VIA MEDICA

ORIGINAL RESEARCH ARTICLE

Acta Haematologica Polonica 2022
Number 3, Volume 53, pages 183–190
DOI: 10.5603/AHP.a2022.0021
ISSN 0001–5814
e-ISSN 2300–7117

Usefulness of training based on outcome of transfusion committee report: assessment by personnel involved in blood therapy

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Abstract

Introduction: We assessed three training formulas i.e. on-site, on-line and e-learning for members of transfusion committees, doctors responsible for blood management, other members of hospital staff, and blood establishment employees involved in blood transfusion.

Fundamental to a successful blood transfusion is the proper education of physicians, nurses and diagnosticians. External inspections of entities involved in blood transfusion revealed that continuous education should be extended to include also other personnel involved in blood transfusion.

Material and methods: Our analysis was based on statistical data from training courses and anonymous satisfaction surveys. Separate questionnaires were prepared for each type of training (on-site, on-line, and e-learning) and questions were adjusted to their specific characteristics. On-site and on-line courses had 659 and 260 participants respectively, and the e-learning module had 6,093. Altogether, 1,101 completed questionnaires were subjected to analysis.

The MS Excel program was used for analysis of questionnaire content and Microsoft Power Business Inteligence (Power BI) was used for data analysis and outcome visualization.

Results: 31% of respondents were members of transfusion committees (49% laboratory diagnosticians, 47% physicians, 4% nurses). On a 5-point scale, an average score of 4.3 was ascribed to sessions that helped upgrade professional qualification (4.37 — on-site, 4.59 — on-line and 4.31 — e-learning). 93.5% of the e-learning participants gave a rating of high or very high to the usefulness and effectiveness of such a formula; 95.6% declared their readiness to recommend it.

Conclusions: All three types of training were found to be useful in upgrading professional awareness. Regardless of the formula of training in which they participated, the responders acknowledged the importance and benefits of continuous training.

Key words: training, blood, transfusion committee

Acta Haematologica Polonica 2022; 53, 3: 183–190

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Received: 26.01.2022 Accepted: 27.02.2022

Introduction

The proper training of medical personnel is one of the prerequisites of safe and effective blood therapy. Supervision over the transfusion chain is one of the responsibilities of the Institute of Hematology and Transfusion Medicine (IHTM) within the framework of the hemovigilance system. An analysis of TC reports and inspections performed by blood establishments (BEs) in hospitals, immunohematology laboratories and hospital blood banks revealed that many areas appertaining to blood transfusion still require improvement, from the basic organization of blood therapy right through to the principles of BE/hospital cooperation and supervision over blood transfusion. Lack of adequate knowledge was determined to be the main reason for the identified non-compliances, and so training of medical personnel became one of the prerequisites of safe and effective blood therapy. Knowledge and expertize are transferred to the medical personnel during external and internal training sessions. The transfusion practice in hospitals is supervised either by physicians appointed responsible for blood management or by transfusion committees. The tasks include monitoring the safe administration of blood components, the analysis of adverse events and reactions, as well as the organization of training courses for medical personnel [1, 2]. For many years now, attention worldwide has been focused on the role of transfusion committees [3, 4].

Ensuring an adequate educational background of physicians, nurses and diagnosticians is fundamental to safe blood collection and transfusion. In Poland, physicians employed in BEs or hospitals have the opportunity to pursue specialization in clinical transfusion medicine. Since 2001, all laboratory diagnosticians with higher education have been offered the opportunity to specialize in laboratory transfusion medicine.

External inspections and analysis of TC reports revealed that continuous education should also be offered to other staff involved at all stages of the blood transfusion chain, and not only to the personnel trained during specialization courses. The two data sources revealed insufficient awareness as regards blood transfusion practices, alternative blood sources, special blood components (i.e. irradiated, inactivated, *etc.*), and handling of adverse reactions and events (ARE) [5, 6].

Knowledge and skills are acquired via training. In Poland, a different scope of training applies to BE personnel and to hospital staff directly involved in transfusion procedures. In-house training has been obligatory for BE staff for many years now, but this has not been the case for hospital staff.

Since 2005, hospitals performing transfusions have appointed physicians responsible for blood management who are obliged to participate in training courses every four years [7]. The same is true of nurses licensed to participate in blood transfusions; after initial theoretical and practical training, they must participate in training every four years. The quality of blood components is also safeguarded by transfusion committees (TCs) which, pursuant to Polish regulations, are established in every transfusion-performing hospital with a minimum of four wards.

Extremely important is continuous training. In 2005–2009, the IHTM cooperated with the Portuguese Blood Institute (*Instituto Português do Sangue e da Transplantação*) in organizing a major training campaign within the Transition Facility project [8]. This program was dedicated primarily to BE staff. Continuious training of BE personnel is mandatory and should be controlled by the IHTM as the competent authority.

The project outcome captured the attention of the Polish Ministry of Health, and its 2010 health policy program allocated separate ministerial funds for countrywide training.

The health policy program 'Ensuring the self-sufficiency of the Republic of Poland in blood and blood components for the years 2015–2020' provided funds for on-site training as well as e-learning in 2017–2020. Training activities also included the publication of the 'Standard for Activity of the Transfusion Committee' [9, 10]. Until then there had been no clear guidelines for the training of TC members. The publication of 'Standard for Activity of the Transfusion Committee'filled the gap between self education and training courses.

The SARS-CoV-2 pandemic induced a broader outlook on training and educational activity. On-site training had to be replaced by new forms of educational activity.

Our study aim was to assess the three training formulas (i.e. on-site/stationary, on-line, and e-learning) addressed to TC members, physicians responsible for blood management, and also to other members of hospital staff involved in blood transfusion, as well as to BE and hospital laboratory diagnosticians performing tests for transfusion.

Material and methods

Our material for analysis was statistical data from training courses as well as from anonymous satisfaction surveys completed by participants. Separate questionnaires were developed for each of the three training formulas: stationary/on-site, on-line, and e-learning. The questions were adjusted to the specific characteristics of each type of training, but some items were common to all three. Representatives of hospitals performing blood transfusion participated in each of the three training modules, while BE employees participated only in e-learning and on-line sessions.

Table I presents the number of training sessions and participants in two types of training (stationary and on-line) organized in 2017–2020. E-learning was launched in November 2018. Figure 1 shows the number of participants

Table I. Data referring to on-site and on-line training courses

Year	Type of course	Professional group							
		Physicians		Nurses and midwives		Laboratory diagnosticians		Total	
		No. courses	No. participants	No. courses	No. participants	No. courses	No. participants	No. courses	No. participants
2017	On-site	1	32	1	45	1	42	**3**	**119**
2018	On-site	2	80	2	86	2	85	**6**	**251**
2019	On-site	2	84	2	84	2	84	**6**	**252**
2020	On-site	0	0	0	0	1	37	**1**	**37**
2020	On-line	2	94	2	92	1	74	**5**	**260**
Total		**7**	**290**	**7**	**307**	**7**	**322**	**21**	**919**

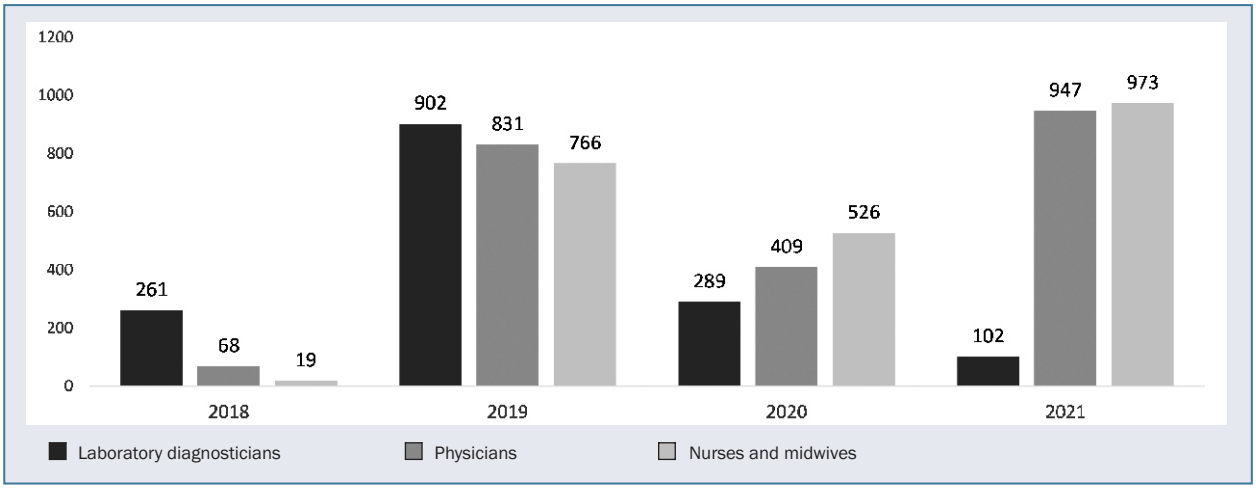

Figure 1. E-learning platform users in period November 2018 to April 2021

of e-learning training between November 2018 and April 2021. A total of 6,093 participants were recorded: 1,554 diagnosticians, 2,255 physicians, and 2,284 nurses. By the end of 2020, a total of 4,071 participants had completed training; 1,452 diagnosticians, 1,308 physicians, and 1,311 nurses. In 2021, the e-learning formula was the only form of educational training.

Lecture topics were adapted to each professional group and covered issues related to the transfusion of blood components. The educational material was tailored to each professional group, with the emphasis on daily routine performance. Each on-site and on-line course consisted of 15 lectures (a 40 min presentation and a 5 min Q&A). The e-learning course comprised 17 lectures divided into 2–3 parts of approximately 10–15 min each. The Q&A module was accessible. Formal tests followed each course. These test results are not the subject of this paper. The topics discussed during training courses were:

- blood transfusion service in Poland, with emphasis on legal acts, organization of blood transfusion therapy in hospitals;
- preparation, use and storage of blood components and blood products;
- indications for the use of blood components and blood products;
- principles of patient blood management (PBM);
- therapeutic procedures — aspects of safe transfusion;
- role of nurse in transfusion process (from ordering of transfusion to adverse reaction/event);
- autologous transfusion and PBM implementation in hospital setting;
- aspects of safe transfusion of blood and blood components;
- adverse events and reactions including serious and clinical cases;
- immunohematology: significance for safe transfusion;
- appropriate provision of blood components;
- organization and tasks of blood banks;
- cooperation between hospital ward, immunohematology laboratory, and blood bank;
- pathogens in transfusion medicine;

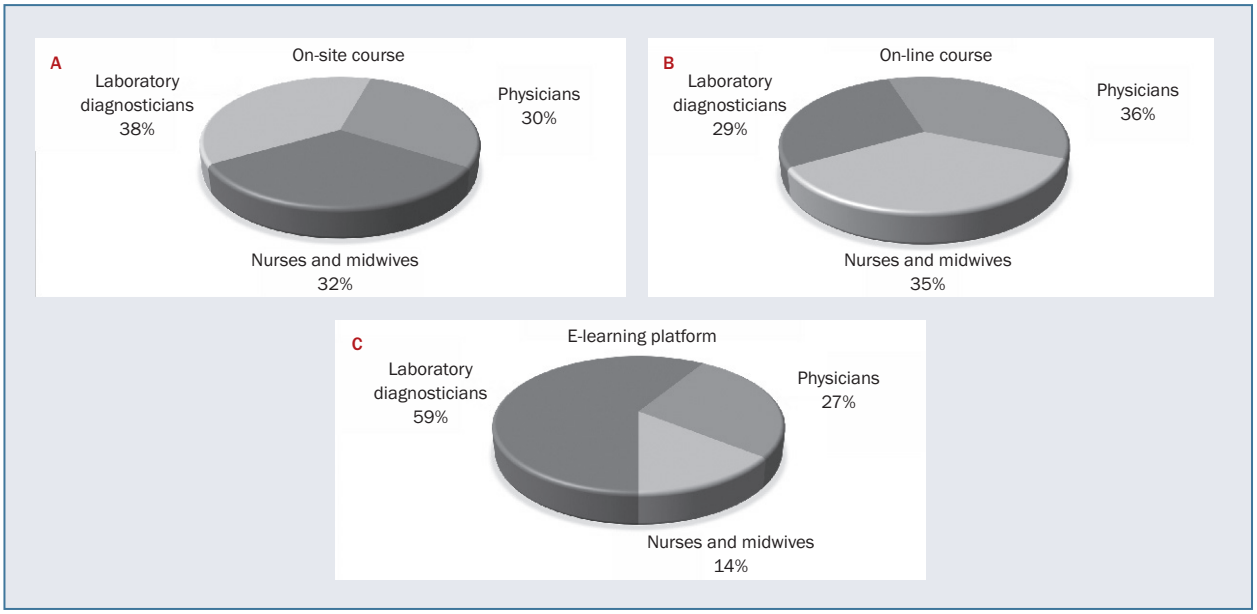

Figure 2A–C. Percentage distribution of professional groups as participants in three types of training course

- tasks of transfusion committee and doctor responsible for blood management;
- importance of IT in transfusion medicine;
- quality assurance system;
- risk management in transfusion medicine;
- and hemovigilance.

Questionnaires

Apart from confirmed participation and passing the test, on-site and on-line training required completion of an anonymous satisfaction questionnaire. Only then were certificates issued. For e-learning participants, the survey was anonymous and voluntary.

Stationary training provided 659 paper questionnaires which were subjected to analysis. On-line training contributed 260 computer-administered questionnaires collected in digital form with special online survey software and subjected to analysis. E-learning platform users were asked to complete an online satisfaction survey in January 2021. The survey link provided via Google Forms remained active only for five weeks, during which 182 participants responded.

The three training formulas thus rendered altogether 1,101 questionnaires.

Methods

For more effective analysis, three MS Excel tables were developed to include survey responses in each training module.

Paper-responses (i.e. to on-site training) were entered into a special table, while electronic responses (i.e. to on-line training and e-learning) were sorted out and transferred into two separate table-templates.

Microsoft Power Business Intelligence (Power BI) was used for data analysis and visualization of the outcome.

Results

In the on-site formula, the highest number of questionnaires was completed by laboratory diagnosticians (248), then by nurses and midwives (215), and then by physicians (196). Among on-line participants, the most numerous group were physicians (94), then nurses and midwives (92), and laboratory diagnosticians (74). The number of completed questionnaires corresponded to that of participants.

While the survey link was active, the questionnaire was completed by 182/4,071 e-learning platform users (4.47%). The 182 comprised laboratory diagnosticians (107), physicians (49), and nurses and midwives (26).

Figure 2 presents the percentage distribution of professional groups with regard to responders of all three training modules.

A very large majority of all responders were women (86%). Figure 3 presents the percentage distribution of women and men broken down by professions.

The e-learning platform survey included questions referring to age. For all three professions, the 25–33 and 34–41 age groups were the most numerous (28% for both). The 49–57 and 41–49 age groups had 24% and 15%, respectively, and the 58–65 age group was the least numerous (5%). Another question referred to membership in the hospital TC and rendered 31% affirmative answers. Most TC members were laboratory diagnosticians and physicians (49% and 47% respectively). Only 4% of nurse-responders declared TC membership.

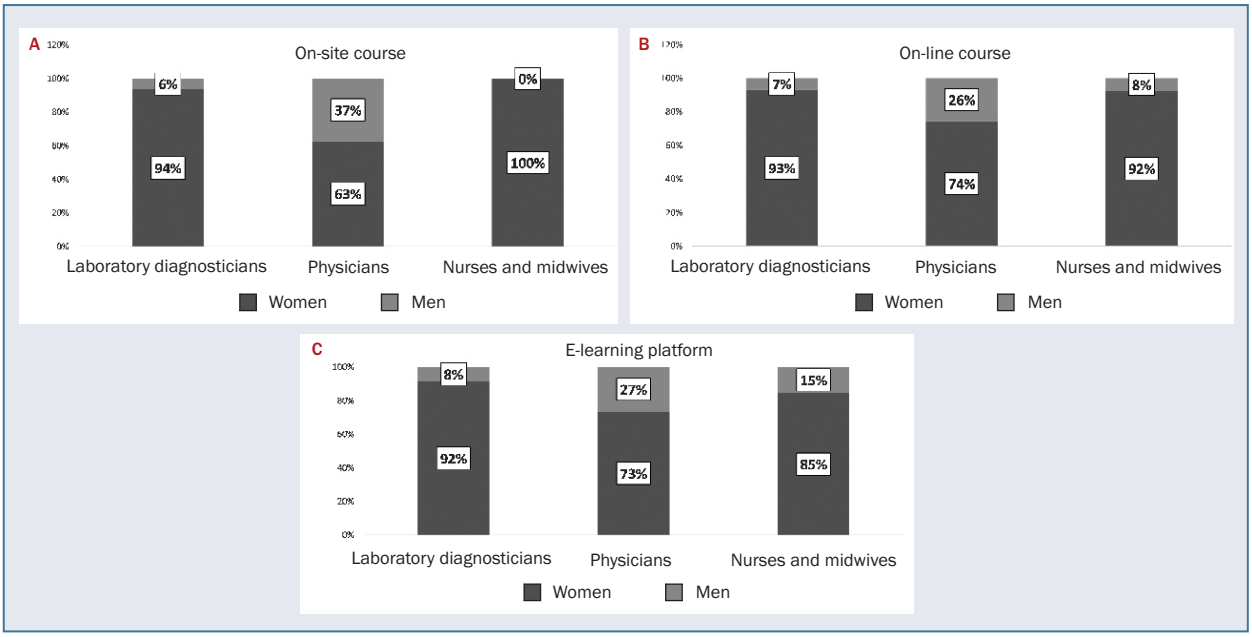

Figure 3A–C. Percentage distributions of men and women as participants in three types of training course broken down into professional groups

Usefulness of the educational content in terms of gaining professional qualifications was estimated by all participants (three modules) on a five-point scale. The educational material was rated very high by all (>4.3 on average, and the highest scores went to on-line training (average rating: 4.59). Participants of the stationary courses and platform users estimated the usefulness of the acquired knowledge at 4.37 and 4.31, respectively. Table II presents the outcome for each professional group.

As regards the uselessness of any lecture, affirmative answers were provided only by 11% of e-learning responders, 6.4% of stationary training responders, and 6.2% — on-line trainees.

Most responders found all topics useful for their daily practice; the least useful referred to organizational issues, legal regulations, immunohematological tests, and blood component administration. Suprisingly, other participants found these very topics worth expanding. The topics indicated as being the least useful were usually those not directly related to the responders' routine tasks. These topics were included in the program to broaden knowledge about transfusion medicine and upgrade the overall performance level.

Regarding the topics to be expanded, most affirmative answers came from e-learning users (37.4%), on-line training participants (15.8%), and in-house training participants (2.4%). The following subjects were the most frequent:

- practical classes, clinical cases;
- immunohematology tests — new challenges, regulations, difficult cases;
- blood therapy in specific patients (e.g. children, transplant recipients);

Table II. Average score in response to survey question: "How useful is the knowledge gained during training for upgrading professional qualifications? (5-point scale)"

Professional group	On-site course	On-line course	E-learning platform
Laboratory diagnosticians	4.33	4.65	4.47
Physicians	4.34	4.49	4.27
Nurses and midwives	4.43	4.62	4.19
Mean	**4.37**	**4.59**	**4.31**

- hemovigilance, serious adverse events and reactions (SARE);
- pathogens;
- and indications for transfusion of blood components on specific examples.

Users of the e-learning module were also asked to assess the usefulness and effectiveness of this form of training, and to declare willingness to recommend it to others. Figure 4 presents the provided answers.

The e-learning platform users were also asked their opinion of the most valuable, and the most burdensome, aspects of such training. They indicated as the most advantageous:

- free access to educational material;
- availability of the course at any time;
- possibility of coming back to previous lectures;

Figure 4. Response to "How do you assess the usefulness and effectiveness of this form of training?" (**A**) and "Would you recommend this training to other people?" (**B**)

- possibility of listening to lectures regardless of location;
- advantage of recorded audio material over 'stationary' lectures;
- and time saving.

They emphasized the extensive knowledge and experience of the lecturers, and appreciated the Q&A option and formal tests after each lecture.

The aspects they found the most inconvenient were:

- problems with concentrating for long periods in front of a computer monitor;
- and no face to face or direct contact with lecturer, and no possibility of asking questions during replay of video-recorded lectures.

Most participants found no negative aspects, while some others suggested making all submitted questions and answers seen to other users. The platform provided the option of a discussion forum, but not all participants were eager to make use of this.

Discussion

In Poland there have been to date no evaluation studies on the activity of TCs, nor countrywide-training dedicated to TC members and other personnel involved in transfusion. There has been no available data for assessment of the current state of knowledge. Preliminary analysis of TC annual activity protocols indicated inadequate knowledge among personnel.

This study offers extensive material for assessment of the effectiveness of educational training. Our evaluation criteria referred not only to the assessment of blood transfusion procedures or to the number of observed ARE, but also to the up-grading of procedures for reporting SARE to the competent authority. According to the data forwarded to the IHTM, the number of reported SARE has markedly increased recently [11]. The significance of reporting such incidents as well as their interpretation have been strongly emphasized during training sessions. Clinical cases were discussed at length to illustrate what should be reported and how to improve self-awareness in this respect. In 2017–2019, the number of SAREs reported to the Institute (as the competent authority) increased from 71 to 196. The 152 reports in 2020 may be attributable to a SARS-CoV-2–related smaller number of donations and transfusions [own information]. Feedback from trainees revealed better self awareness as a result of the completion of courses to be positively associated with a higher reporting rate for SAREs.

Education in transfusion medicine for medical students and residents is often insufficient. It therefore seems necessary to develop formal training programs/curricula to assess the outcome and enforce cooperation both at national and international levels [12]. Although traditional classroom training has always been considered adequate, training based exclusively on printed material is usually ineffective [2, 4]. Recently, attention has focused on new training techniques targeted at medical students and residents. One such example is e-learning [13–15].

Miller et al. [16] draws attention to the role of transfusion practitioner (TP) and the TC. In both cases, solid background knowledge about transfusion medicine is essential for adequate daily performance. Special training programs for TPs and TC members are required to upgrade the safety of transfusion as well as new techniques and modalities [16].

Our study demonstrates that the trainees who completed the courses found all three modules to be beneficial for training of personnel in transfusion medicine.

The current epidemiological situation has enforced the remote training formula as one of the most advantageous solutions. Adjusting the training modality to the needs of the particular professional group seems to be a top priority [17]. The impact of the SARS-CoV-2 pandemic on the number of e-learning participants is evident. In Poland, the obligatory 4-year interval between training courses for physicians responsible for blood management and for nurses was extended by nine months. In 2020, the interest in the e-learning platform was lower, most likely because medical personnel had more pandemic-related tasks. The first months of 2021 however witnessed a rapid increase in the number of trainees, most likely due to the expiry of licenses for medical staff as well as the absence of opportunity to organize in-house training.

Analysis of the e-learning questionnaires demonstrates high (45%) and very high (48%) satisfaction rates. Almost 78% were willing to recommend this form of training.

The e-learning trainees were also asked about practical application of the acquired knowledge. The average rating was 4.3 (on a 5-point scale), while the level of satisfaction was rated 4.45. The tutors (stationary and online training) were assessed for content and lecture presentation; the purpose was to confirm the choice of the lecturing team. A high level of tutorial knowledge was confirmed: 91.2% of respondents (e-learning platform) declared the training course to have met their expectations and that the acquired knowledge improved the quality of their daily performance.

Discussions with trainees revealed greater self-awareness of the significant role of TCs and doctors responsible for blood management because lecturers strongly emphasized some aspects related to safety, risk management and SARE. Focus on TCs activity helped the participants realize its significance for transfusion-related activities.

As mentioned earlier, in 2017–2020, on-site training for medical staff who were members of transfusion committees was financed from the health policy program. The aim was to expand education in transfusion medicine. The e-learning platform launched as part of this program was dedicated to continuous and regular self-education in blood transfusion. This platform comprised the educational material presented during stationary and on-line courses: 176 films, 291 quizzes, 30 PDF files and 30 presentations with additional materials, and 30 video files in mp4 format.

Unlimited access to the e-learning platform also provided opportunities for medical personnel who were not directly involved in transfusion practice activities but who were eager to acquire skills in this field. Such was the approach of most responders of the e-learning platform. A similar approach has also been observed in other countries [18].

Adequate training of medical personnel is essential for safe transfusion. Morgan assessed the effectiveness of training in transfusion medicine for medical students and residents, and stressed the value of such training [2]. The courses contributed to the development of theoretical and practical skills, and were highly rated. Numerous studies have emphasized the need to upgrade knowledge in all professional groups involved in transfusion medicine. Inadequate knowledge means poor cooperation between the professional groups involved in transfusion procedures, which may lead to higher morbidity and mortality and ultimately to higher treatment costs [1, 4, 13–15]. Study results (our own included) indicate satisfaction with the training and awareness of the significance of continuous training. Peterson et al. have presented an excellent example of an e-learning module conducted since 2007, with over 400,000 trainees from 1,500 hospitals and organizations. A survey completed by 3,885 responders revealed that 89.3% gained additional knowledge in transfusion practice, and 87.6% believed that this knowledge would impact on therapy outcomes and patient safety [19]. Our survey outcome was similar. Training could be implemented both on a national scale and in hospitals [20]. Internal training programs could be tailored to the hospital profile while a uniform educational training program is recommended to facilitate the exchange of experience.

Participants' comments revealed numerous topics as requiring more profound discussion. Growing awareness regarding transfusion procedures and of ARE/SARE, as well as the necessity of reporting them to the competent authority (IHTM), was also observed. Our analyses identified the areas of transfusion medicine that still require improvement and implementation of advanced regimens and methods of blood and blood component therapy as well as novel solutions, guidelines and regulations for strengthening donor and recipient safety.

To this purpose however, training and educational activities must be supported by legal regulations, guidelines and governmental financing.

Authors' contributions

JAP — conceived and planned study design. JAP, AM and KS — performed research and contributed to data analysis. JAP wrote paper with input from all authors. All authors approved manuscript.

Conflict of interest

None.

Financial support

This study was not supported by a financial grant.

Ethics

The work described in this article has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans; EU Directive 2010/63/EU for animal experiments; Uniform requirements for manuscripts submitted to biomedical journals.

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