing Care before Blood Transfusion** involved 18 items covering 5 areas:
  - Patient identification: 3 items (6 marks).
  - Patient information and consent: 2 items (4 marks).
  - Request for transfusion: 1 item (2 marks).
  - Blood samples for pre-transfusion testing: 4 items (8 marks).
  - Collection and delivery of blood components: 8 items (16 marks).
- **Nursing Care during Transfusion** involved 30 items covering 2 areas:
  - Administration of blood component: 23 items (46 marks).
  - Monitoring of the patient: 7 items (14 marks).
- **Nursing Care after Transfusion** involved 3 items covering one area:
  - Documentation: 3 items (6 marks).

Scoring System

According to the observation checklist, the scoring system was ranked on a three-point scale from 0 to 2:"done completely" practice was given 2 marks, "done incompletely" was given 1 mark, and "not done" practice was given a zero. The total scores were 51 points. The scores equal to or more than 75% were considered a satisfactory practice level (equal to or more than 39 points), while scores less than 75% (less than 39 points) were considered an unsatisfactory practice level **(El Nasr et al., 2016).**

3.5Validity and Reliability of the Tool

A panel of five experts from the fields of Critical Care and Emergency Nursing and Anesthesia and Intensive Care Medicine, Mansoura University tested the content validity of the tool. The clarity, relevance, and applicability were revised, and modifications were done accordingly. The panel suggested omitting the step regarding the decision to transfusion because it is the responsibility of the physician not the nurse. Cronbach's Alpha test was used to test the reliability of the tool, and the value was 0.82. Hence, the tool is reliable.

3.6Pilot Study

The pilot study involved 10% (5 nurses) of the total participants to assess the objectivity, clarity, and applicability of the data collection tool. Moreover, it estimated the time needed to complete the observation checklist. Nurses involved in the pilot study were excluded from the main study.

3.7Ethical Considerations

Before beginning the data collection, ethical approval was obtained from the Research Ethics Committee of the Faculty of

Nursing, Mansoura University. Permission was granted by the director of the Gastrointestinal Surgery Center. Also, informed consent was obtained from the eligible nurses who accepted to participate in the study after being informed about the study's aim, procedure, benefits, and risks. They were assured that they were free to roll out of the study anytime. It was also emphasized to them that data were used only for research purposes and that the confidentiality of the personal data was maintained through coding. Participants' nurses were also assured that their practice scores would not be included in their annual evaluation.

3.8Data Collection

Data were collected between April and November 2020. Data collection was carried out in three phases: preparation, implementation, and evaluation phases.

Preparation Phase

Permission to carry out this study was gained from the authority of the selected hospital and the ICUs. The primary investigator (PI) introduced her to the nurses in the selected setting, explained to them the study details, and invited them to participate in the study. The PI interviewed the nurses to collect their demographic characteristics using part 1 of the tool. The interview was done individually for each nurse, and it lasted about 10 minutes.

Implementation Phase

The PI observed the participant nurses during their practice of blood transfusion to assess their compliance with the blood transfusion guidelines using part 2 of the tool. Participant nurses were observed three times during different shifts (morning, afternoon, and night) according to their ICU work schedule, and the mean of the three observations was calculated. The PI completed the observation checklist for each nurse in 45-60 minutes.

Evaluation Phase

In this phase, the critical care nurses' compliance with blood transfusion guidelines was evaluated, and their practice scores were calculated to determine satisfactory and unsatisfactory practices

3.9 Data Analysis

Data were analyzed using the Statistical Package for Social Science software version 20 (SPSS, Inc, Chicago, IL & USA). The Chi-square test (Fisher's exact test) was used to compare qualitative data that were reported as frequencies and percentages. Mean and standard deviation were used to express quantitative data (SD). To distinguish between repeated measurements, the ANOVA test was used.

4.Results

Table 1 shows the demographic characteristics of the participant nurses. The results revealed that 85.7% of participants were females, and 83.7% of them were aged between 20-30 years old with a mean age of 16.33 ± 6.0025. Nearly half of the participant nurses (49%) were working in the middle care unit, and 53.1% of them graduated from the Technical Institute of Nursing. The results also illustrated that 67.3% of the nurses had from 1 to 5 years of work experience in the ICU. Furthermore, 75.5% of participant nurses reported that they attended previous educational sessions concerning blood transfusion. The biggest proportion of the participants (45.9%) attended two educational sessions.

Figure 1 displays participant nurses' total practice level of blood transfusion guidelines. The results showed that 81.6% of participant nurses' had a satisfactory practice level regarding compliance with blood transfusion guidelines, while 18.4% of them had an unsatisfactory level (total score < 75%).

Table 2 portrays participant nurses' satisfactory practice level of blood transfusion guidelines. It showed that the participant nurses had a satisfactory practice level regarding the three phases of blood transfusion: pre-transfusion, during transfusion, and post-transfusion (79%, 80.6%, & 76.8% respectively). The result also illustrated that all participant nurses had the highest satisfactory practice level regarding patient identification, collection and delivery

of blood components, and administration of blood components. The majority of the participant nurses demonstrated satisfactory practice levels regarding obtaining patient information and consent, blood samples for pre-transfusion testing, and patient monitoring (91.8%, 98%, & 98% respectively). On the other hand, 91.8% of the participant nurses demonstrated an unsatisfactory practice level regarding the request for blood transfusion and documentation.

Table 3 describes participant nurses' total and subtotal mean compliance scores with blood transfusion guidelines. The results clarified that the nurses' total mean practice score was 86.5±2.1. Additionally, administration of blood components was perceived as the highest compliance domain among the participant nurses with a mean score of 34.2±1.3, while the request for transfusion domain and documentation domain were perceived as the lowest compliance with a mean score of 1.2 ± 0.17 and 3.1± 0.28 respectively.

Table 1 Demographic Characteristics of the Participant Nurses

	n=49	
Variables	*N*	%
Age (years)		
20-30 years	41	83.7%
31-40 years	6	12.2%
41-50 years	2	4.1%
Mean ± SD	16.33 ± 6.0025	
Gender		
Male	7	14.3%
Female	42	85.7%
Workplace		
Liver Transplantation ICU	8	16.3%
Surgical ICU	17	34.7%
Middle Care Unit	24	49%
Level of education		
Nursing school	6	12.2%
Technical institute	26	53.1%
Bachelor of Nursing	16	32.7%
Postgraduate	1	2%
ICU experience (years)		
1-5 years	33	67.3%
6-10 years	10	20.4%
>10 years	6	12.3%
Attended previous education session	37	75.5%
Number of sessions		
One	13	35.2%
Two	17	45.9%
Three	7	18.9%

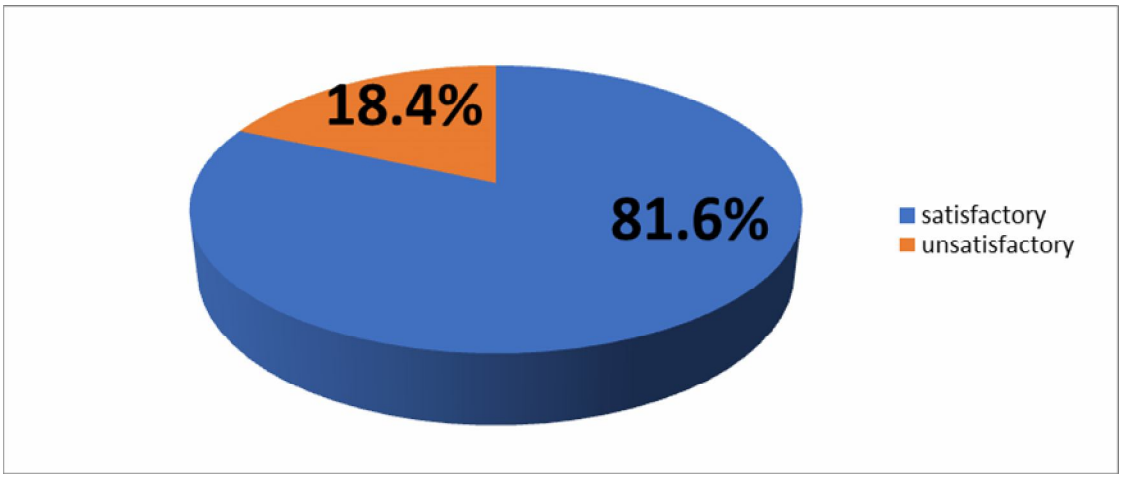

Figure 1. Participant Nurses' Total Practice Level of Blood Transfusion Guidelines

Table 2 Participant Nurses' Satisfactory Practice Level of Blood Transfusion Guidelines

Blood transfusion phases	Practice level				in+max
	Sat.	%	Unsat.	%	
Pre transfusion (satisfactory = 79%)					
• Patient identification	49	100%	0	0%	83.3+100
• Patient information & consent	45	91.8%	4	8.16 %	66.7+100
• Request for blood transfusion	4	8.16%	45	91.8%	52.8+91.7
• Blood samples for pre-transfusion testing	48	98%	1	2%	72.2+80.6
• Collection & delivery of blood components	49	100%	0	0%	100+100
During transfusion (satisfactory= 80.6%)					
• Administration of blood components	49	100%	0	0.0%	77.8+100
• Patient monitoring	48	98%	1	2%	72.2+100
Post transfusion (satisfactory= ٧6.8%)					
• Documentation	4	8.16%	45	91.8%	52.8+91.7
Total score	49	100%	0	0%	84+96

Table 3 *Participant Nurses' Total and Subtotal Mean Compliance Scores with Blood transfusion Guidelines*

Guidelines Domains	Number of Guidelines Items	Full marks	Mean ± SD	Rank	
Patient identification	3	6	6.0 ± 0.0	5	
Patient information & consent	2	4	4.84 ± 0.5	6	
Request for transfusion	1	2	1.2± 0.17	8	
Blood samples for pre-transfusion testing	6	12	8.98 ± 0.14	4	
Collection & delivery of blood components	8	16	16 ± 0.0	2	
Administration of blood components	18	36	34.2±1.3	1	
Patient monitoring	6	12	11.1± 0.94	3	
Documentation	3	6	3.1± 0.28	7	
Total score Min- Max score	47 84- 96	94	**86.5± 2.1**		

5. Discussion

Providing safe and adequate blood is an integral part of every country's national healthcare policy and infrastructure **(Khalil et al., 2021).** Nurses play a critical role in ensuring the safety of blood transfusion **(Mohammad, 2021).** They are involved in four phases including preparing blood units, collecting blood packs, before, and after transfusion activities, and patient safety monitoring **(Vaghar, 2018).** Therefore, nurses must have adequate knowledge and competencies in the transfusion of blood and blood products **(Bediako, Poku & Druye, 2021).** Hence, we conducted this study to assess the critical care nurses' compliance practice with blood transfusion guidelines.

The findings of the current study illustrated that most of the participant nurses aged between 20-30 years old and slightly more than half graduated from the Technical Institute of Nursing. This may be because newly graduating nurses are assigned to work as staff nurses in ICUs to improve the standard of patient care **(El Assy, Kandeel & Abd El Rahman, 2022)**. This is supported by the results of other studies **(Hendy, Mohamed, & Marzouk, 2017; Bediako, Ofosu-Poku & Druye, 2021)**. However, a study by **Elewa & El Kattan, (2017)** reported that nearly half of the participant nurses were aged between 30 - 40 years old and only 16% of them graduated from the Technical Institute of Nursing. These discrepancies are due to the availability of different educational nursing programs currently running in Egypt including Secondary Nursing Schools, Technical Nursing Institutes, Bachelor of Nursing Programs, and Postgraduate Programs **(El Assy, Kandeel, & Abd El Rahman, 2022)**.

Regarding gender, the findings of the present study revealed that most of the participant nurses were females. This is expected as the majority of nurses in Egypt are females and their numbers are still greater than males. Additionally, the public view of nursing is still that it is a female-dominated profession. This observation is in line with several investigations which reported that most of the participant nurses were female **(Elhy & Kasemy, 2017; Bediako, Ofosu-Poku & Druye, 2021; Elewa & Elkattan, 2017; Hendy, Mohamed & Marzouk, 2017; Lee, Rahim & Din, 2016; Dos Santos, Santana & Oliveira, 2021; Soliman & Ehapashy, 2021; Vaghar, 2018)**. In contrast, a study by **Dubey, Sonker & Chaudhary (2013)** showed that more than half of the nurses were males. This could be because the highest proportion of the nurses included in the mentioned study were male laboratory technicians.

The current study revealed that nearly two-thirds of the participant nurses had between 1 and 5 years of work experience in the ICU. This is agreed with other studies that reported the biggest proportion of nurses had work experience of less than 5 years **(Elewa and Elkattan, 2017; Mohammad, 2021)**. However, other investigations found that most participant nurses had work experience of more than 5 years **(Dos Santos, Santana, and Oliveira, 2021; Elhy and Kasemy, 2017)**. This could be because most participants in the current study are in the age category between 20 and 30 years old.

The study findings illustrated that the majority of participant nurses attended previous educational sessions on blood transfusion. This is due to the availability of training programs as a part of hospital policy. Consequently, this may positively affect the care of patients requiring blood transfusion. These results agree with **Bediako, Ofosu-Poku, and Druye (2021)** who assessed safe blood transfusion practices among nurses in a major referral center in Ghana and found that more than half of the participant nurses attended training programs. On the other hand, **Hendy, Mohamed, and Marzouk, (2017)** reported that all nurses did not receive any training courses regarding the management of patients undergoing blood transfusion. Also, **Ali, El Hadad, and Ahmed (2022) and Elhy and Kasemy (2017)** reported that most of the nurses did not attend any training program concerning blood transfusion. This may be due to work overload, shortage of nursing staff, or unavailability of hospital educational programs in the cited studies.

The findings of the current study depicted that the participant nurses had a satisfactory compliance level regarding all phases of blood transfusion guidelines. Several factors may have relevance to these findings: First, participant nurses working in the Gastrointestinal Surgery Center deal with blood and blood product transfusion at a much greater frequency than any other hospital. Second; the availability of the GIT hospital orientation program before working in ICUs. Third; most participant nurses attended educational programs on blood transfusion practice. Finally, the availability of blood transfusion brochures and posters in the hospital's blood bank.

Similarly, one recent study reported that nurses fared better in transfusion practice **(Panchawagh, Melinkeri, & Panchawagh, 2020).** However, many other investigations reported that the majority of nurses demonstrated insufficient practice concerning blood transfusion. The studies explained this as nurses had unsatisfactory knowledge related to the blood transfusion process which had a negative impact on the quality of their practice **(Bediako, Ofosu-Poku, &Druye, 2021; Sapkota, Poudel, Sedhain, & Khatiwada, 2018; Soliman & Elhapashy, 2021).** In the same line, a recent Egyptian study conducted in Damanhour on a convenient sample of ninety nurses involved in providing direct care for blood transfusion patients reported that the majority of nurses had an unsatisfactory level of overall practice regarding safe blood transfusion procedure **(Ali, El Hadad & Ahmed, 2022).**

The observation practice checklist used in this study was divided into three phases. Nurses' compliance with pre-blood transfusion guidelines, nurses' compliance during transfusion, and nurses' compliance after transfusion. The highest score of satisfactory practice was for nurses' practices during blood transfusion and the lowest was for post transfusion

6. Limitations

This study involved a small size convenience sample and it was conducted in three ICUs in one hospital (Gastrointestinal Surgery Center). These factors limited the generalizability of the research findings.

7. Conclusion and Recommendations

The participant nurses' total practice score of blood transfusion guidelines was satisfactory. In addition, nurses have an unsatisfactory practice level with the request for blood transfusion and documentation of the transfusion process. Hence, there is a need for periodic refresher training sessions for critical care nurses on updated blood transfusion guidelines with a specific focus on checking blood requests and documentation of blood transfusion. This will enhance nurses' practice, optimize patient safety and reduce blood transfusion-related complications in ICUs.

8. Acknowledgments

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9. Declaration of Conflicting Interests

The authors declared no potential conflicts of interest regarding the research or publication of the article.

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