Original article

Adherence to Hemovigilance Protocols on Storage, Preparation, and Administration among Nurses in the Open-Heart Intensive Care Unit

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ABSTRACT

Background: Adherence to blood storage, preparation, and administration standards has an important role in preventing blood-transfusion errors. In addition, the blood-transfusion rate following open-heart surgery is quite high. The aim of this study was to assess the adherence to hemovigilance standards on blood storage, preparation, and administration among nurses in the intensive care unit (ICU).

Methods: One hundred nurses of the Open-Heart ICU of Rajaie Cardiovascular, Medical, and Research Center, Tehran, Iran, participated in this descriptive study. The nurses' practice was supervised from the time of the entrance of the blood unit to the ICU until the end of the transfusion process. The ICU nurses' hemovigilance practice was compared with the Iranian Ministry of Health and Medical Education's standards. The nurses' demographic and occupational characteristics were evaluated regarding the scores of the hemovigilance standards in their practice.

Results: Concerning the standards of blood transfusion, 93% of the study nurses adhered to the protocols on blood-unit preservation, 84% on preparation, and 92% on transfusion. There were no statistically significant differences between the nurses' age, sex, work experience, education, last transfusion workshop participation and practice assessment, number of blood-transfusion procedures performed per month, and achieved standard scores on blood storage, preparation, and administration (all P>0.05).

Conclusions: The study nurses achieved 85% of the standard scores on the preservation, preparation, and transfusion of blood units. The demographic and occupational characteristics of the ICU nurses had no effect on their hemovigilance practice. *(Iranian Heart Journal 2015; 16(3): 16-21)*

Keywords: ■Blood transfusion ■Nurses' practice ■Standards ■Intensive Care Unit

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Safe and appropriate use of blood products is essential for numerous clinical treatments. Blood products are routinely used around the word. One-third of the general population either has required or will require blood products in their lives. A total of 3,000,000 blood components are transfused each year in Iran. These statistics increase even annually.[1-4]

Blood transfusion is one of the most common and challenging nursing skills in that a single error in transfusion can have serious or even fatal consequences. The Serious Hazards of Transfusion (SHOT) reports have demonstrated that, between 1996 and 2003, the risk of receiving wrong blood was 1 per 16,500 blood products—which included mismatch of the blood unit with that of the patient blood (a common error), sample being mislabeled with another patient, blood component ordered for the wrong patient, blood sample being taken from the wrong patient, patient detected wrongly at bed side checking (the most hazardous error), patient being transfused with mismatch RH blood, patient being transfused with un-irradiated blood, blood being stored in domestic refrigerators, blood not being transfused within 30 min after entrance, blood transfused with drugs, inappropriate instrument applied, and blood warmed with the wrong method. The most common risk was transfusing ABO incompatible blood (1 per 100,000), with the risk of death of 1 per 150,000 transfusions.[2, 3, 5-11]

Established in French in 1994, the hemovigilance system identified issues requiring attention and helped improve blood-product safety and transfusion processes. Historically, doctors and patients are often greatly concerned about transfusion-transmitted infection such as hepatitis B and C, human immunodeficiency virus (HIV), and sepsis. This problem has declined since the introduction of pre-released bacterial screening in the early 2008. In the recent decade, most of the studies have tended to search for the ways to prevent blood-transfusion errors and have achieved satisfactory results. In 2012, the SHOT report indicated that risk of receiving the wrong blood had decreased to 1 per 322,580 products and that the risk of morbidity had dropped to 1 per 21,415 transfusions.[3, 5, 11-13]

In Iran, hemovigilance was first utilized in 2008 with a view to improving blood-product safety and transfusion processes in hospitals. This system teaches the blood-transfusion standards to the personnel through blood-transfusion workshops and practical slide lectures and posters. Nevertheless, Aslani et al.[16] showed that most of the health care workers in their study lacked sufficient knowledge of blood transfusion. Another study assessed the practice and knowledge status of health care workers vis-à-vis safe transfusion in the Iranian city of Gonabad and reported that the subjects had average knowledge.[20] Two other studies conducted in the Iranian cities of Hamedan[17] and Zabol[14] arrived at the same results.[17] Likewise, Piri et al.[14] reported that only 51.6% of their study participants possessed sufficient knowledge of transfusion.

Nurses are the last individuals in the transfusion chain and their awareness of the blood-transfusion standards is essential in all aspects of the clinical transfusion process. Accordingly, we aimed to investigate the level of adherence to the blood-transfusion standards among nurses working in the Open-Heart Intensive Care Unit (ICU).

METHODS

The present cross-sectional study recruited nurses working in the Open-Heart ICU of Rajaie Cardiovascular, Medical, and Research Center, Tehran, Iran.

The instruments employed in this research comprised a demographic form, which contained 7 questions on age, gender, education, participation time in hemo-vigilance workshops, and number of blood-transfusion procedures within a month. In

addition, there was a blood-transfusion standard checklist, which contained 43 questions each having 2 points. The first 2 questions related to blood storage, the next 22 questions were on blood preparation, and the last 22 questions concerned blood transfusion. Scoring was based on the following scale: 1= performing the procedure without mistakes and 0 = mistake in all parts or any part of the procedure. The form consisted of an extra column for describing the reason for the non-practical questions. The minimum score possible was 0 and the maximum was 46. The validity of this instrument was assessed by 5 experts. Its reliability was also examined through test-retest by the head nurses and those in charge of the ICU.

The inclusion criteria were comprised of willingness to participate in the study and working in the ICU. The exclusion criteria consisted of refusing to participate in the study and working only on night shifts.

First, the aim of the study was explained orally to the participants. Then, the nurses who wished to participate were asked to complete the demographic form. In the next step, the nurses' practice was supervised by the researcher from the time of the entrance of the blood product to the ICU until the end of the transfusion process. The data were analyzed using Statistical Package for the Social Sciences (SPSS), version 21.0.

RESULTS

The mean age of the subjects was 30.5±4.2 (23–42) years. Males and females accounted for 6% and 94% of the subjects, corresponddingly. Most of the participants (97%) had a bachelor's degree and 3% had a master's degree. All of them had participated in the transfusion workshop and had a mean work experience of 83.3±54.4 (13–300) months.

Table 1. Occupational characteristics of the ICU nurses

	Uncountable Variables	Total(n)	%
1	Level of education	Bachelor's degree	97
		Master's degree	3
2	Participation in blood-transfusion workshop	3 mon	1
		6 mon	73
		9 mon	17
		One y	9
3	Blood-transfusion procedures within a month	1	61
		2	36
		3	3
4	Sex	Male	4
		Female	96

Hemovigilance Practice regarding Storage

Our results demonstrated that 95% of the transfusions were performed within 30 min and if any delay was encountered, the blood was returned to the transfusion service provider as soon as possible. Additionally, 93% of the study nurses did not store blood in the ward or domestic refrigerators.

Hemovigilance Practice regarding Preparation

All (100%) of the subjects worked in accordance with the standards on prescription order; indication for transfusion; pre-transfusion medication administration; appropriate venous access; bedside checking of the patient's full name, RH, and ABO with the blood label; and blood request and equipment for the procedure. Before transfusion, 94% of the subjects washed their hands. In addition, the blood-request sheet was checked against the number allocated by the hospital by 14% of the subjects.

Hemovigilance Practice regarding Transfusion

All (100%) of the study nurses documented the start time; performed pre-transfusion observation of the patient's temperature, pulse, and blood pressure and registered them on the observation chart or transfusion record; used the transfusion set; visually inspected the blood for abnormal appearances, discoloration, hemolysis, clot formation, damage, or leakage; observed the patient for the first 15 min; repeated and documented the observation of the patient's temperature,

pulse, and blood pressure every 30 min; recorded the time each product finished upon the transfusion completion; retained the compatibility label in the patient's medical records; and infused blood within 3–4 hours. None of the subjects fully adhered to the standard precautionary measures. Only 46% of the subjects wore gloves.

Consequently, apropos the standards of blood transfusion, 93% of the study nurses adhered to the protocols on blood-unit preservation, 84% on preparation, and 92% on transfusion. Moreover, there were no statistically significant differences between the nurses' age, sex, work experience, education, last transfusion workshop participation and practice assessment, and number of blood transfusion procedures performed within a month.

Table 2. Percentage of adherence to hemovigilance standards on blood preservation, preparation, and transfusion among the nurses

Preservation (%)

Transfusion of the blood after 30 min at the latest	95
Preservation of the blood in the domestic refrigerator	7

Preparation (%)

Checking the prescription order	100
Checking the indication for transfusion	100
Preparing the equipment	100
Finding the appropriate venous access	100
Obtaining an informed consent	0
Doing bedside checking	100
Visually inspecting the blood for abnormal appearances	100
Checking the blood-request sheet against the number allocated by the hospital	14
Confirming the patient's identification	100
Checking the patient's birth time	0
Checking the patient's ABO and RH	100
Washing hands	94
Taking standard precaution	0
Documenting the commencement time of transfusion	100
Observing the patient's temperature, pulse, and respiration before transfusion	100
Using the transfusion set	100

Transfusion (%)

Observing the patient for the first 15 min	100
Repeating and documenting the patient's temperature, pulse, respiration, and blood pressure every 30 min	100
Transfusing blood individually	100
Repeating and documenting the patient's temperature, pulse, respiration, and blood pressure at the end of transfusion	100
Recording the time each product was completed	100
Recording the volume of the transfused blood	100
Retaining the compatibility label in the patient's medical record	100
Infusing the blood within 3 – 4 h	100
Flushing the blood administration site	100

Table 3. Percentage of adherence to hemovigilance standards divided by the steps of the practice

Outcomes	%
Preservation	93
Preparation	84
Transfusion	92
Total	85

Moreover, there were no statistically significant differences between the nurses' age, sex, work experience, education, last transfusion workshop participation and practice assessment, number of blood transfusion procedures performed within a month, and achieved standard scores on the storage, preparation, and administration of blood according to the Rho Spearman and Mann-Whitney test results.

DISCUSSION

The results obtained from the present study demonstrated that the overall percentage of adherence to the hemovigilance standards on blood preservation, preparation, and transfusion among the nurses in the Open-Heart ICU of Rajaie Cardiovascular, Medical, and Research Center was 85%. A descriptive investigation by Aslani et al.[16] showed that the knowledge of blood and blood components, technique of blood infusion, and its indications and side effects was average among the nurses recruited in their study. Teimuri et al.[18] demonstrated that the knowledge of the nurses included in their study as regards the use of needles with appropriate diameters was reasonably acceptable, while the subjects' understanding of the indications and methods of blood heating and transfusion by force was incorrect. In another study by Tabiee et al.,[19] only 50% of the subjects adhered to the hemovigilance standards satisfactorily. Likewise, Bayraktar et al.[20] reported similar results among their study population apropos the transfusion standards. An investigation in France showed that the lowest level of knowledge on blood transfusion among the nurses recruited in the study was concerning the failure to identify the patient and the required blood component.[21-24] Elsewhere,

Saillour et al. [25] conducted a descriptive study and found low levels of knowledge and practice in the participants. Along the same lines, a study in Turkey showed that the nurses' knowledge and practice vis-à-vis hemovigilance was far from satisfactory.

The reasons for the inconsistency between the results of the above-mentioned studies and ours may be time differences in the establishment of the hemovigilance system, application of the standards in the hospitals, and in-service training of the health care workers.

CONCLUSIONS

The nurses in the Open-Heart ICU of Rajaie Cardiovascular, Medical, and Research Center achieved 85% of the standard scores on the blood vigilance protocols on preservation, preparation, and transfusion — which seems an acceptable level of adherence. The demographic and occupational characteristics of the ICU nurses had no effect on their hemovigilance practice.

Limitations
Our survey is a single-center evaluation of nursing practice. To achieve more robust and generalizable results, we recommend future large-scale multi-center studies. However, one of the strengths of the present study is the inclusion of 100 out of the 108 Open-Heart ICU nurses in our center.

Acknowledgments

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