Original Article

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Knowing and Use Situations of Hemovigilance System in the Scope of Blood Transfusion Safety of Nurses: Rural Example

Hemşirelerin Kan Transfüzyon Güvenliği Kapsamında Hemovijilans Sistemini Bilme ve Kullanım Durumları: Kırsal Bölge Örneği

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ABSTRACT

Objective: This study was carried out to determine the nurses' knowledge of the hemovigilance system and their use of it, within the scope of blood transfusion safety.

Methods: The sample of this descriptive and cross-sectional study consisted of all nurses (n=65) working at Gümüşhane State Hospital. The data were collected with "Structured Question Form" Number, percentage, mean, Continuity Correction, Pearson Chi-Square and Fisher Exact tests were used to evaluate the data.

Results: Of the nurses, 90.8% were women, the average age was 27.01±5.16 (20-48) years and 86.1% had undergraduate or higher education. Of the nurses, 84.6% knew that they were supervised by a hemovigilance nurse. Nurses (43.1%) who received training on the hemovigilance system had higher levels of knowing that "each unit of blood taken from the donor follows the final destination (100.0%)" than the nurses who did not receive training (p <0.05). The nurses who knew that they were supervised during transfusion related processes performed the following steps at a higher rate than those who did not know that they were inspected (p <0.05): "Wearing gloves before the application (100.0%)", "using appropriate branches in children (87.3%)", "obtaining written consent before blood transfusion (100.0%)", and "completing the blood transfusion within a maximum of four hours (87.3%)" were higher than nurses who did not know that they were supervised (p

ÖZ

Amaç: Bu çalışma; hemşirelerin kan transfüzyon güvenliği kapsamında hemovijilans sistemini bilme ve kullanım durumlarını belirlemek amacıyla yapıldı.

Yöntemler: Kesitsel tipteki araştırmanın örneklemini, Gümüşhane Devlet Hastanesi'nde çalışmakta olan tüm hemşireler (n=65) oluşturdu. Veriler, "Yapılandırılmış Soru Formu" ile toplandı. Verilerin değerlendirilmesinde sayı, yüzdelik, ortalama, continuity correction, pearson chi-square ve fisher exact testi kullanıldı.

Bulgular: Hemşirelerin %90,8'i kadındı, yaş ortalaması 27,01±5,16 (min: 20 - maks: 48) yıldı ve %86,1'i lisans ve üstü eğitime sahipti. Hemşirelerin %84,6'sı bir hemovijilans hemşiresi tarafından denetlendiğini bilmekteydi. Hemovijilans sistemi ile ilgili eğitim alan hemşirelerin (%43,1) "hemovijilansın, bağışçıdan alınan her bir ünite kanın son varış yerine kadar izlediğini (%100,0)" bilme durumları eğitim almayan hemşirelerden daha yüksek bulundu (p<0,05). Hemovijilans hemşiresi tarafından denetlendiğini bilen hemşirelerin "uygulama öncesi eldiven giyme (%100,0), çocuklarda uygun branül kullanma (%87,3), kan transfüzyonu öncesi yazılı onam alma (%100,0), kan transfüzyonunu azami dört saat sürede tamamlama (%87,3)" gibi transfüzyon basamaklarını gerçekleştirme durumları denetlendiğini bilmeyen hemşirelere göre yüksek bulundu (p<0,05). Ayrıca; hemşirelerin büyük bir çoğunluğunun (%90,8) kan transfüzyonuna ilişkin güncel prosedürü kullandıkları belirlendi.

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<0.05). Also; the majority of nurses (90.8%) were determined to use the current procedures for blood transfusions.

Conclusion: In line with the findings of the study, it was stated that the nurses who were educated about the hemovigilance system and who knew that they were supervised by the hemovigilance nurse, had high hemovigilance system usage.

Keywords: Nurse, hemovigilance, hemovigilance nurse, blood transfusion

Sonuç: Araştırmadan elde edilen bulgular doğrultusunda, hemovijilans sistemi ile ilgili eğitim alan ve hemovijilans hemşiresi tarafından denetlendiğini bilen hemşirelerin hemovijilans sistemi kullanım durumlarının yüksek olduğu belirlendi.

Anahtar Sözcükler: Hemşire, hemovijilans, hemovijilans hemşiresi, kan transfüzyonu

Introduction

The term hemovigilance consists of the combination of the Greek words "hema = blood" and Latin "vigilance = alertness" (1). International Haemovigilance Network (IHN) defines hemovigilance as "a set of monitoring procedures covering the entire blood transfusion chain (from collection of blood and its components to monitoring recipients) to collect and evaluate information on unexpected or undesirable effects arising from therapeutic use of blood products and to prevent their occurrence or recurrence (2).

Hemovigilance was first used in France in 1990, and the national hemovigilance system was established in France for the first time in 1992 (1). Later, various organizations were established to increase blood transfusion safety in many countries such as the United Kingdom, Canada, the Netherlands, Japan, Russia, Switzerland and the United States of America (3). In Turkey, first definition of hemovigilance was made in the 4th item of the Blood and Blood Products Regulation which was published in the Official Gazette (No:27074, date: 04/12/2008) (4). According to this Regulation; the main goal of the hemovigilance system is to increase transfusion safety. The actor of the system is the hemovigilance nurse. Hemovigilance nurse monitors and inspects whether all transfusions performed in the hospital are carried out safely within the scope of the "Transfusion Monitoring Form", organizes periodic trainings about safe blood transfusion, informs the transfusion committee about improprieties, makes sure that the regulator and preventive actions are initiated by the relevant clinic and keeps records and documents on these issues (5).

Clinical nurses have a responsibility to provide safe transfusion and to provide high standards of care during transfusion. In the literature, it has been reported that blood transfusion errors are mostly practitioner-related and mostly occur during the transfusion process (6,7). Therefore; nurses should have sufficient knowledge and skills to provide safe blood transfusion to the right patient, to inform the patient about transfusion, to keep the blood in appropriate conditions and for the appropriate time, to observe the patient in terms of warming and reaction symptoms that may occur during transfusion, and to prevent complications that may occur. They should have sufficient knowledge and skills about what can be done when complications develop (8). The nurse should follow the patient closely for any complications that may develop. Vital signs should be checked at appropriate intervals before, during and after any transfusion. Early detection of a complication that develops during transfusion and immediate initiation of treatment is an important issue in terms of preventing mortality (9).

Blood and blood products are used to improve the clinical condition of many patients and to save lives (10). Human errors that prevent blood transfusions from being carried out properly are largely caused by non-compliance with relevant blood transfusion procedures (11). It is important for nurses to use up-to-date evidence-based clinical guidelines for safe and effective transfusion (6). In this context, the Ministry of Health in Turkey has published National Directory Hemovigilance in 2016 (5). According to this guide; in providing safe blood transfusion, nurses should pay attention to the elements included in the Transfusion Follow-up Form, such as appropriate blood, correct patient, appropriate procedure and timing (5,12).

Nurses with transfusion-related roles and responsibilities should be able to use the hemovigilance system and make relevant notifications (13). The correct use of the hemovigilance system by nurses ensures the safety of the patient in the process of taking the blood product from the donor and transfusing it to the recipient. However, misuse of the hemovigilance system such as transfusing the blood product containing wrong group or antigen to the patient, not checking the identity information of the patient before the transfusion, not being monitored and evaluating the changes in the patient's condition adequately during the transfusion, not following the unwanted or unexpected reactions, not reporting the developing reaction to the physician, not following the patient sufficiently after blood transfusion, and not complying with the storage conditions of the blood product, can cause morbidity and mortality in patients (5,14,15). Therefore, this study was conducted to determine the nurses' knowledge and use of the hemovigilance system within the scope of blood transfusion safety.

Research Question

1. Is there a difference between nurses knowing that they are being supervised by the hemovigilance nurse and nurses that do not know that they are being supervised, in terms of using the hemovigilance system within the scope of blood transfusion safety?

Method

Research Type

The research was done in cross-sectional type.

Research Universe-Sample

The population and the sample of the study consisted of all nurses (n=65) who worked in a State Hospital between June and August 2018 and performed blood transfusions. The number of nurses were as follows: ınternal medicine 4, chest diseases 4, surgery 3, urology 3, orthopedics 3, otolaryngorhinology 2, neurology 3, cardiology 3, ophthalmology 2, gynecology 3, delivery room 4, pediatrics 5, ıntensive care units 10, dialysis 5, laboratory 6 and operating room 5. The participation rate in the study was determined as 100%.

Data Collection Tools

The research data were collected by the researchers using the "Structured Question Form" created by scanning the literature (5,13) and presented to the "expert panel" (three lecturer nurses) to receive their opinions on the content of the form. In line with the recommendations of the experts, seven questions were removed and the form was finalized. The form included questions about nurses' knowledge on the hemovigilance system within the scope of blood transfusion safety and its use.

The "Structured Question Form" consisted of three parts.

In the first part; there were nine open-ended and closed-ended questions to determine the nurses' introductory information (age, gender, marital status, education level, total years of work in the profession, the clinic in which the nurse worked, the year of working in the clinic, whether training on the hemovigilance system, and whether knowing that it was supervised by the hemovigilance nurse).

In the second part, there were a total of 12 closed-ended questions. There were 7 questions aimed at determining the nurses' knowledge of the hemovigilance system (monitoring the blood component to the final destination, unexpected/unwanted reactions, main target of hemovigilance, preventing the recurrence of adverse reactions, etc.), and 5 questions aimed at determining the status of knowing the duties and responsibilities of the hemovigilance nurse (organizing trainings, reporting non-conformities to the transfusion committee, reporting adverse events and reactions to the hospital hemovigilance coordinator, etc.)

In the third part, there were a total of 24 questions: Six questions on "pre-transfusion" (washing hands before transfusion, wearing gloves, administering medication at the request of a physician, following and applying the current procedure, etc.) within the scope of the "Transfusion Control Form"; 7 questions on "Patient and Blood Component Identification" (identity check, patient's blood type, blood donor number, final check of ingredient, check of cross-match test, reporting status when encountering incompatibility, etc.); 8 questions on "Application Techniques and Monitoring" (recording vital signs, monitoring adverse reactions, recording etc.); 3 questions on "Timing" (starting time after the blood component comes from the blood bank, recording the start and end time of the transfusion, the maximum duration of the transfusion, etc.)

Data Collection Method

The "Structured Question Form" was administered by the researcher using a face-to-face interview technique between June and August 2018, within a suitable time frame in the units where the nurses work. Nurses' names were not included in the form. The form took about 15 minutes to fill.

Evaluation of Data

Statistical Package for Social Sciences (SPSS) for Windows 24.0 program was used for the coding and statistical analysis of the data obtained from the study. Descriptive statistics (number, percentage, mean, standard deviation), continuity correction, pearson chi-square and Fisher Exact tests were used to evaluate the data. The results were evaluated at 95.0% confidence interval and $p<0.05$ significance level.

Ethical Aspect of the Research

The necessary institutional permission to conduct the research was obtained from the Gümüşhane Provincial Health Directorate (date: 10/07/2018 and number: 38032705-044-E.113), and the ethics committee permission was obtained from the Gümüşhane University Ethics Committee (number: 2018/6 and date: 02/07/2018). Verbal consent was obtained from each of the nurses after the necessary explanations were given to the nurses about the purpose and application of the study before starting the study.

Results

Of the nurses participating in the study, 90.8% were women, 61.5% were single and 86.1% had undergraduate or higher education and the average age was 27.01±5.16. It was determined that 44.6% of the nurses had been working in the clinic for 1-5 years, 93.7% of them had been working for five years or less. Of the nurses, 56.9% did not receive training on the hemovigilance system and 84.6% knew that they were supervised by the hemovigilance nurse (Table 1).

All of the nurses (100%) who received training on the hemovigilance system (43.1%) answered "yes" for the statements of "hemovigilance monitors each unit of blood or blood component from the donor to the final destination", "hemovigilance collects information about unexpected/ adverse reactions from clinical use", "hemovigilance system takes corrective actions to prevent the recurrence of unwanted reactions and improper applications during the blood donation and transfusion process", "hemovigilance follows the document confirming that the blood transfusion has been completed", and "hemovigilance monitors the information about whether early and adverse reactions are observed"; 96.4% answered "yes" for the statements of "hemovigilance, in the case of a suspected transfusion-related reaction in the recipient, traces the patient

to the donor in order to identify the donor who has donated the blood component that is likely to lead to the reaction". Their state of knowing was significantly higher than those who did not receive training (p<0.05). Of the nurses who received training on the hemovigilance system, 85.7% knew that "the hemovigilance nurse works directly under the transfusion committee and is also a natural member of the transfusion committee" and 96.4% knew that "the hemovigilance nurse should report all adverse events and reactions to the hospital hemovigilance coordinator". Their state of knowing was significantly higher than those who did not receive training (p<0.05) (Table 2).

Nurses who knew that they were supervised during transfusion-related processes performed the following steps in the "pre-transfusion" section at a higher rate than those who did not know that they were inspected (p<0.05) (Table 3): "Wearing gloves before application (100%)", "washing hands before application (96.4%)", "benefiting from the current procedure related to blood transfusion (94.5%)", "establishing vascular access with a minimum 23G branch in children (87.3%)", "Administering medication to the patient with the physician's request before the transfusion (83.6%)", and "being constantly aware of the current procedures and information about blood transfusion (78.2%)".

Nurses who knew that they were supervised during transfusion-related processes performed the following steps in the "Patient and Blood Component Identification" section at a higher rate than those who did not know that they were inspected (p<0.05) (Table 3): "Informing the patient about the benefits of blood transfusion, the reason for administration, possible complications and reaction symptoms (100%)", "having the patient/relative sign the informed consent form before the blood transfusion (100%) and" reporting the situation to the transfusion center when encountering any inconvenience (98.2%)".

Nurses who knew that they were supervised during transfusion related processes performed the following steps in the "Application Techniques and Monitoring" section at a higher rate than those who did not know that they were inspected (p<0.05) (Table 3): "Making blood transfusion using a standard 170-200 µm diameter filter set (81.8%)", "Monitoring and recording the vital signs (fever, pulse, blood pressure, respiration) of a patient every 30 minutes during transfusion (100%)" , "Not using a solution other than 0.9% NaCl for filling or washing the transfusion set in transfusion of whole blood, erythrocyte, platelet suspensions (80%)", "Following the patient for a minimum of 60 minutes after the end of the transfusion (92.7%)" and "Destroying an empty blood bag after transfusion (72.7%)".

Nurses who knew that they were supervised during transfusion related processes performed the following steps in the "Timing" section at a higher rate than those who did not know that they were inspected (p<0.05) (Table 3): "Starting the blood transfusion within 30 minutes at most after the blood component comes from the blood bank if the patien's condition is appropriate (90.9%)" and "Completing the transfusion of whole blood and erythrocyte concentrate within a maximum of 4 hours (87.3%)".

Table 1. Introductory features of the nurses

	n	%
Gender		
Female	59	90.8
Male	6	9.2
Marital status		
Married	25	38.5
Single	40	61.5
Education level		
High school/associate degree	9	13.9
Undergraduate or higher	56	86.1
Working year in the profession		
1 year ↓	16	24.6
1-5 years	29	44.6
6 years or ↑	20	30.8
Working year in the clinic		
5 years or ↓	61	93.7
5 years ↑	4	6.3
Training status on the hemovigilance system		
Yes	28	43.1
No	37	56.9
Knowing that you are being supervised by a hemovigilance nurse		
Yes	55	84.6
No	10	15.4
Mean age: 27.01±5.16 (Min:20-Max:48)		

Discussion

The hemovigilance system covers all processes such as monitoring, reporting and investigating adverse events throughout the transfusion chain, from the collection of blood and blood components to the follow-up of recipients. Safe transfusion success is closely related to the knowledge and behavior of healthcare professionals participating in the treatment. Therefore, safe transfusion should be well coordinated between hospital's clinical staff and transport laboratories, hospital transport committees, regulatory agency and national health authorities, and healthcare professionals who perform blood transfusion should be constantly trained by a hemovigilance nurse (3,5). In our study, all of the nurses (43.1%) who received training on the hemovigilance system (100%) stated that they monitored the blood component of hemovigilance from the donor to the final destination, gathered information about unexpected /unwanted reactions and took action to prevent them, and followed up the document confirming that blood transfusion was completed. In a study, it was reported that 64.7% of the nurses defined hemovigilance as collecting information about unexpected or undesirable effects during blood transfusion (16).

One of the duties of the hemovigilance nurse is to control transfusion safety. Every staff who is involved in the organization of the hemovigilance system has transfusion-related duties and responsibilities and can make all notifications related to

Table 2. According to their hemovigilance training status. nurses' knowledge of the hemovigilance system and their knowledge of the duties and responsibilities of the hemovigilance nurse

	Receiving hemovigilance training			
	Yes	No	Total	x^2
Hemovıgılance system	n (%)	n (%)	n (%)	p
Hemovigilance monitors each unit of blood or blood component from the donor to the final destination (patient. disposal. manufacturer).				
Yes	28 (100.0)	31 (83.8)	59 (90.8)	x^2=5.002
No	-	6 (16.2)	6 (9.2)	p=0.035
Hemovigilance collects information about unexpected/adverse reactions from clinical use.				
Yes	28 (100.0)	27 (73.0)	55 (84.6)	x^2=8.943
No	-	10 (27.0)	10 (15.4)	p=0.002
The main goal of hemovigilance is to increase the safety of the blood donor and the recipient (transfusion) by preventing the recurrence of adverse reactions and events.				
Yes	24 (85.7)	31 (83.8)	55 (84.6)	x^2=0.046
No	4 (14.3)	6 (16.2)	10 (15.4)	p=1.000
Hemovigilance takes corrective actions to prevent the recurrence of unwanted reactions and improper applications during blood donation and transfusion process.				
Yes	28 (100.0)	28 (75.7)	56 (86.2)	x^2=7.905
No	-	9 (24.3)	9 (13.8)	p=0.004
If there is a suspicion of a transfusion-related reaction in the recipient. hemovigilance traces back from the patient to the donor to identify the donor who has donated the blood component likely to cause the reaction.				
Yes	27 (96.4)	19 (51.4)	46 (70.8)	x^2=15.656
No	1 (3.6)	18 (48.6)	19 (29.2)	p=0.000
Hemovigilance follows the document confirming that blood transfusion has been completed.				
Yes	28 (100.0)	29 (78.4)	57 (87.7)	x^2=6.904
No	-	8 (21.6)	8 (12.3)	p=0.032
Hemovigilance monitors information on whether early and adverse reactions are observed.				
Yes	28 (100.0)	29 (78.4)	57 (87.7)	x^2=6.904
No	-	8 (21.6)	8 (12.3)	p=0.008
Hemovigilance nurse				
The hemovigilance nurse works directly under the transfusion committee and is also a natural member of the transfusion committee.				
Yes	24 (85.7)	17 (45.9)	41 (63.1)	x^2=9.183
No	4 (14.3)	20 (54.1)	24 (36.9)	p=0.002
The hemovigilance nurse organizes periodic training on blood transfusions.				
Yes	24 (85.7)	25 (67.6)	49 (75.4)	x^2=2.828
No	4 (14.3)	12 (32.4)	16 (24.6)	p=0.093
The hemovigilance nurse notifies the transfusion committee of nonconformities regarding blood transfusions.				
Yes	27 (96.4)	30 (81.1)	57 (87.7)	x^2=3.478
No	1 (3.6)	7 (18.9)	8 (12.3)	p=0.065
The hemovigilance nurse reports all adverse events and reactions to the hospital hemovigilance coordinator.				
Yes	27 (96.4)	28 (75.7)	55 (84.6)	x^2=5.273
No	1 (3.6)	9 (24.3)	10 (15.4)	p=0.021
The hemovigilance nurse inspects the appropriateness of transfusion-related processes within the scope of the "Transfusion Control Form"				
Yes	26 (92.9)	29 (78.4)	55 (84.6)	x^2=2.567
No	2 (7.1)	8 (21.6)	10 (15.4)	p=0.103

Continuity Correction. Pearson Chi-Square. Fisher Exact Test

Table 3. The status of the nurses to perform the transfusion steps within the scope of the "Transfusion Control Form" according to their knowledge that they are supervised in transfusion-related processes

	Knowing that you are being supervised			
	Yes	No	Total	x^2
Before transfusion	n(%)	n(%)	n(%)	p
I wash my hands before procedure.				
Yes	53 (96.4)	9 (90.0)	62 (95.4)	x^2=0.778
No	2 (3.6)	1 (10.0)	3 (4.6)	p=0.399
I wear gloves before procedure.				
Yes	55 (100.0)	8 (80.0)	63 (96.9)	x^2=11.349
No	-	2 (20.0)	2 (3.1)	p=0.022
I establish vascular access with a minimum of 23 G branules in children.				
Yes	48 (87.3)	5 (50.0)	53 (81.5)	x^2=7.809
No	7 (12.7)	5 (50.0)	12 (18.5)	p=0.014
If there is a physician's request before the transfusion. I will give medication to the patient.				
Yes	46 (83.6)	3 (30.0)	49 (75.4)	x^2=13.118
No	9 (16.4)	7 (70.0)	16 (24.6)	p=0.001
I am constantly aware of current procedures and information regarding blood transfusion.				
Yes	43 (78.2)	4 (40.0)	47 (72.3)	x^2=6.161
No	12 (21.8)	6 (60.0)	18 (27.7)	p=0.022
I use the current procedure for blood transfusion.				
Yes	52 (94.5)	7 (70.0)	59 (90.8)	x^2=6.084
No	3 (5.5)	3 (30.0)	6 (9.2)	p=0.042
Patient and blood component identification				
While the transfusion is starting. I finalize the patient's blood type. blood donor number and component				
Yes	54 (98.2)	9 (90.0)	63 (96.9)	x^2=1.899
No	1 (1.8)	1 (10.0)	2 (3.1)	p=0.286
I check that the serological test results of the blood product are negative.				
Yes	48 (87.3)	7 (70.0)	55 (84.6)	x^2=1.939
No	7 (12.7)	3 (30.0)	10 (15.4)	p=0.175
I check that the blood product number on the blood product label and the blood product number on the cross label are the same.				
Yes	53 (96.4)	9 (90.0)	62 (95.4)	x^2=0.778
No	2 (3.6)	1 (10.0)	3 (4.6)	p=0.399
I check the appearance of the blood product and the bag (clot. color. residue. particles).				
Yes	55 (100.0)	9 (90.0)	64 (98.5)	x^2=5.586
No	-	1 (10.0)	1 (1.5)	p=0.154
I inform the patient about the benefits of blood transfusion. application reason. possible complications and reaction symptoms.				
Yes	55 (100.0)	8 (80.0)	63 (96.9)	x^2=11.349
No	-	2 (20.0)	2 (3.1)	p=0.022
I have the patient or the patient's relative sign the informed consent form before blood transfusion.				
Yes	55 (100.0)	8 (80.0)	63 (96.9)	x^2=11.349
No	-	2 (20.0)	2 (3.1)	p=0.022
I report any inconvenience to the transfusion center.				
Yes	54 (98.2)	7 (70.0)	61 (93.8)	x^2=11.637
No	1 (1.8)	3 (30.0)	4 (6.2)	p=0.010

Table 3. contiuned

Application techniques and monitoring				
I perform blood transfusion using a standard 170-200 µm diameter filter set.				
Yes	45 (81.8)	3 (30.0)	48 (73.8)	x^2=11.764
No	10 (18.2)	7 (70.0)	17 (26.2)	p=0.002
I monitor and record the patient's vital signs (fever. pulse. blood pressure. respiration) 15 minutes after the transfusion starts.				
Yes	51 (92.7)	8 (80.0)	59 (90.8)	x^2=1.636
No	4 (7.3)	2 (20.0)	6 (9.2)	p=0.228
I monitor and record the vital signs (fever. pulse. blood pressure. respiration) of a patient every 30 minutes during transfusion.				
Yes	55 (100.0)	8 (80.0)	63 (96.9)	x^2=11.349
No	-	2 (20.0)	2 (3.1)	p=0.022
In transfusion of whole blood. erythrocyte. platelet suspensions. no solution other than 0.9% NaCl should be used for filling or washing the transfusion set.				
Yes	44 (80.0)	4 (40.0)	48 (73.8)	x^2=7.010
No	11 (20.0)	6 (60.0)	17 (26.2)	p=0.015
I monitor the patient for adverse reactions during blood transfusion				
Yes	55 (100.0)	9 (90.0)	64 (98.5)	x^2=5.586
No	-	1 (10.0)	1 (1.5)	p=0.154
When the patient develops an adverse reaction. I stop the transfusion and record the clock.				
Yes	54 (98.2)	9 (90.0)	63 (96.9)	x^2=1.899
No	1 (1.8)	1 (10.0)	2 (3.1)	p=0.286
After the transfusion is over. I follow the patient for a minimum of 60 minutes for adverse reactions.				
Yes	51 (92.7)	6 (60.0)	57 (87.7)	x^2=8.397
No	4 (7.3)	4 (40.0)	8 (12.3)	p=0.016
I destroy the empty blood bag after transfusion.				
Yes	40 (72.7)	3 (30.0)	43 (66.2)	x^2=6.899
No	15 (27.3)	7 (70.0)	22 (33.8)	p=0.013
Timing				
I start the blood transfusion within 30 minutes. if the patient's condition is suitable. after the blood component comes from the blood bank.				
Yes	50 (90.9)	5 (50.0)	55 (84.6)	x^2=10.878
No	5 (9.1)	5 (50.0)	10 (15.4)	p=0.005
I record the start and end time of the blood transfusion.				
Yes	53 (96.4)	8 (80.0)	61 (93.8)	x^2=3.923
No	2 (3.6)	2 (20.0)	4 (6.2)	p=0.109
I complete the transfusion of whole blood and erythrocyte concentrate in a maximum of 4 hours.				
Yes	48 (87.3)	4 (40.0)	52 (80.0)	x2=11.818
No	7 (12.7)	6 (60.0)	13 (20.0)	p=0.000
Continuity Correction. Pearson Chi-Square. Fisher Exact Test				

hemovigilance. The hemovigilance officers of the relevant clinics and the hospital's hemovigilance nurse are responsible for the proper execution of these notifications (5). In our study, the majority of the nurses who received training (85.7%) reported that the hemovigilance nurse was a member of the transfusion committee and organized periodic trainings, and that the hemovigilance nurse inspected the appropriateness of transfusion-related processes within the scope of the "Transfusion Control Form" (92.9%), and that transfusion incompatibilities were reported to the transfusion committee and the events/reactions to the hemovigilance coordinator by the hemovigilance nurse (96.4%). In a study investigating the importance and effectiveness of the training given by the hemovigilance nurse in terms of patient safety, the success rate was reported as 88.8% (Mat et al., 2017). In another study, Günişen, Özdemir, and Tok (18) reported that 66.1% of the participants did not attend any training, course or seminar on blood transfusions.

In the literature, it is strongly emphasized that the knowledge level of nurses on blood transfusion is insufficient and that this situation should be standardized by supporting with trainings and supervision should be carried out (12,19). In the presented study, it was determined that 96.4% of the nurses who knew that they were supervised by a hemovigilance nurse (84.6%) washed their hands before transfusion, and that all (100%) wore gloves before transfusion. Before starting blood transfusion, hands should be washed according to the hand washing standard and gloves should be worn (20,21). Göktaş Baltacı et al. (22) reported in their study based on observation that 60% of the nurses washed their hands before the application and 74% wore gloves (22).

It is appropriate to use number 23 needles for pediatric patients (23-25). It was determined that 87.3% of the nurses who knew that they were supervised by a hemovigilance nurse opened vascular access with a minimum of 23G branules in children before transfusion. Göktaş Baltacı et al. (22) reported in their study that 88% of the nurses could choose the appropriate cannula for blood transfusion depending on whether the patients were adults or children. In the study of Hijji et al. (19), it was reported that after the blood product came to the clinic, the vascular access was established with a suitable cannula and the vascular access was controlled, which caused the blood to be kept and the duration of the transfusion to prolong.

Human errors that prevent the proper conduct of blood transfusions are largely due to non-compliance with the relevant blood transfusion procedures (11). It is important for nurses to use up-to-date evidence-based clinical guidelines for safe and effective transfusion practice (6). In our study, it was determined that 78.2% of the nurses were constantly aware of the current procedure and information regarding blood transfusion and that 94.5% of them benefited from the current procedure for blood transfusion.

It was determined that almost all of the nurses (98.2%), who knew that they were supervised by the hemovigilance nurse, made the final check of the patient's blood type, blood donor number and the component at the beginning of the transfusion. Misidentification of the blood unit or recipient is the most common cause of hemolytic transfusion reactions. Identifying the patient and the blood sample correctly, matching the patient's ID bracelet with the identification barcode of the blood or blood product are among the necessary steps for safe transfusion (26). Hijji et al. (19) reported that 29% of 49 nurses compared the information on the blood bag and the patient's wristband. Again, Gürkan (27) reported that the expiration dates of blood and blood products were controlled, while Bayraktar (28) reported that nurses had control deficiencies.

In the literature, it was reported that 76% of healthcare professionals verified the identity of the patient, blood or blood product, serial number, amount of blood product to be taken before transfusion, and performed the pre-transfusion instructions including transfusion time, expiry date of blood product, blood type, serological cross match and doctor's request form. It was reported that 90% of them rejected the blood product in case of any turbidity or foamy appearance of the blood (26). In the study presented, nurses who knew that they were supervised by a hemovigilance nurse, checked that the serological test results of the blood product were negative (87.3%), that the blood product number on the blood product label was the same as the blood product number on the cross label (96.4%), and that the appearance of the blood product and the bag (clot, color, sediment, particles) was appropriate (100%).

Whole blood, erythrocyte and platelet suspensions, fresh frozen plasma and cryoprecipitate are sent with a standard blood donation set due to the fibrin fragments and particles they contain. Filters in these sets have 170-200 micron diameter pores (24,25). It was determined that 81.8% of the nurses, who knew that they were supervised by a hemovigilance nurse, used a standard 170-200 μm diameter filter set for blood transfusion.

The first 15 minutes of a blood transfusion is very important for signs of severe reaction. According to the literature, vital signs should be measured and recorded before and 15 minutes after the start of transfusion. It has been reported that the patient should be followed up for other reactions during the transfusion and a few hours after the end of the transfusion, and the patient's vital signs should be monitored every half hour or hourly (29). In our study, 92.7% of the nurses who knew that they were supervised by a hemovigilance nurse, monitored and recorded the patient's vital signs (fever, pulse, blood pressure, respiration) 15 minutes after the start of transfusion, and all of them (100%) observed the vital signs of a patient (fever, fever, etc.) every 30 minutes during transfusion. It was found that 92.7% of them watched the patient for a minimum of 60 minutes after the end of the transfusion in terms of an adverse reaction.

In the literature, it is reported that the blood component should be given to the patient within 30 minutes after it is taken out of the refrigerator (23,29). In our study, it was determined that 90.9% of the nurses, who knew that they were supervised by a hemovigilance nurse, initiated the blood transfusion within 30 minutes at most after the blood component came from the blood bank, if the patient's condition was suitable, in accordance with the literature.

According to what is stated in the National Hemovigilance Guide Blood Transfusion Control Form (5); the start and end time of blood transfusion should be recorded and the transfusion should be completed in a maximum of four hours. In this study, it was determined that 96.4% of the nurses, who knew that they were supervised by the hemovigilance nurse, recorded the start and end time of the blood transfusion, and that 87.3% completed the transfusion of whole blood and erythrocyte concentrate within a maximum of four hours.

Study Limitations

Since this study was conducted in a public hospital, the results of the study were valid only for the nurses working in this hospital. Another limitation was the small size of the research sample. Therefore, it could not be generalized to all nurses. In

addition, only the data obtained from the statements of nurses were included. Observational findings were not included.

Conclusion

In conclusion, in our study, the use of the hemovigilance system was high in the nurses who received training on the hemovigilance system and knew that they were supervised by the hemovigilance system. Nurses, who knew that they were under supervision, had high rates of performing transfusion steps including "wearing gloves before the application", "using appropriate branches in children", "getting written consent before blood transfusion", and "completing the blood transfusion in a maximum of four hours".

For nurses who have not received training, it is recommended to plan periodic in-service trainings for hemovigilance system and blood transfusion practices and to update transfusion information in cooperation with hospital managers. In addition, it is recommended to install systems that can control security in every hospital in order to increase the security in blood transfusion applications. Despite the limitations of the study, it is thought that the findings of the research may have an important contribution in terms of guiding the researches and training programs to be carried out to determine the nurses' knowledge of the hemovigilance system and its use.

Ethics

Ethics Committee Approval: The necessary institutional permission to conduct the research was obtained from the Gümüşhane Provincial Health Directorate (date: 10/07/2018 and number: 38032705-044-E.113), and the ethics committee permission was obtained from the Gümüşhane University Ethics Committee (number: 2018/6 and date: 02/07/2018).

Informed Consent: Obtained.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Concept: H.D., S.H., Design: S.H., Data Collection or Processing: S.H., Analysis or Interpretation: H.D., Literature Search: S.H., Writing: H.D., S.H.

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