Determination of health workers' level of knowledge about blood transfusion

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ABSTRACT

OBJECTIVE: This study was conducted to determine the knowledge level of healthcare workers about blood transfusion.

METHODS: The study was conducted between October 1, 2015 and November 2, 2015 with 100 healthcare personnel working in a training and research hospital. A survey consisting of 19 questions based on the literature was prepared and administered. In addition to descriptive statistical methods (frequency), Fisher's exact chi-square test and Yates' correction for continuity were used to compare qualitative data. Significance was assessed at p<0.05.

RESULTS: Of the total, 52% of the participants were ≤29 years of age and 94% were women. In all, 71% were nurses and 42% had been working at the hospital for 2 to 5 years. Seventy-nine percent indicated that they had been trained in blood and blood product transfusion, 86% stated that transfusions were performed to replace deficient blood volume, and 95% responded that blood was to be requested by a physician, and 97% indicated that informed consent of the patient should be obtained for a blood transfusion. In all, 78% of respondents identified crossmatching as the final check for ABO compatibility. With respect to blood unit quality, 90% of the respondents stated that they would return blood if the label could not be read and 98% would reject the product if the integrity of the blood bag was compromised or of the blood had a cloudy or foamy appearance. In the event of a patient experiencing fever and shock, 96% of the survey participants indicated that they would consider that it could be a reaction to a blood transfusion. The need to confirm the patient's identity and the type of blood products was corroborated by 91%, and 85% agreed that no other medication should be added to the blood to be transfused. Furthermore, 88% of the study participants approved of continuous training regarding the transfusion of blood and blood products.

CONCLUSION: According to the results of this research, while the knowledge of the healthcare professionals surveyed was adequate, standardization was lacking. In this respect, it may be advisable to conduct further studies on blood transfusion practices, and to provide additional in-service training to ensure patient safety and avoid medical errors.

Keywords: Blood; education; health worker; nurse; transfusion.

Blood transfusion is an essential component of modern medical care [1, 2]. It has been reported that every year, 80 million units of blood are collected, and that a blood transfusion is performed every second [2]. According to 2006 government data 1,137,000 units of blood were transfused in Turkey in 1 year [3].

The objectives of healthcare services are the protection of and improvement in the health of the individual and the community, to treat the sick, and to do what is possible to provide for a healthy life. Healthcare professionals responsible for providing services should approach patients bearing in mind the principle of "First, do no harm." Errors that occur in the provision of healthcare may directly result in the death or the deterioration of the health of a patient [4]. Mistakes can be avoided through good practices. Patient safety is a critically important issue in improving the quality of healthcare services [5].

Important errors that adversely affect patient safety include inadequate identity confirmation, lack of effective communication with the patient, prescription errors, nosocomial infections, premature termination of the patient's treatment, patient falls, development of pressure sores, not evaluating risk factors, and surgery performed on the wrong side [6].

Inappropriate behavior of healthcare providers, lack of professional proficiency, and negligence while performing their duties may have an adverse effect on the patient [6].

While healthcare services benefit society, there is also risk in the complex merging of processes related to providing healthcare services, technological developments, and human factors [7, 8].

Blood transfusion and nursing care

When performing a blood transfusion, nurses must pay attention to 4 basic elements: appropriate blood, correct patient, proper procedure, and right timing [9].

Nurses assume various roles and responsibilities in all stages of the process of a blood transfusion. It is important for the nurse to closely observe the

Table 1. Distribution of sociodemographic characteristics of the respondents

	n	%
Age		
≤29 years	52	52
30–39 years	35	35
40–49 years	13	13
Gender		
Female	94	94
Male	6	6
Profession		
Nurse	71	71
Midwife	27	27
Medical assistant	1	1
Emergency medical technician	1	1
Length of time working at the hospital		
0–1 year	8	8
2–5 years	42	42
6–10 years	19	19
11–20 years	21	21
≥21 years	10	10

patient for any complications that may develop. Vital signs must be checked before, during, and after any transfusion at appropriate intervals. The early determination of a complication developing during transfusion and prompt initiation of treatment are important safety considerations [10].

Blood and blood products are used to improve the clinical status of many patients and to save lives [11, 12]. Human errors that disrupt the proper execution of blood transfusions largely occur as a result of failure to comply with the relevant blood transfusion procedures [13]. These errors are mostly preventable. Mistakes related to blood transfusions may occur both within and outside of the blood bank. The present study was conceived and planned due to the serious need for additional research concerning the knowledge level of healthcare workers related to blood transfusion.

MATERIALS AND METHODS

The study population consisted of 100 individu-

TABLE 2. Distribution of responses to questions concerning blood transfusion

	n	%
Previously received training on blood transfusion		
Yes	79	79
No	21	21
Who requests a blood transfusion?		
Physician	95	95
Nurse	5	5
Is informed consent of the patient obtained for blood transfusion?		
Yes	97	97
No	3	3
When do you attach the patient ID crossmatch barcode?		
At the time of transfusion	75	75
When the blood bag is transported from the service	1	1
I don't attach, I don't know	4	4
Tubes with ID barcode labels on them are kept ready until the time of transfusion	20	20
When is a blood product rejected?		
Cloudy, foamy appearance of the blood	90	90
Blood bag integrity is compromised	98	98
Inappropriate blood storage conditions in the unit	86	86
Label information is illegible	98	98
None of the above	3	3
No response	2	2
If you encounter a problem with a blood product before performing a transfusion, who do you inform first?		
Blood center	39	39
The physician in charge	56	56
Charge nurse	2	2
Director of health services	1	1

als who were working at a training and research hospital located on the Anatolian side of Istanbul. The necessary permission was obtained from the institution where the research was performed before the investigation was initiated. Study data were collected between January 10, 2015 and February 11, 2015 in face-to-face interviews. A survey consisting of 19 questions, prepared according to literature information was used to collect the relevant data. Descriptive statistical methods (frequencies) were used to present study data, and qualitative data were compared using Fisher's exact chi-square test with Yates' correction for continuity. Statistical significance was set at p<0.05.

RESULTS

Of the study population, 52 patients (52%) were aged ≤29 years, 94 (94%) were female, 71 (71%) were nurses, and 42 (42%) participants had been working at the hospital for 2 to 5 years (Table 1). The survey results indicated that 79 (79%) participants had received training about the transfusion of blood and blood products, 86% (n=86) of respondents indicated that transfusions were performed to replace deficient blood volume, 95% (n=95) of participants replied that blood and blood products were to be requested by a physician, and 97% (n=97) of the participants agreed with the need to obtain the informed consent of patients for trans-

TABLE 3. Distribution of responses to additional questions concerning blood transfusion

Symptoms suggesting blood transfusion reaction	n	%
Rash	84	84
Fever	96	96
Burning or tingling sensation along IV route	50	50
Dark-colored urine	20	20
Sudden fluctuation in blood pressure	84	84
Shock	96	96
Agitation	31	31
Bleeding	15	15
None of the above	–	–
Do you think there is a need for training about the transfusion of blood and blood products?		
Yes	88	88
No	12	12

fusion. Seventy-eight (78%) participants described crossmatching test as the final step to ensure ABO compatibility (Table 2). Ninety-eight percent of the participants indicated that they would return blood if the integrity of the blood bag was compromised or if the label was illegible, and 90 (90%) participants indicated that they would also decline donated blood with a cloudy or foamy appearance. Furthermore, 96 (96%) participants stated that they would consider reaction to blood transfusion in the event of development of fever or shock in the patient. Of the 100 participants, 91 affirmed necessity to confirming patient identity using hospital ID bracelet and the blood product, and 85 (85%) respondents rejected the addition of any drug to the blood. Eighty-eight (88%) participants agreed with the necessity for continuous training on blood and blood products (Table 3). No statistically significant difference was found in the distribution of responses to the questions between those who received or did not receive training on blood transfusions (p>0.05).

DISCUSSION

Blood transfusion is a complex, multidisciplinary, and multi-stage process. Since any erroneous or in-

complete step may lead to a fatal clinical outcome, every step must be performed according to procedural guidelines. Verifications before transfusion are very important to minimize risk and avoid error.

The most frequent cause of hemolytic transfusion reaction is misidentification of either the blood unit to be transfused or the recipient. Among the required steps for safe transfusion, accurate identification of the patient and the blood sample are of crucial significance. Matching the identity bracelet of the patient and the ID barcode of the blood or blood product is essential. Hijji et al. performed a study with 49 nurses and reported that 29% of the nurses confirmed ABO compatibility of blood bag and ID bracelet, while 4% checked the patient ID bracelet, blood bag, blood request form, and the information recorded in the patient observation form [14]. Gurkan et al. indicated in their study that the expiration date of blood and blood products was checked, while Bayraktar et al. found lack of relevant control. Sahin et al. also concluded that there was insufficient knowledge about crossmatching of blood and blood products [15, 16]. Siegenthaler et al. reported transfusion reaction due to lack of inspection of the expiration date [17]. Seventy-six percent of the healthcare professionals who participated in our study agreed that pre-transfusion procedure should consist of 2 healthcare professionals confirming and recording the identity of the patient, type of blood or blood product, serial number, quantity of blood product to be transfused, duration of the transfusion, expiration date, blood group, serological crossmatch, and physician's request form and instructions before transfusion. Our study results also indicated that most healthcare professionals confirmed ABO compatibility by comparing the personal identifying information of the patient with that on the label on the blood product.

Before initiating a blood transfusion, in order to avoid any error and to ensure ABO compatibility, the expiration date of the blood product, the results of crossmatching, and tests for diseases as AIDS and hepatitis B, the patient's file number, and physician's instructions should be examined. Since hemolytic reaction developing as a result of inadequate observance of pre-transfusion safeguards constitutes the

most important cause of transfusion-related deaths, attention to these measures has the utmost importance [15, 18].

Early recognition of complications occurring during or as a result of a blood transfusion requires the close observance of the nurse before, during, and after the transfusion. In the study conducted by Lahlimi et al., it was reported that of 42 nurses, 40% had incomplete information about potential post-transfusion reactions [19]. Blood transfusion reactions are classified as acute or delayed reaction [15, 18]. Blood transfusions are an important cause of morbidity and mortality. Therefore, it is very important that nurses can recognize a blood transfusion reaction and know the measures to be taken in response [15, 18].

Though each blood reaction manifests differently, they have some common symptoms. Most frequently seen manifestations include a fever, chills, shivering, nausea and vomiting, tachycardia, dyspnea, cyanosis, low back pain, chest pain, urticaria, erythema, a burning sensation along the transfused vein, headache, dizziness, hypotension, and hematuria [15, 18].

In our survey, in response to the question, "What symptoms suggest a blood transfusion reaction?" 55% of the participating healthcare workers selected lower back/chest pain, 84% said rash, 96% indicated presence of a fever, and 84% noted sudden fluctuation in blood pressure. Importantly, this result demonstrates that more than 50% of our participants knew the most frequently encountered complications of a blood transfusion. A study performed by Sazama et al. stated that a nurse's lack of attention to manifestations of patient reaction and continuation of administration of a blood transfusion led to the death of a patient [20]. Encouragingly, the staff participating in our study knew of nearly all (96%) of these manifestations. Bayraktar et al. found that fever and shivering were the most frequently known symptoms of blood transfusion reaction among nurses [15]. This result is consistent with that of our study.

Monitoring vital signs and symptoms during the pre-transfusion period facilitates the determination of any transfusion reaction. In a study performed by Faukaneli et al., it was indicated that the risk of overlooking a transfusion reaction exists in 10% of patients due to failure to record patient vital signs and symptoms during the pre-transfusion period [21]. The patient should be observed directly for the first 15 minutes after the initiation of a blood transfusion and checked thereafter at intervals (every 15 minutes). In their study, Taylor et al. reported that vital signs and symptoms of patients were observed in 88% of cases [22]. The Hijji et al. study of 49 nurses reported that 35% observed their patients at bedside for the first 15 minutes of the transfusion. A smaller percentage of the nurses monitored pulse rate (35%) and body temperature (32%) of their patients throughout the first 15 minutes of the blood transfusion [23].

In our study, in the category of "What information about transfusion is true?" a multiple choice question, "At what time points is the transfusion patient to be checked on?" (before beginning transfusion, at 30 minutes, at every hour during transfusion, at termination of the transfusion, 4 hours after termination of the transfusion) was responded to correctly by 45% of the participants. This suggests that there is a lack of compliance with blood transfusion follow-up directions at the training and research hospital where this investigation was conducted.

A blood bag must be without any hole or leak, and should not contain hemolyzed blood or coagulum. In a study entitled "Improving the process of blood transfusion at a public hospital in the Turkish Republic of Northern Cyprus" by Erkoc et al., the authors reported that after providing transfusion nurses with pocket-sized information about the implementation of transfusion, the majority of nurses checked for the presence of hemolysis (90.4%) and clotting (90.9%) in plasma, and holes or leaks in blood bags (91.8%) [24].

Bayraktar et al. also found that nurses did not verify the safety of blood bags. In our survey, participants responded to the multiple choice question of "When should blood or a blood product be rejected?" as follows: when the blood has a cloudy or foamy appearance (90%), when the integrity of the

blood bag is compromised (90%), when the label information on the blood bag cannot be read (98%), and when blood storage conditions are not safe (86%). The majority of survey participants (93%) knew the conditions under which a blood product should be returned.

The flow rate of a unit of transfused blood should be adjusted to the duration of the transfusion (maximum 4 hours). If a transfusion were to last more than 4 hours, bacteria can grow in blood secondary to increased room and blood temperature. Prolonged transfusion may also lead to the development of hemolysis [15, 18]. A question on this topic was answered correctly by 32% of the nurses in the study of Bayraktar et al. and 61.6% of the nurses in a study conducted by Benli et al. [15, 18]. In our study, 90% of the participants responded to the question, "For how long may a transfusion be given?" by choosing the answer "whole blood and erythrocyte suspension are to be delivered within 4 hours." This was consistent with the result of the Benli study.

In the literature, it has been stated that the first step in the prevention of the improper implementation of transfusion is to draw blood from the right patient and to ensure correct labeling [25]. At least 2 identifiers are recommended for the proper identification of the patient; these should not include the patient's room number or bed number [26]. There is no study from Turkey in the literature reporting taking a blood sample for pre-transfusion testing from the wrong patient as a result of misidentification of the patient; however, this may be a result of inadequate reporting of errors. Many relevant studies from other countries have been shared [25]. In a study performed by Chiaroni, et al., the authors indicated that in some cases, patients were not correctly identified because of similarities in name, surname, birth date, etc. In another study, inability to correctly identify name, surname, birth date, and gender of a patient led to a blood sample being drawn from the wrong patient [27]. Lumadue et al. found cases of mislabeling of samples as a result of the incorrect name, surname, or hospital ID number assigned to the patient.

Lundy et al. determined that blood tubes had been sent to the laboratory without personal identifying information on the label in 17% of cases studied. Personal ID information should be written on the label of the blood tube to be used when blood is drawn in order to eliminate the possibility of an empty tube being used for the sample of another patient or the ID label of another patient being mistakenly affixed to the tube [28, 29]. A total of 75 healthcare professionals participating in our study responded to the question "When do you put the barcode for crossmatching on the tube?" with the response "at the time blood sample is taken." Putting a label with the patient information barcode on the tube at the time of blood collection will prevent cases of misidentification and help to ensure patient safety [28, 29].

In various studies it has been established that nurses did not know enough about complications that may occur in a blood transfusion or the signs of potential complication [18, 30], and did not monitor patients [15, 16], yet they knew to terminate blood transfusion promptly in the event complications did arise [18, 30] and did so [16].

There are studies from abroad in the literature that report mortality and serious morbidity as an outcome of improper blood transfusion [19]. Studies performed in Turkey have indicated that the attending physician was informed about the development of complications related to blood transfusion [15, 16]. In the present study, it was also observed that the respondents knew to terminate a transfusion when complications developed. Nearly all (99%) of the participants replied to a multiple choice item in our survey regarding the procedures to be followed in cases of suspected blood transfusion reaction with "I immediately stop the transfusion." This correlates with the high level of awareness of transfusion reactions reflected in other survey questions.

Limitations of the study: Since the data of this survey are limited to the responses given by healthcare professionals working at a training and research hospital, the results cannot be generalized.

CONCLUSION

An evaluation of the data indicated that the knowledge level of the healthcare professionals interviewed about blood transfusion was above average. Nonetheless, continuation of in-service training about blood transfusion is recommended.

Our data revealed that 60.8% of the respondents replied to the question, "If you discover a problem with a blood product before you administer a transfusion, who do you inform first?" with "the physician in charge." This response suggests that during subsequent training sessions the participants should be advised to contact the blood center when any problem is detected in transfusion blood products.

There was no statistically significant difference in the distribution of the responses given by participants who had received training and those who had not (p>0.05).

The results of our research demonstrate that the likelihood these healthcare professionals would make a medical error related to blood transfusion was low. Quality assurance work that is ongoing in the hospital where this research was conducted and in-service training aimed at patient safety and minimizing errors likely contributed to this result.

Based on the evaluation of the results, the following recommendations are offered to provide healthcare professionals with adequate information about blood transfusion, and to put this information into practice:

- Provide nursing staff with well-planned, useful, continuous in-service training and perform regular follow-up of the effectiveness of these training sessions;
- In order to make in-service training effective and practicable, as well as to minimize errors, the transfusion procedure should be standardized;
- Standardization of transfusion procedure training should include diagrams illustrating the proper method of providing blood transfusion and explain possible side effects that may occur; and
- Blood transfusion committees should oversee proper implementation of these recommendations.

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