

# Transfusion audit of blood products using the World Health Organization Basic Information Sheet in Qazvin, Islamic Republic of Iran

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## التفتيش على نقل منتجات الدم في قزوین، جمهورية إيران الإسلامية باستخدام صحيفة المعلومات الأساسية لمنظمة الصحة العالمية

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الخلاصة: استهدفت هذه الدراسة تقييم مدى ما تتمتع به صحيفة المعلومات الأساسية حول نقل الدم من قابلية للتطبيق في جمع المعطيات، والتعريف على الكفاية الإجمالية لتوثيق الأطباء لنقل منتجات الدم، ثم تنفيذ التفتيش على مدى ملاءمة نقل منتجات الدم باستخدام هذه الصحيفة. وقد راجع الباحثون مراجعة استباقية عملية لنقل منتجات الدم والدواعي السريرية لها لدى البالغين الذين أدخلوا المستشفيات التعليمية للرعاية الثالثة في قزوین، واستخدموا صحيفة المعلومات الأساسية حول نقل الدم. وقد وجد الباحثون على وجه الإجمال أن التوثيق الكافي قد تحقق لدى 62.6% من جميع مرآت نقل الدم، وبمدى يتراوح بين 41% و73%، وذلك تبعاً للاختصاص الطبي. كما وجد الباحثون أن طلبات النقل لم تكن ملائمة لدى 15.7% من طلبات نقل الكريات الحمراء وكامل الدم، و40.8% من طلبات نقل الصفائح و34.1% من طلبات نقل البلازما المجمدة. واستنتج الباحثون أن من الممكن استخدام المعلومات المركزة على صحيفة المعلومات الأساسية مع جمع المعطيات بهدف تقديم معلومات ارتجاعية حول فعالية الدلائل الإرشادية المحلية والوطنية لنقل الدم وحول مدى الامتثال لها.

ABSTRACT We assessed the practicality of using the transfusion Basic Information Sheet (BIS) for data collection, to determine the overall adequacy of physician documentation of blood product transfusion, and to make an audit of the appropriateness of blood product transfusion. The transfusion process and clinical indications for transfusions administered to adult hospitalized patients in 3 tertiary care teaching hospitals in Qazvin were prospectively reviewed. Adequate documentation was achieved in 62.6% of all transfusion episodes, range 41%–73%, depending on the medical specialty; 15.7% of red blood cells and whole blood requests, 40.8% of platelet requests and 34.1% of fresh frozen plasma requests were inappropriate. BIS-based information along with data collection can be used to provide feedback regarding the effectiveness of and compliance with local and national transfusion guidelines.

## Audit de la transfusion des produits sanguins à l'aide de la fiche d'information de base de l'Organisation mondiale de la Santé, à Qazvin (République islamique d'Iran)

RÉSUMÉ Nous avons évalué l'aspect pratique de l'utilisation de la fiche d'information de base relative à la transfusion et destinée au recueil des données, de déterminer l'adéquation générale de la documentation des médecins sur la transfusion des produits sanguins, et de conduire un audit sur la pertinence des épisodes de transfusion. Le processus de transfusion et les indications cliniques de transfusions sanguines administrées aux patients adultes hospitalisés dans trois hôpitaux universitaires de soins tertiaires à Qazvin ont été étudiés prospectivement. Globalement, une documentation adéquate a été obtenue dans 62,6 % des épisodes de transfusion. Ce pourcentage variait de 41 % à 73 % selon les spécialités médicales. Nous avons observé que 15,7 % des demandes de transfusion d'érythrocytes et de sang total, 40,8 % des demandes de plaquettes et 34,1 % des demandes de plasma frais congelé étaient contre-indiquées. Les données recueillies sur la fiche d'information de base associées aux autres données collectées peuvent être utilisées pour analyser l'utilisation efficace et conforme des directives nationales et locales des pratiques de transfusion.

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## Introduction

Clinical audit is a management tool for the appraisal and justification of appropriateness and efficiency of transfusion therapy, and an important part of the quality assurance programme which can provide necessary information for improving transfusion medicine practice [1]. Adequate documentation of evidence to support a rationale for blood transfusion is considered an essential part of transfusion medicine. More complete and appropriate documentation allows more transfusion episodes to be assessed in an audit [2]. Transfusion is considered appropriate when it is used to treat conditions leading to significant morbidity and mortality and which cannot be prevented or managed effectively by other means [3]. Various strategies have been developed to reduce the inappropriate use of blood components. These include guidelines and consensus conferences as well as monitoring of transfusion practice, education, and self-audit by clinicians [4].

The World Health Organization (WHO) Regional Office for Europe developed a pan-European quality system using a basic information sheet (BIS) to improve the clinical use of blood products. The outcome of the pilot study indicated that the BIS for transfusion can serve as a tool for data collection and evaluation. Moreover, assessment of the impact of the transfusion BIS showed that BIS-based information can be used for measurement of performance against local guidelines, comparison of practices, improving performance and facilitating best transfusion practices [5].

The aims of the present study were to extend previous works on assessing the practicality of using the transfusion BIS for data collection, to determine the overall adequacy of physician documentation of blood product transfusion, and to carry out an audit of the appropriateness of blood products transfusion using the WHO BIS.

## Methods

We prospectively reviewed the transfusion process using a WHO transfusion BIS [5], and clinical indications for red blood cell (RBC), platelet, and fresh frozen plasma (FFP) transfusions administered to adult ( $\geq 18$  years) hospitalized patients in 3 tertiary care teaching hospitals in Qazvin (Department of Internal Medicine at Boali Sina Hospital, Department of Surgery at Shahid Rajaei Hospital, and Department of Obstetrics and Gynaecology at Kossar Hospital) in the 9-month period December 2007–August 2008.

The appropriate use of platelet and FFP transfusions was assessed using the recommendations published by the British Committee for Standards in Haematology (BCSH) [6,7], and RBC transfusions were reviewed and compared with the current hospital guidelines.

An internal medicine attending physician used the BCSH and the hospital guidelines for each request within 48 h of transfusion to classify the transfusion as appropriate if the criteria were completely fulfilled and inappropriate if the criteria were not completely covered. Doubtful assessments were judged by consensus after case review with a clinical haematologist.

The following information was documented through a customized BIS for transfusion [5] (Farsi version, translated by a haematologist native to the study area) by internal medicine, surgery, and obstetrics and gynaecology resident physicians at the time a blood product was requested for any adult patient: age, weight, date, transfusion start time, emergency or routine request, diagnosis, clinical indications, pre- and post-transfusion laboratory and clinical assessment, transfusion targets, blood components transfused, supporting therapies, transfusion outcome (clinical and/or laboratory improvement), and transfusion side-effects [5].

Documentation adequacy was judged independent of transfusion justification. Transfusions were classified as adequately documented if, at least, the BIS included:

- documentation of a plan for transfusion;
- documentation of pre- and post-transfusion clinical or laboratory assessment;
- documentation of outcome of transfusion (clinical and/or laboratory improvement) regardless of whether the transfusion episode was justified or not.

All resident physicians responsible for prescribing in the study departments were asked for their consent to participate in the study, and were provided with guidance information for using the transfusion BIS. They were also asked to state any additional clinical conditions which may influence transfusion decisions but which were not included in the form.

The study was approved by the Institutional Review Board of Qazvin University of Medical Sciences.

SPSS, version 13.0, was used both at data entry and analysis.

## Results

During the study period, 829 transfusion episodes were documented in 742 patients, who received a total number of 1994 units of blood components. The patient demographic data and transfusion episode information for each department are shown in Table 1.

Of 829 transfusion episodes, 519 were identified as adequately documented [43.4% (40/92) of whole blood transfusion episodes, 67.2% (361/537) of red cell transfusion episodes, 59.7% (52/87) of platelet transfusion episodes, and 58.4% (66/113) of FFP transfusion episodes]. This means adequate documentation of at least a plan for transfusion, pre- and post-transfusion clinical

**Table 1 Patient demographic data and transfusion episode information according to department**

Demographic data and transfusion episode information	Department			Total
	Internal medicine	Surgery	Obstetrics/gynaecology	
<b>Sex</b>				
Males, No. (%)	234 (60)	107 (67)	-	341 (46)
Females, No. (%)	156 (40)	53 (33)	192 (100)	401 (54)
Mean (SD) age (years)	56.7 (19.9)	50.5 (23.7)	33.4 (9.6)	49.6 (21.2)
<b>No. of transfusion episodes</b>				
WB	19	15	58	92
RBC	281	147	109	537
PC	67	2	18	87
FFP	78	3	32	113
Total	445	167	217	829
<b>Units/episode, mean (SD) median [range]</b>				
WB	2.1 (1.4) 2 [1-7]	1.6 (1.1) 1 [1-4]	1.7 (0.9) 2 [1-6]	1.8 (1.0) 2 [1-7]
RBC	1.6 (0.6) 2 [1-4]	1.8 (0.8) 2 [1-4]	1.8 (0.9) 2 [1-4]	1.7 (0.7) 2 [1-4]
PC	7.5 (2.5) 7 [2-10]	6.0 (6) <sup>a</sup>	4.9 (2.5) 4 [2-10]	6.9 (2.6) 6 [2-10]
FFP	2.8 (1.7) 2 [1-10]	2.0 (2) <sup>a</sup>	2.9 (1.6) 2 [2-9]	2.8 (1.7) 2 [1-10]
<b>No. of units transfused</b>				
WB	42	24	102	168
RBC	461	258	193	912
PC	500	12	88	600
FFP	215	6	93	314
Total	1218	300	476	1994
<b>Single unit transfusions</b>				
RBC, No. (%)	119 (42.3)	53 (36.8)	51 (46.4)	223 (49.9)
WB, No. (%)	7 (35)	10 (66.7)	23 (39.7)	40 (45.2)

<sup>a</sup>There was only 1 episode of PC transfusion and 1 episode of FFP transfusion in the Department of Surgery, thus, there is no standard deviation or range. SD = standard deviation; WB = whole blood; RBC = red blood cells; PC = platelet concentrate; FFP = fresh frozen platelets.

or laboratory assessment, and outcome of transfusion.

Documentation adequacy of each part of the BIS was determined. Adequate documentation of patient identification required that patient's name, age, sex, and weight were completed. Transfusion targets, pre- and post-transfusion assessment, were judged adequately documented if, as a minimum, appropriate fields according to prescribed blood components were completed. Adequate documentation of the outcome of transfusion necessitated that minimally, the result and 1 of the therapeutic effects of transfusion (clinical or laboratory improvement) were included.

Patient identification was adequately documented in 64.6% of transfusion episodes, and the transfusion start time in 76.2% (Table 2). Documentation of the laboratory or clinical circumstances necessitating transfusion, and targets and outcome of transfusion reached the 80% minimum accuracy requirement for medical recording (Table 2).

The volume of blood loss, the existence of shock and the International Statistical Classification of Disease (ICD10) code were inadequately documented in all departments.

Improvement after transfusion therapy was achieved in 88.2% of transfusion episodes with a range of 84.8%–93.0%, depending on the department (Table 2). Although in 389 (58.6%) episodes

the clinicians indicated that they had achieved the laboratory improvement, a review of outcome indicators comparing the registered outcome with actual outcome showed that in 25% of episodes laboratory improvement was not actually achieved after transfusion

Of 596 episodes of whole blood and RBC transfusion, 503 (84.3%) were considered appropriate according to the current hospitals guidelines (Table 3). Of 76 episodes of platelet transfusion, 45 (59.2%) were deemed appropriate according to the BCSH guidelines, and of 91 episodes of FFP transfusion 31 (65.9%) were deemed appropriate according to the same guidelines. Overall, of 763 blood product transfusions, 79.6% were judged appropriate.

**Table 2** Number and percentages of transfusion episodes with adequate documentation in each part of the basic information sheet (BIS) and overall adequate documentation according to department

Section of the transfusion BIS	Department							
	Internal medicine		Surgery		Obstetrics & gynaecology		Total	
	(n = 445)		(n = 167)		(n = 217)		(n = 829)	
	No.	%	No.	%	No.	%	No.	%
<b>Patient identification</b>	295	66.2	112	66.9	129	59.4	536	64.6
<b>Start of transfusion</b>	316	71.0	139	83.1	177	81.6	596	76.2
<b>Assessment</b>								
Pre-transfusion	432	97.1	158	94.6	209	96.3	799	96.3
Post-transfusion	366	82.2	139	83.1	116	53.4	621	74.9
Transfusion targets	387	86.9	156	93.4	187	86.1	730	88.1
Outcome	383	86.1	143	85.5	137	63.1	663	80.0
Overall <sup>a</sup>	307	69.2	121	72.3	91	41.9	519	62.6
<b>Outcome of transfusion therapy</b>	(n = 383)		(n = 143)		(n = 137)		(n = 663)	
Improvement	325	84.8	133	93.0	127	92.7	585	88.2
Both clinical & laboratory improvement	199	51.9	83	58.0	65	47.4	347	54.9
Clinical improvement	95	26.4	50	34.9	51	37.2	196	29.7
Laboratory improvement	31	8.1	0	0.0	11	8.0	42	6.3
Either clinical or laboratory improvement	126	32.9	50	34.9	62	45.3	238	35.9
No improvement	58	15.1	10	6.9	10	7.3	78	11.7

<sup>a</sup>Adequate documentation included at least a plan for transfusion, pre- and post-transfusion clinical or laboratory assessment, and outcome of transfusion.

## Discussion

Several lines of research have emerged that suggest the use of the transfusion BIS promotes self education in new staff, permits a further improvement in appropriate requests by acting as a checklist and promoting reflective practice, and allows the audit of transfusion practice to be performed easily [5,8].

Although most departments (with the exception of obstetrics and gynaecology) reached adequate documentation of greater than 80% in critical areas of the transfusion BIS (transfusion targets, pre- and post-transfusion outcome), the overall adequate documentation (at least documentation of a reason for transfusion, pre- and post-transfusion clinical or laboratory assessment, and the transfusion outcome) was achieved only in 62.6% of all transfusion episodes.

These items all are dynamic components of clinical decision-making [3]. The WHO BIS would support the clinical decision making, provided the collection of related information necessary to make a decision are documented as accurately and completely as possible by clinicians, that highlights the importance of observing, training, and providing performance feedback on a regular basis particularly on the areas of poor compliance and performance to ensure achievement of compliance and performance standards necessary to support the efficiency and appropriateness of transfusion [9,10].

The finding that in 58.6% of cases, the clinicians indicated that they had achieved their laboratory results, but in only 33.6% did they meet the actual endpoints, while not inconsistent with WHO findings [5], is striking, and highlights the discrepancy between clinicians' statements and actual performance. The study results showed

that there was a significant correlation between this finding and inappropriate use within established clinical guidelines.

The volume of blood loss and the existence of shock were inadequately documented in the study departments. As the correct diagnosis of shock is critical for proper management, an accurate history and assessment of the patient's symptoms must be performed before commencing treatment. Including the degree of hypovolaemic shock (according to percentage of the blood loss and the associated clinical signs) in the WHO BIS is, therefore, more practical than global assessment of shock and leads to improved documentation.

Moreover, in agreement with results of previous reports [5,8], the ICD10 code was often not recorded, probably because it was seldom available for the clinicians at the bedside practice. Therefore the ICD10 code could be removed and replaced with

**Table 3 Appropriate and inappropriate blood products transfused according to hospital guidelines for red blood cell transfusions and according to British Committee for Standards in Haematology (BCSH) guidelines for platelet and fresh frozen platelet (FFP) transfusions [6,7]**

Indication	Appropriate episodes		Inappropriate episodes	
	No. (sum of units transfused)	Mean (SD) range	No. (sum of units transfused)	Mean (SD) range
Contributory indications for RBC according to hospital guidelines (WB, RBC) (n = 596)	503 (881)	1.8 (0.82) 1-7	93 (142)	1.5 (0.63) 1-4
Acute blood loss <sup>a</sup>	176 (337)	1.9 (0.78) 1-4	35 (55)	1.6 (0.60) 1-4
Anaemia in critical care (target values as for acute blood loss)	64 (107)	1.7 (1.10) 1-6	9 (12)	1.3 (1.0) 1-4
Peri-operative transfusion (to maintain Hb concentration > 10g/dL)	82 (128)	1.6 (0.65) 1-4	24 (35)	1.4 (0.52) 1-2
Anaemia <sup>b</sup>	145 (256)	1.7 (0.72) 1-4	11 (18)	1.6 (0.87) 1-4
Anaemia <sup>c</sup>	36 (53)	1.4 (0.51) 1-2	14 (22)	1.5 (0.75) 1-4
Contributory indications for platelets (n = 76)	45 (327)	7.4 (2.6) 2-10	31 (201)	6.4 (2.7) 2-10
Bone marrow failure <sup>d</sup>	27 (208)	8.0 (2.2) 3-10	6 (47)	7.8 (2.7) 4-10
Peri-operative or invasive procedure <sup>e</sup>	11 (69)	8.0 (2.2) 3-10	7 (41)	5.8 (2.0) 4-10
Massive haemorrhage/transfusion <sup>f</sup>	1 (10)	10.0 <sup>g</sup>	5 (20)	4.0 (1.8) 2-6
Acute DIC in presence of bleeding & severe thrombocytopenia	1 (10)	10.0	2 (10)	5.0 (0.0) 5
Autoimmune thrombocytopenia in presence of major haemorrhage	5 (30)	6.0 (3.8) 2-10	11 (83)	7.5 (2.8) 3-10
Contributory indications for FFP (n = 91)	60 (172)	2.8 (1.4) 1-10	31 (71)	2.3 (1.7) 1-6
Single factor or coagulation inhibitor deficiency	5 (17)	3.4 (0.54) 3-4	-	-
Immediate reversal of warfarin effect in presence of life-threatening bleeding	10 (34)	3.4 (2.5) 1-10	9 (22)	2.4 (0.8) 1-4
Acute DIC in presence of bleeding and abnormal coagulation results	16 (53)	3.3 (1.4) 2-7	10 (21)	2.1 (1.2) 1-5
Liver disease	14 (31)	2.2 (0.80) 1-3	6 (18)	3.0 (2.0) 1-6
Active bleeding and PT > 1.5 × mean normal value	15 (37)	2.5 (0.64) 2-4	6 (10)	1.7 (0.51) 1-2

<sup>a</sup>To maintain circulating blood volume and Hb concentration > 8g/dL in otherwise fit patients and > 10g/dL in elderly patients and those with known cardiovascular and respiratory diseases.

<sup>b</sup>Hb concentration < 8g/dL in otherwise fit patients.

<sup>c</sup>Hb concentration < 10g/dL in patients over 65 years and patients with cardiovascular or respiratory disease.

<sup>d</sup>To prevent spontaneous bleeding when the platelet count < 10 × 10<sup>9</sup>/L or < 20 × 10<sup>9</sup>/L in the presence of additional risk factors for bleeding.

<sup>e</sup>Platelet count < 50 × 10<sup>9</sup>/L, or < 100 × 10<sup>9</sup>/L before surgery in critical sites such as brain or eyes.

<sup>f</sup>Platelet count < 50, or < 100 × 10<sup>9</sup>/L if micro-vascular oozing.

<sup>g</sup>There was only 1 episode of 10 units PLT transfusion, thus, there is no standard deviation or range.

WB = whole blood; RBC = red blood cells; SD = standard deviation; Hb = haemoglobin; PT = prothrombin time; DIC = disseminated intravascular coagulation.

free text asking clinical indication for the transfusion as well as the patient-based conditions that may influence the decision to transfuse a blood product (e.g. active bleeding in a patient with known cardiovascular or respiratory disease). Including the indications for transfusion would also improve adherence to transfusion guidelines and ensure appropriate blood transfusion practice.

Although this study did not aim to assess the proportion of inappropriate use of blood components and the situations in which the transfusions were

considered inappropriate, the audit data using the WHO BIS showed that 15.7% of RBC and whole blood requests, 40.8% of platelet requests, and 34.1% of FFP requests, were inappropriate. The rate of inappropriate use of RBC, platelet, and FFP was within the ranges reported in previous studies [11-16]. However, our results are not directly comparable with these results because of differences in the guidelines used.

Furthermore, of 629 transfusion episodes, 263 were for a single unit of

whole blood or red cell transfusion and 62% of these were classed as inappropriate use. Skodlar et al. [8] and Metz et al. [12] also found a high proportion of inappropriate use of single-unit transfusion. Transfusion of a single unit of RBC should not be considered inappropriate by itself, however, its use without an appropriate clinical judgement is not acceptable [17,18].

Audits identify areas of problems in transfusion practice which can be corrected by education and formulation of

practice guidelines [19]. To improve the effectiveness of the audit programmes, an audit must be simple, periodic, systematic and documented.

The WHO BIS includes transfusion measures for RBCs, platelets, and FFP and the reasons for transfusion for all blood components. These measures can be used for initial audits.

Building on prior work [5,8], the authors predicted that the WHO BIS could be used in clinical settings as a practical data collection tool. The study findings support this prediction. Additionally, the WHO BIS will enable the transfusion service to improve patient care and outcome through the systematic review of the use of transfused blood components against transfusion guidelines. In addition to retrospective review of transfusion practice, the WHO BIS allows the transfusion service to evaluate

product utilization by a prospective or concurrent review of ordering practices. In the prospective audit, reviewing and justifying the decision to use transfusion is provided prior to prescription and administration of blood, and the patient receives the correct blood product or avoids an unnecessary transfusion, whereas a concurrent audit of requests is performed by reviewing all order forms within 12–24 hours after blood component administration and gives more timely feedback to clinicians about their individual guideline adherence [19].

Furthermore, the WHO BIS could be customized to ensure efficacy of audit processes by considering certain points, e.g. it could include the classification of the degree of hypovolaemic shock. A free text asking about some details regarding the patient's diagnosis and any relevant procedures to be undertaken

that may influence the transfusion decision could also be included.

In conclusion, the study findings suggest that the WHO BIS would be a practical tool for both data collection and auditing the transfusion practice. Further research, however, should be carried out to assess the feasibility, validity and supporting role of the WHO BIS in effective local implementation and audit of guidelines.

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