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ORIGINAL PAPER

Quality indicators for the hospital transfusion chain: a national survey conducted in 100 dutch hospitals

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Background The 2011 Dutch Blood Transfusion Guideline for hospitals incorporates seven internal quality indicators for evaluation of the hospital transfusion chain. The indicators aim to measure guideline compliance as shown by the instatement of a hospital transfusion committee and transfusion safety officer (structural indicators), observance of transfusion triggers and mandatory traceability of labile blood components (process indicators).

Study Design and Methods Two voluntary online surveys were sent to all Dutch hospitals for operational years 2011 and 2012 to assess compliance with the guideline recommendations.

Results Most hospitals had a hospital transfusion committee and had appointed a transfusion safety officer (TSO). In 2012, only 23% of hospitals complied with the recommended minimum of four annual transfusion committee meetings and 8 h/week for the TSO. Compliance with the recommended pretransfusion haemoglobin threshold for RBC transfusion was achieved by 90% of hospitals in over 80% of transfusions; 58% of hospitals measured the pretransfusion platelet count in over 80% of platelet transfusions and 87% of hospitals complied with the legally mandatory traceability of blood components in over 95% of transfusions.

Conclusion With the current blood transfusion indicators, it is feasible to monitor aspects of the quality of the hospital transfusion chain and blood transfusion practice and to assess guideline compliance. The results from this study suggest that there are opportunities for significant improvement in blood transfusion practice in the Netherlands. These indicators could potentially be used for national and international benchmarking of blood transfusion practice.

Key words: blood transfusion, blood transfusion committee, quality indicators, traceability, transfusion safety officer, transfusion triggers.

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Introduction

Monitoring the quality of practice in health care using indicators enables hospitals to identify areas of poor performance and measure improvement [1, 2]. This can also be applied to transfusion practice. The 2011 version of the Dutch Blood Transfusion Guideline (hereinafter: Blood Transfusion Guideline) published internal quality indicators for transfusion practice [3]. These indicators were developed as a quality tool for the hospital transfusion chain based on the AIRE (Appraisal of Indicators through Research and Evaluation) instrument [4]. They aim to measure guideline compliance, improve transparency and stimulate observance of transfusion triggers as well as confirmation of transfusion of blood components. Hospitals may use them to identify areas for improvement of transfusion practice and for monitoring trends. The

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development and selection of the quality indicators are described in detail in the Blood Transfusion Guideline [3].

In the Netherlands professional medical guidelines are developed under the auspices of the Dutch Institute for Healthcare Improvement CBO (formerly: Centraal BegeleidingsOrgaan) by working groups of experts in various medical specialties [5]. The Blood Transfusion Guideline, first published in 1982, has been revised regularly at the initiative of the National Users' Board of the national blood supply organisation Sanquin.

Transfusion and Transplantation Reactions in Patients (TRIP), the Dutch National Hemovigilance and biovigilance office, collates and reports annually on transfusion reactions and incidents in the transfusion chain [6]. Each year TRIP requests the hospitals to provide data on units of blood components transfused. TRIP is in contact with the designated hemovigilance officer in each of the Dutch hospitals; in nearly all hospitals, there is also a transfusion safety officer (TSO; referred to as haemovigilance employee in the English translation of the Blood Transfusion Guideline) of nursing or biomedical laboratory background who provides practical training on blood transfusion and assists in preparing haemovigilance reports.

On behalf of the CBO blood transfusion working group, TRIP performed a pilot survey of the proposed quality indicators before publication in order to test their practicality, which led to a few minor amendments. At the request of the National Blood Users' Board, TRIP surveyed all the Dutch hospitals for their indicator data for 2011. Based on the 2011 results, it was decided to repeat the survey and collect 2012 data with extra clarifying questions on two indicators. It was hoped that a second survey would achieve a higher response [7].

In this paper, the quality indicator survey results from 2011 to 2012 are presented and discussed.

Materials and methods

The CBO blood transfusion working group defined seven quality indicators consisting of four structural indicators and three process indicators that were published with accompanying factsheets in the Blood Transfusion Guideline (Table 1) [3].

Data collection

The haemovigilance officers in the Dutch hospitals were invited by letter to participate in the voluntary survey of transfusion quality indicators. The data were collected using a dedicated password-protected form on the TRIP website, incorporating links to the indicator factsheets. Hospitals that did not enter data were sent one reminder by email.

For indicator 6, which originally captured a combined end-point based on having performed both pre- and post-

Table 1 Recommended quality indicators for the hospital blood transfusion chain

Indicators	Ideal value
Structural indicators	
Indicator 1	
1a: instatement of hospital transfusion committee (yes/no)	Yes
1b: number of annual meetings of hospital transfusion committee	≥4
Indicator 2	
2a: formal appointment of transfusion safety officer (haemovigilance employee) (yes/no)	Yes
2b: the number of weekly hours spent on haemovigilance tasks	8 h/week
Indicator 3	
Possibility to generate data from hospital computer information system with regard to indicators 5, 6 and 7 (yes/partially/no)	Yes
Indicator 4	
Electronic pretransfusion identification check (yes/on a limited number of wards/no)	Yes
Process indicators	
Indicator 5	
Indication for RBC transfusion: the percentage of erythrocyte transfusions with a pretransfusion Hb ≤6·0 mmol/l (≤9·6 g/dl) within 72 h before transfusion (representative sample allowed)	Near 100%
Indicator 6	
Indication and measurement of effect of platelet transfusions: the percentage of platelet transfusions for which the platelet count was measured <12 h prior to transfusion (a) and <24 h after transfusion (b) in haematology–oncology patients	Near 100%
Indicator 7	
Traceability of transfused blood components: the percentage of units (not returned to the blood transfusion laboratory) for which the transfusion laboratory received confirmation of administration	100%

transfusion platelet counts, these counts were surveyed separately in the 2012 data collection: 6a pretransfusion platelet count and 6b post-transfusion platelet count. Note that indicator 6 did not aim to measure compliance with specified transfusion triggers for platelet transfusions for various indications.

For the second round of data collection on indicator 7, regarding traceability of all blood components (red blood cell concentrates, platelets and fresh-frozen plasma), a question was added about the hospitals' administrative traceability procedures.

Statistical analysis

The 2011 and 2012 blood use data provided to TRIP were applied to analyse responses and assess associations between responders and non-responders with regard to overall blood use and use of red blood cells (RBC) and platelets. The differences between hospitals and between years were tested for statistical significance with ANOVA. For indicators 1 and 2, where specific requirements are formulated in the guideline, change in compliance rate from reporting year 2011 to 2012 was assessed (both separately and combined) with a test for equality of proportions. Statistical analyses were performed with the *R* open source software for statistical computing (version 3.0.0).

Results

Response

Out of the total of 100 hospitals in the Netherlands 78 responded in 2011. In 2012, there were 76 responders (response rate 78%). An overview of results is presented in Table 2. The total number of Dutch hospitals decreased to 98 in 2012 due to discontinuation of transfusion services at two small hospitals; the merger of two hospitals was counterbalanced by the addition of two hospitals that previously reported to TRIP through a single external laboratory. There were no statistically significant differences in total numbers of blood components transfused per hospital between responders and non-responders in either reporting year, nor between hospitals that participated once or twice in the

Table 2 Results of survey of recommended quality indicators

Structural indicators	Ideal value	Response (2012)	Median; mean	IQR	Remark
1 1a: instatement of hospital transfusion committee (yes/no)	Yes	76 Yes = 1	1; 0·96	1-1	
1b: number of annual meetings of hospital transfusion committee	≥4	73	3; 3	2-4	27 compliant in 2012
2 2a: formal appointment of transfusion safety officer (haemovigilance employee; yes/no)	Yes	76 Yes = 1	1; 0·89	1-1	
2b: number of weekly hours spent on haemovigilance tasks	≥8	71	8; 10·9	2-18	
3 Possibility to generate data from hospital	Yes	75	0·5; 0·49	0-1	Desirable for practical reasons.
computer information system with regard to	Yes	76	0·5; 0·45	0-0·5	Yes = 1 Partially = 0·5
indicators 5, 6 and 7 (yes/partially/no)	Yes	76	0; 0·43	0-1	
4 Electronic pretransfusion identification check (yes/on a limited number of wards/no)	Yes	77	0; 0·014	0-0	Not yet a norm Yes = 1 Partially = 0·5
Process indicators					
5 *Indication for RBC transfusion:* the percentage of RBC transfusions with a pretransfusion Hb ≤6·0 mmol/l (≤9·6 g/dl) within 72 h before transfusion	Near 100%				In active bleeding Hb level may be higher
6 *Indication and measurement of effect of platelet transfusions:* percentage of platelet transfusions in haematology–oncology patients for which the platelet count was measured <12 h prior to transfusion (a)	100%	38	0·82; 0·78	0·96-0·73	
And <24 h after transfusion (b)	100%	38	0·74; 0·64	0·48-0·85	
7 *Traceability of transfused blood components:* percentage of units (not returned to the blood transfusion laboratory) for which the transfusion laboratory received confirmation of administration	100%	46	0·99; 0·90	0·96-1·00	

Table 3 Blood use (RBCs, platelets and fresh-frozen plasma) in responding vs. non-responding hospitals

	Reporting year 2011		Reporting year 2012	
	Responding hospitals	Non-responding hospitals	Responding hospitals	Non-responding hospitals
Number of hospitals (number with known number of blood components transfused)	78 (76)	22 (18)	76 (76)	20 (20)
Annual blood use (units)				
Mean annual blood use	6438	7206	6201	4507
25th percentile	2602	2696	2447	1232
Median (50th percentile)	4406	3863	3828	2841
75th percentile	8680	8006	7244	11 122

survey (Table 3). In all, 66 hospitals participated in both annual surveys. There were 10 hospitals that participated in the 2012 survey for the first time; however, 11 hospitals that participated in the 2011 survey did not respond in 2012 for unknown reasons.

Hospital blood transfusion committee and transfusion safety officer (indicators 1 and 2)

In both survey years, all but three responding hospitals had instated a hospital transfusion committee. Those without transfusion committees were hospitals with very few blood transfusions, with the exception of one large hospital in 2011. Only 30% of responding hospitals in 2011 and 36% of responding hospitals in 2012 held the recommended four annual meetings (Table 4). Most hospitals had appointed a transfusion safety officer. In 2011, 36 out of 73 responding hospitals employed their transfusion safety officer for the recommended minimum of 8 h/week (49%); this was the case in 39 out of 71 (55%) responding hospitals in 2012 (Table 5). There was no correlation between the hospitals' level of blood use and their compliance with these two quality indicators (data not shown), nor was there a statistically significant change in compliance rates from 2011 to 2012. Only 14% of the responding hospitals in 2011 and 23% in 2012 complied with both the recommended minimum of four annual transfusion committee meetings and the minimum of 8 weekly hours for haemovigilance tasks by a transfusion safety officer. The increase was not statistically significant, nor was there an increase in compliance rates from 1 year to the next among the 66 hospitals that provided data for both years.

Ability to generate data from the hospital computer system (indicator 3)

Of the participating hospitals, 37 (47%) in 2011 and 39 (51%) in 2012 replied that data for at least one of the process indicators 5, 6 and 7 could be generated from the laboratory computer system (response: yes). Figure 1 shows the 2012 response per process indicator as well as the number of hospitals that actually provided data for each indicator. The provision of data increased with the level of automated data generation (on average 35% for hospitals answering 'No', 53% for 'Partially' and 72% for 'Yes'). However, not all hospitals that stated they could generate data from their computer system actually provided data for the process indicators.

Electronic pretransfusion check (indicator 4)

With regard to electronic pretransfusion checking of patient and blood component, four hospitals reported partial implementation (i.e. on a limited number of hospital wards) in 2011. In 2012, one hospital (a non-participant in 2011) reported hospital-wide implementation of the electronic pretransfusion check and six reported partial implementation. Thus, compliance with indicator 4 in 2012 was only 1%.

Table 4 Responding hospitals with blood transfusion committee (BTC) and number of annual meetings

Indicator 1 Hospitals with BTC (% of respondents)		Number of annual BTC meetings					
		≥4	3	2	1	0	Not reported
2011	75 (96)	23	23	18	9	1	1
2012	73 (96)	27	22	16	5	1	2

Table 5 Hospitals with transfusion safety officer and weekly hours spent on haemovigilance tasks

Indicator 2 Transfusion safety officer appointed (% of respondents)		≥8 h/week	<8 h/week	Not reported
2011	65 (83)	37	24	4
2012	68 (89)	39	24	5

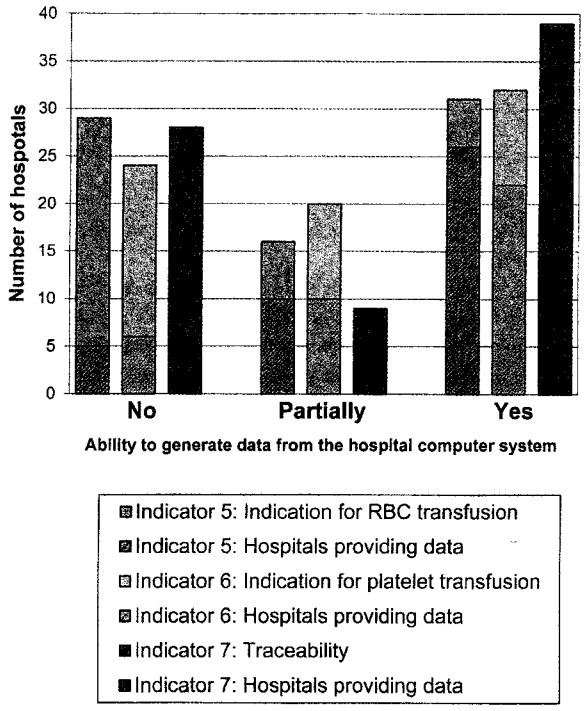

Fig. 1 Ability to generate data on process indicators (indicator 3) from hospital laboratory information systems and actual provision of data in 2012.

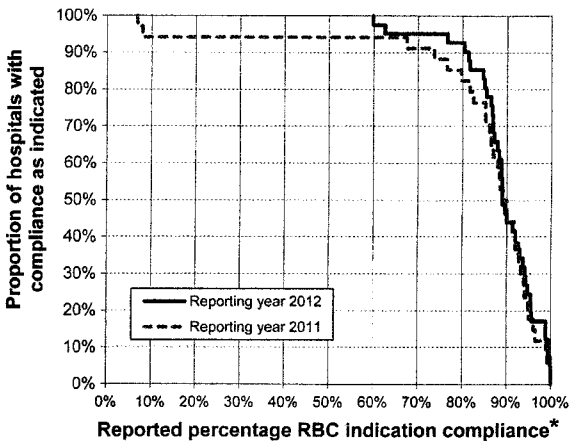

Fig. 2 Percentage of hospitals as a function# of the level of compliance to the RBC transfusion indication in 2011 and 2012 (34 and 41 hospitals, respectively).
*Indicator 5: the percentage of red blood cell transfusions with a pretransfusion Hb ≤6·0 mmol/l (≤9·6 g/dl) within 72 h before transfusion.
#Reading of this graph: draw a vertical line at the compliance level of interest, for example 90%. Where this line cuts the curve, draw a horizontal line to the vertical scale to read the percentage of hospitals at this level of compliance or higher: thus in both 2011 and 2012 approximately 45% of hospitals reported a compliance of 90% or higher.

Process indicators for red blood cell transfusion, platelet transfusion and traceability (indicators 5, 6 and 7)

Between 30 (38%) and 46 (61%) hospitals provided data for one or more of the process indicators 5, 6 and 7. The response on these indicators was significantly lower than the response on the four structural indicators, both for 2011 and for 2012.

Regarding the RBC transfusion trigger (indicator 5) 34 hospitals submitted data in 2011 and 41 hospitals submitted data in 2012. Four hospitals in 2011 and 8 hospitals in 2012 submitted data based on a representative sample of RBC transfusions. The number of hospitals at each level of compliance to the RBC transfusion indicator is shown in Fig. 2. In the figure, it can be seen that 82% (2011) and 90% (2012), respectively, of responding hospitals met the compliance criteria for RBC transfusions in over 80% of transfusions.

Only 30 hospitals in 2011 provided data for indicator 6. In 2012, 38 hospitals provided data for 6a (pretransfusion indication measurement) and 36 provided data for post-transfusion effect measurement (6b). Figure 3 shows the number of hospitals at each level of compliance with this indicator. The wide range of reported outcomes observed in 2011 was presumed to be caused by the incorporation of two measurements in one indicator. For 2012, the numerator data regarding pretransfusion platelet count within 12 h before platelet transfusion (6a) and effect measurement within 24 h after transfusion (6b) were captured separately. Compliance with measuring the pretransfusion platelet count was higher than measuring the post-transfusion platelet count (which was comparable to compliance with the combined indicator in 2011). Both indicators show a wide range of reported values; in 2012, 58% of responding hospitals measured the pretransfusion platelet count in over 80% of platelet transfusions.

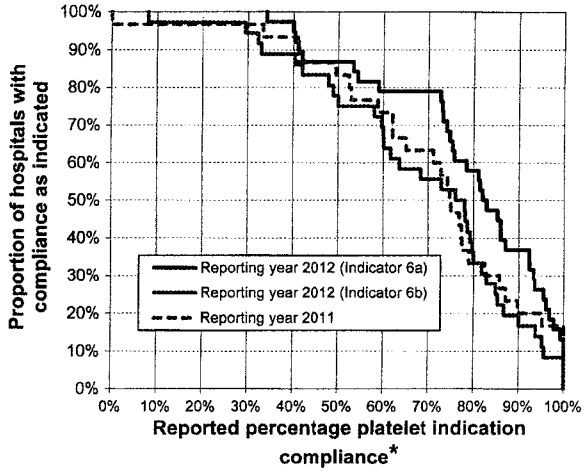

Fig. 3 Proportion of hospitals as a function of the level of compliance with the platelet transfusion indicator in 2011–2012 in haemato-oncology patients (30 and 38–36 hospitals, respectively).
*Indicator 6 the percentage of platelet transfusions where the platelet count was measured <12 h prior to transfusion (6a) and <24 h after transfusion (6b) in haematology–oncology patients. The graph for reporting year 2011 shows the reported compliance to both criteria.

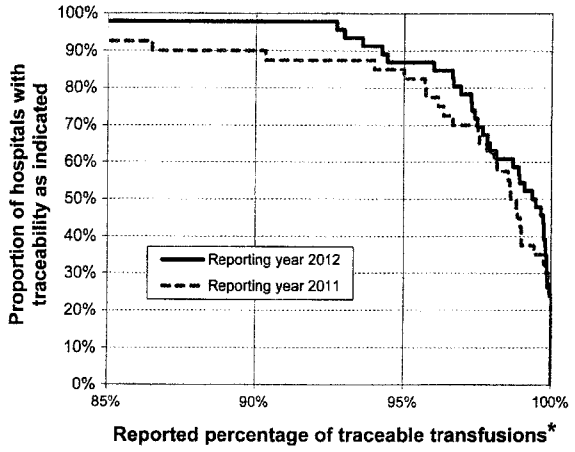

Fig. 4 Proportion of hospitals as a function of the level of traceability of transfused blood components in 2011 and 2012 (40 and 46 hospitals, respectively).
*Indicator 7: percentage of units not returned to the blood transfusion laboratory for which the laboratory received confirmation of administration. Note that the proportion of hospitals between 0% and 85% of traceable transfusions remains unchanged.

Out of the 40 hospitals in 2011 and 46 hospitals in 2012 that submitted data on traceability (indicator 7), 10 (25%) and 11 (24%) hospitals, respectively, reported 100% traceability of all blood components issued from the transfusion laboratory. The number of hospitals at each level of traceability of transfused blood components is shown in Fig. 4. From this figure, it is clear that traceability is generally high: over 95% traceability was achieved in 87% of responding hospitals in 2012 (83% in 2011).

During analysis of the 2011 survey results, it was noted that there was no information on the administrative processes for confirming transfusion in the hospitals. Additional questions on this were added in the 2012 survey. As shown in Table 6, the administrative processes for ensuring traceability in the responding hospitals varied widely. In 15 (20%) of 74 responding hospitals, the transfusion laboratory did not receive any form of confirmation of transfusion after issuing a blood component and the issued blood component was assumed to have been transfused to the patient for whom it was issued. Two of these hospitals, however, still reported traceability amounting to 99% (this was based on a sample of returned blood bag tags) and 100% (near-identical numerator and denominator not explained), respectively. Among hospitals where the transfusion laboratory receives confirmation of transfusion to the patient, only some subsequently make a distinction in the computer system between 'transfusion confirmed' on the one hand and 'transfusion presumed' for cases where confirmation cannot be obtained: this was in place in 23 (31%) of 74 responding hospitals in 2012. All 11 hospitals that reported 100% traceability in 2012 (identical numerator and denominator) had administrative procedures to confirm transfusion; however, five stated that they did not register unconfirmed transfusions differently from confirmed transfusions in their computer system.

The data regarding 2011 and 2012 were comparable for all indicators. Analyses were repeated for the subset of 66 hospitals that participated in the survey in both years and showed no differences with the exception of a statistically significant rise in the proportion of hospitals that provided actual figures for process indicators 5, 6 and 7: from 46% to 61% (P-value = 0·005).

Discussion

The Dutch Blood Transfusion Guideline incorporates extensive quality and safety recommendations with regard to all aspects of the hospital blood transfusion chain of labile blood components comparable to the Australian Standard for Blood and Blood products [8]. The selection of the seven quality indicators followed a similar procedure to that described by the Joint Commission on Accreditation of Healthcare Organisations for the development of performance measures for patient blood management, but did not involve a pilot testing phase for volunteer participating hospitals with webcast training and guidance by email or telephone regarding data collection, as no funds or personnel were available for such an effort [9]. For reasons of practicality, a limited set of blood transfusion quality indicators was selected.

Table 6 Traceability: additional questions and answers received in the 2012 survey

Administrative method of confirming transfusion to transfusion laboratory	**Hospitals total n = 74 responses, (%)**
Return of transfusion form	53 (72)
Return of empty bag	5 (7)
Electronic tracking	1 (1)
No confirmation, transfusion assumed to have been administered	15 (20)
Action if no confirmation received	**Hospitals total n = 71 responses, (%)**
Ward contacted for confirmation	48 (68)
Electronic patient records checked	6 (8)
No further confirmation sought	17 (24)
Administrative process in case of unconfirmed transfusion	**Hospitals total n = 67 responses, (%)**
Registered as transfused to intended recipient	42 (63)
Registered differently, for example transfusion to intended recipient assumed	25 (37)

This study obtained a good participation of 78% of Dutch hospitals in a voluntary survey evaluating seven internal quality indicators for hospital blood transfusion practice. A high response rate (>93%) was achieved for the structural indicators (1–4), but a lower response was obtained for the three process indicators (38–61%) which required extracting data from laboratory information systems or analysing data samples.

The answers to indicators 1 and 2 are easily obtained and offer a nationwide overview of transfusion guideline implementation with regard to instatement of a transfusion committee and employment of a transfusion safety officer in the Dutch hospitals. Most hospitals have a hospital transfusion committee and have appointed a transfusion safety officer, but there was lower compliance (23% in 2012) with regard to the recommended four annual transfusion committee meetings (indicator 1b) combined with formal appointment of a transfusion safety officer for a minimum of 8 h/week (indicator 2b). These guideline indicators are based on the assumption that a regularly convening transfusion committee and the appointment of a transfusion safety officer for a minimum of 8 h/week will have a positive effect on hospital transfusion practice. There is no comparative research available that provides evidence for improvement of transfusion practice by a hospital transfusion committee and transfusion safety officer. However, it is likely that they do improve their hospital's transfusion practice as it is their primary function to implement the guideline recommendations and oversee the quality of blood transfusion practice in their institution (Indicator 1 factsheet) [5].

The ability to extract data is a prerequisite for efficient annual measurement of quantitative transfusion practice process indicators. Some hospitals reported that they could potentially generate data for the process indicators, but as the relevant computer programming had not been performed actual data could not be provided. There was a statistically significant increase in the proportion of process indicators reported (from 44% in 2011 to 55% in 2012; $P = 0{\cdot}03$), with the increase primarily in the reporting of indicators 5 and 6 by hospitals that stated that no or only partial automated data extraction was possible (data not shown). This suggests that in the second round of indicator data collection (2012) more effort was put into the (semi) manual extraction of the required data. Providers of laboratory computer information systems may in future be requested by hospitals to improve data extraction facilities in order to provide such process indicators to their end users.

For indicator 5 (indication for RBC transfusion), 90% of responding hospitals met the criterion in over 80% of RBC transfusions in 2012. The Hb level of ≤6·0 mmol/l (≤9·6 g/dl) is the level above which according to national and international consensus transfusion of red cells is not indicated for any patient as no positive effect is to be expected [3, 10, 11]. The window of 72 h was chosen to be able to include outpatients as well as inpatients. All hospitals should be able to approach 100% compliance with this indicator. Providing the data can be extracted from the transfusion laboratory information system, this indicator is useful for documenting RBC transfusion triggers and could provide information for benchmarking of red cell prescribing practice.

The measurement of platelet counts for establishing indication and effect of platelet transfusion in hemato-oncology patients (indicator 6) was selected as an indicator in the Blood Transfusion Guideline as a means of monitoring platelet transfusion practice in a patient population for whom platelet transfusions are often prescribed [3]. It is possible that some transfusion laboratories were not able to identify this patient group and may have chosen to include all platelet transfusions

or to provide no data. Our 2012 survey results show that pretransfusion platelet counts are available in a higher percentage of transfusions than post-transfusion platelet counts (Fig. 3). However, the data on both pre- and post-transfusion platelet counts suggest that compliance with the guideline could be improved in the majority of responding hospitals. As refractoriness due to HLA antibodies after transfusion of leucoreduced platelets occurs in only 7% of cases, it could be argued that pretransfusion platelet count could suffice as an indicator [12]. However, other causes for a poor increment in platelet count after transfusion (e.g. sepsis, graft-versus-host disease, splenic entrapment, ABO-incompatible platelets, low-quality product) might then be missed. The indicator did not measure appropriateness of platelet transfusion. The United Kingdom National Comparative Audit of Blood Transfusion, performing a re-audit of platelet use in 2010, considered 34% of prophylactic platelet transfusions inappropriate and found that overall 27% of platelet transfusions could have been avoided [13]. A national audit in the Netherlands would be needed to determine percentages of inappropriate platelet transfusions.

Complete traceability from donor to recipient is mandatory by European law [14]. Data linking each unit to its intended recipient or final destination must be kept for 30 years, and this is commonly available in the blood transfusion computer system. However, confirmation that a unit has actually been transfused is not always returned to the transfusion laboratory – although there would normally (also) be a record of transfusion in the patient's dossier – this is less likely to be accessible for 30 years. Indicator 7 aims to measure compliance within hospitals with the mandatory traceability of blood components from donor to recipient. In 2011 only 8 and in 2012 only 11 responding hospitals met the required 100% traceability. The additional questions on traceability in 2012 revealed that 15 responding hospitals (20%) did not have any process in place for the administration of traceability.

For many years, various indicators on blood transfusion have been collected and reported in European context in order to compare blood transfusion practices [15]. Such evaluations have provided very useful insights and do not only allow comparison of blood use between countries (e.g. blood use per capita), but also allow assessment of changes in blood transfusion practice over time. The United Kingdom National Comparative Audit of Blood Transfusion has captured useful, quite detailed information on transfusion indications and other relevant parameters; however, this work is based on a sample of transfused units in a sample of hospitals [16]. As far as we know, this is the first published study with national data on hospital-level compliance with specific national transfusion practice recommendations.

For reasons of practicality, a very limited number of indicators were identified by the working group that revised the CBO Blood Transfusion Guideline. Each of the indicators was chosen for its potential for improving hospital transfusion practice. Obviously, they cannot cover all aspects of hospital transfusion practice. The additional questions in the second survey provided more insight into the methods for documenting the actual administration of blood components.

It is to be noted that the indicators were primarily developed for use as internal quality indicators for the hospital transfusion process. Obviously automated extraction of process indicator data is paramount for hospitals. Besides the use of these indicators for internal monitoring, they constitute a potential tool for benchmarking. Furthermore, the current indicators could also be used to compare hospital transfusion practice between countries; adoption of these indicators by the International Society of Blood Transfusions would then be needed.

The number of hospitals that were able to provide data for process indicators showed only a slight increase in 2012 and there was little change in compliance. It was therefore decided not to repeat the survey in 2013. The present results will be presented in national fora as a stimulus for increasing response and for improvement of practice. When a new round of data collection is undertaken, changes in the hospitals' indicator data can be assessed against other 'gold standard' parameters to assess validity of each indicator and determine a benchmark. Revision of the quality indicators will be included with the next revision of the Blood Transfusion Guideline. At that time, the results as well as additional indicators which may be in use in the hospitals or in other countries should be taken into account. To assist hospitals with future gathering of data for the quality indicators, the necessary IT assistance should be made available.

Conclusion

This study shows that it is feasible to monitor aspects of the quality of blood transfusion practice and to assess guideline compliance using blood transfusion quality indicators. Providing that the data can in future be generated from hospitals' computer systems, repeated collection of indicator data will allow monitoring of change within the hospitals as well as at national level and could form a basis for (inter)national benchmarking.

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MRS was involved in the selection of the quality indicators, PYZJ co-ordinated data collection, MPJ performed data analysis, PYZJ and JCWO drafted the article, all authors critically reviewed the article and consent to its submission.

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