Received: 17 May 2022 | Revised: 3 August 2022 | Accepted: 11 September 2022

DOI: 10.1111/tme.12920

SHORT COMMUNICATION

TRANSFUSION MEDICINE WILEY

E-learning/online education in transfusion medicine: A cross-sectional international survey

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Abstract

Objectives: This survey aims to assess the scope of transfusion e-learning courses in blood establishments and transfusion services internationally.

Background: E-learning/online education is increasingly used in the education of medical professionals. There is limited published data on the use of e-learning for transfusion medicine.

Material and Methods: An International survey was designed and distributed to all members of the International Society of Blood Transfusion to assess utilisation of e-learning in their institutions. Descriptive statistics were used to summarise the results.

Results: A total of 177 respondents participated, 68 of which had e-learning modules in their institutions. Approximately two-thirds of the courses were developed in-house (66%), and 63% are available to learners from outside the host institutions. In one-third of institutions, these courses were established during the COVID-19 pandemic, while 15% had used e-learning courses for more than 10 years.

The courses target different audiences and topics ranging from blood donation to hemovigilance. The most common audiences were physicians (71%), laboratory scientists/technologists (69%) and transfusion practitioners (63%). Formal assessment of learning outcomes is used in 70% of the programs.

Conclusions: The survey demonstrates the widespread use of e-learning courses in transfusion education, with a substantial proportion being developed during the COVID-19 pandemic.

KEYWORDS
education, e-learning, transfusion medicine

1 | BACKGROUND

Blood transfusion is one of the most commonly performed medical procedures, with more than 100 million units of blood collected globally each year to meet transfusion demands.[1] Given well-defined risks, blood transfusions should be given only when indicated,[2] yet evidence indicates ongoing significant levels of inappropriate use of blood.[3] Education forms an important component of programmes of patient blood management (PBM), which may be associated with reduced hospital mortality, shorter in-hospital length-of-stay and reduced costs to the health system.[4]

Educational initiatives for the transfusion process are complex and require engagement with a broad multidisciplinary group of

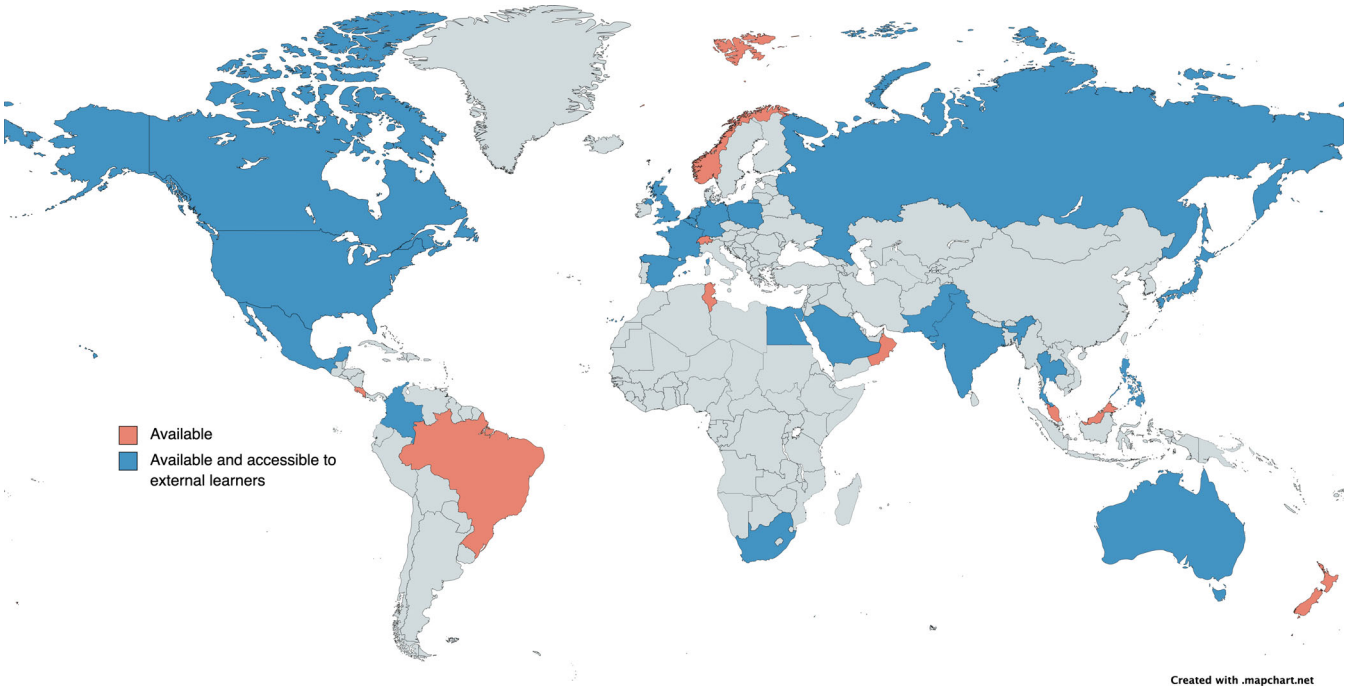

FIGURE 1 Availability of transfusion medicine e-learning/online education in different institutions

healthcare professionals involved in the transfusion chain from donor to patient. However, the current literature documents many knowledge gaps in transfusion medicine among physicians and nurses,[5,6] raising questions about how effective current educational strategies are. This is a larger problem in low- and middle-income countries (LMICs) where education is less accessible, especially in rural settings, and may be compromised by limited resources and high workload.[7] In the past, transfusion education has been typically delivered through lecture-based classroom training, together with formal and informal job training.[8]

Electronic delivery of learning (e-learning/online education) has been increasingly used in the health care sector and health sciences education.[9,10] Well-developed, targeted online or e-learning programs have the advantage of being accessible to an almost unlimited number of learners with access to a wide pool of educational material, at a time and place convenient to them. During the Coronavirus (COVID-19) pandemic, the utilisation of such methods of training proved useful to provide socially distant education and training.[11]

Conversely there are some barriers and challenges to implementing e-learning that have been identified. These include the cost of development and delivery, real or perceived lack of information technology knowledge and/or skills, and limitations to its usefulness as a solo-learning method in some contexts, topics and settings, especially these requiring high levels of practical training.

There are no published data on the use of transfusion-related e-learning programs. Internationally there are a small number of well-established and long-running, regional and national programs in Australia,[12] Canada,[13] the United Kingdom[14] and the United States.[15,16] These have a large uptake of learners, and are used for professional development, and/or as part of mandatory/compliance training for healthcare professionals. They may also be used as part of hospital and health service accreditation requirements. However, the scope of utilisation of e-learning/online education in transfusion medicine education in different countries worldwide is unknown. This survey aims to assess the scope of transfusion e-learning courses in blood establishments and transfusion services worldwide.

2 | METHODS/MATERIAL

A cross-sectional survey was designed by the International Society of Blood Transfusion (ISBT) Clinical Transfusion Working Party, with participation of experts in transfusion education and e-learning (Supporting Information). The survey aimed to explore the scope of e-learning/online education in transfusion medicine that is in use in institutions globally, including the topics covered, target audience and use of learner assessment. The initial survey was reviewed by the working group members for face and content validity to ensure it would capture the information needed. The survey was programmed electronically by an expert on questionnaire construction who further checked the survey for common errors. After multiple rounds of testing and editing, the electronic survey was piloted among nine members.

The survey contained 12 questions covering demographics of the participant and their work institution (5 questions), and 7 questions tailored to use of e-learning/online education including development, topics covered, target audience and use of assessment. The participants were alerted that the term e-learning is used interchangeably with the terms online learning, web-based learning, online education, computer-assisted or aided instruction, internet-based learning,

TABLE 1 Demographics of respondents with transfusion medicine e-learning courses in their institutions (n = 68)

Variable	N (%)
World Health Organization regions	
• Africa	5 (7.4%)
• Americas	12 (17.6%)
• Eastern Mediterranean	5 (7.4%)
• Europe	27 (39.7%)
• South-East Asia	10 (14.7%)
• Western Pacific	9 (13.2%)
Institution	
• Education Provider	7 (10.3%)
• Hospital	4 (5.9%)
• Hospital-based Blood Services	9 (13.2%)
• Hospital-based Transfusion Services/Blood Bank	16 (23.5%)
• National Blood Establishment	5 (7.4%)
• National Blood Service/Blood Centre	8 (11.8%)
• Regional Blood Service/Blood Centre	11 (16.2%)
• Other	8 (11.8%)
Main role in institution	
• Haematologist, haematopathologist, TM physician	19 (27.9%)
• Blood bank medical director	15 (22.1%)
• Education provider or developer	10 (14.7%)
• Transfusion practitioner, nurse or safety officer	6 (8.8%)
• Medical clinical scientist or technologist	5 (7.4%)
• Blood bank laboratory manager	4 (5.9%)
• Safety and Quality Management	1 (1.5%)
• Other	8 (11.8%)
Main role in the e-learning education program	
• Member of the development team	22 (32.4%)
• Educator/supervisor who provides educational content	25 (36.8%)
• Administrator of the program	3 (4.4%)
• Participant/learner	13 (19.2%)
• Other	5 (7.4%)
• No response	15 (22.1%)
Source of the e-learning courses	
• Developed 'in-house'	45 (66.2%)
• Obtained from another organization or a third-party provider	20 (29.4%)
• Do not know	2 (2.9%)
• Other	1 (1.5%)
• No response	15 (22.1%)
Duration of the e-learning programs	
• Since the COVID19 pandemic	20 (29.4%)
• Less than 5 years	21 (30.9%)
• 5–10 years	15 (22.1%)
• More than 10 years	10 (14.7%)
• No response	2 (2.9%)

Abbreviation: TM, transfusion medicine.

multi-media learning, technology-enhanced learning and/or virtual learning. Question skip logic was applied as appropriate.

The survey was administered in English using a SurveyMonkey® online questionnaire.[17] The survey link was distributed to all registered ISBT members by the ISBT central office using direct email on 26 July 2021, with one reminder on 12 August 2021, and responses were collected up to 1 September 2021. The participants reviewed an informed consent page and provided consent through completing the questionnaire. Participants were informed that their information would be collected and stored in accordance with the ISBT Privacy Policy.

The data were reviewed by two members independently, and participants with incomplete responses were excluded with agreement by consensus. Data from participants who completed all survey questions were included in the analysis. Descriptive statistics were undertaken and reported variables were expressed in numbers and percentages. Categorical variables were presented as proportions.

3 | RESULTS

The survey was distributed to 1481 ISBT members, with 176 responses received from 74 countries (response rate 12%). The respondents were from all six World Health Organization (WHO) regions: namely Europe (n = 53, 30%), the Americas (n = 32, 18%), South-East Asia (n = 31, 18%), Africa (n = 23, 13%), Eastern Mediterranean (n = 19, 11%) and Western Pacific (n = 18, 10%).

A total of 68 respondents indicated that e-learning courses were used in their institutions. The largest group of responses were from Europe (Figure 1). Of all respondents, 56% worked in academic/university-affiliated institutions and 10% were education providers or developers (Table 1). A majority (n = 45, 66%) of the e-learning courses were developed within the organisation, with 20 (n = 20, 29%) sourced from a third-party provider, while the source was unknown for the remainder.

There was considerable variability in the length of time that these e-learning courses had been available, with nearly one third developed in the past 5 years (n = 21) and 29% (n = 20) having been developed since the COVID-19 pandemic began, presumably as a response to the pandemic and the need to socially distance (Table 1). Approximately two-thirds (63%) of the courses were available to learners from outside the institutions (Figure 1).

The courses that were in use targeted a range of audiences and topics. The most common audiences were physicians (n = 48, 71%), laboratory scientists/technologists (n = 47, 69%), transfusion practitioners (n = 43, 63%), and medical students (n = 41, 60%). The commonest topics covered in the e-learning courses were transfusion reactions (n = 59, 87%), laboratory practice (n = 55, 81%) and haemovigilance (n = 53, 78%). More than half of the respondents had courses on transfusion reactions targeting physicians (63%) and transfusion practitioners (57%) (Figure 2). E-learning courses on laboratory practice were in use in 63% of the institutions for laboratory scientists/technologists. Formal assessment of learning outcomes was used in 69% of the e-learning programs.

	Transfusion reactions	Laboratory Practice	Hemovigilance	Blood Administration	Patient Blood Management	Blood Donation	Apheresis	Other	**Audience (%)**
Physicians	63	35	53	50	59	40	32	25	71
Laboratory Scientists/technologists	43	63	44	28	32	28	24	22	69
Transfusion Practitioners	57	38	53	52	50	35	29	22	63
Medical Students	50	27	43	41	47	35	27	21	60
Nursing/ Midwifery	46	19	37	46	35	24	15	19	54
Laboratory Students	29	46	28	22	21	22	15	18	53
Phlebotomists	10	18	16	13	12	27	21	10	41
Nursing/ Midwifery Students	29	10	25	28	27	13	10	16	37
Other	4	7	6	6	6	6	44	6	13
Topics covered (%)	87	81	78	75	75	66	46	37	

FIGURE 2 A heat map of target audiences and topics of the e-learning courses in institutions using them. Numbers reflect proportions of institutions with e-learning courses as stratified by topics and audiences ($n = 68$)

4 | DISCUSSION

This survey provides an overview of e-learning education in an international setting for transfusion medicine. The findings reveal potential differences between WHO regions, with a greater number of e-learning programs appearing to be available in Europe. A majority of courses were developed in house but are available for learners from outside institutions, and a third of e-learning programs were developed during the COVID-19 pandemic. The survey showed that e-learning used by the respondents in their organisations broadly targets a wide range of professions within the transfusion chain, and different transfusion topics. The majority of respondents indicated that their courses had some formal assessment component.

While e-learning offers a consistent and integrated approach in educating and training of all healthcare staff involved in the practice of transfusion medicine, there is limited literature on the use of e-learning in medical education in transfusion medicine. E-learning can provide convenient, interactive, self-paced and tailored learning based on personal learning objectives.[10] The predominant presence in Europe may be influenced by ISBT membership demographics and a higher use of information technology and e-learning than in other countries.

Availability of courses to learners from outside the organisation offers opportunities for institutions that lack the required resources to use these e-learning programs. Developing and maintaining transfusion medicine e-learning programs can be labour-intensive and involves input from a multidisciplinary team; including medical, nursing and laboratory professions.[18] The development of the web-based content requires expertise from professionals from other disciplines including graphic designing and web coding. In addition, these courses need to be maintained and updated based on learners' feedback, and emerging evidence in the field. For many countries, especially LMIC, these pose challenges for development and adoption, limiting many e-learning interventions to small-scale applications, mainly on a pilot basis.[19] Gaining access to existing international transfusion medicine online learning resources may help offset development costs and make such investments more affordable, in particular for countries with limited resources.[8] While the availability of e-learning programs to the global communities offers an advantage, there may be significant differences in practices, and hence applicability, that should always be considered when evaluating programs for local adoption. Our survey also highlights the important role of international transfusion organisations and societies in developing freely accessible programs that can be tailored to different settings and resources, such as the one developed by the International Society of Blood Transfusion.[20]

The field of medical education has rapidly evolved during the pandemic, with a transition from in-person, face-to-face instruction to online learning in order to ensure physical distancing and limit the spread of the virus.[11,21] During the COVID-19 pandemic, the rapid development and implementation of e-learning methods required significant effort from the faculty and administrative staff. While this has been found to be an acceptable mean of acquiring theoretical or content knowledge, teaching practical skills has proven to be more challenging. The utilisation of such courses for transfusion medicine education during the pandemic offers some insight into this form of education and applicability in future pandemics.

The diversity of the topics taught and target audiences in our survey reflects the broad scope of education and training required for

healthcare professionals in transfusion medicine. The transfusion process is a complex interlinking chain of steps that involves a multidisciplinary group of healthcare professionals. Ensuring patient safety during these steps requires individual and organisational commitment to the education and training of all individuals involved in the transfusion chain, from the initial blood donation to the administration of the blood. All healthcare professionals involved in blood transfusion need to have basic knowledge of indications and alternatives to blood transfusion, risks and benefits, and possible adverse events and their management.

Availability of assessment tools for many of these courses enforces the importance of determining their impact on learning outcomes. Like all education and training, e-learning requires a comprehensive evaluation strategy.[22] In most cases assessment is used to determine whether the learner has passed/failed the course, and it often forms one component of a competency requirement. In addition, assessment provides feedback to the learner on their progress, enabling the learner to see areas and topics where further knowledge may be required. Assessment is also a useful quality assurance tool for course facilitators to assess their course content and delivery style. Certification is required to prove competency and for accreditation purposes.

To the best of our knowledge, this survey is the first to assess the utilisation and scope of e-learning in transfusion medicine education worldwide. However, this survey has some limitations. It did not address the format of the e-learning used, or whether it involves interactive tools or other innovative approaches such as applying gaming and tactics to boost engagement. Moreover, the survey did not address whether these programs were implemented as a stand-alone e-learning, or as part of a hybrid/blended learning, how they are evaluated and how outcomes are assessed (e.g., if part of a formative or summative assessment).[22] This survey did not seek information on how well the acquired knowledge is applied to day-to-day-practice. This is important to consider when determining the role of e-learning and its effect on learner's performance and whether it enhances their learning[23] and if it improves patient care and outcomes. Finally, this survey has a low response rate and might have missed other e-learning programs available to other ISBT members who did not participate and to learners who are not ISBT members.

5 | CONCLUSION

This survey demonstrates the widespread use of e-learning courses in transfusion medicine education around the world. This provides potential opportunities for consistent, high-quality education and training, especially for LMIC countries, that may not have the resources required to develop such programs. Further research is needed to determine the effectiveness of e-learning in transfusion medicine education and how assessment is performed.[24] It is important that the assessment covers the learning objectives, and where possible assesses higher-order thinking skills[25] and impact on learner behaviour and system outcomes. Moreover, research should explore how comparable this form of education is to standard face-to-face or a hybrid education. As the COVID-19 pandemic begins to recede and life returns to some form of pre-pandemic 'normal' this may assist educators in making informed decisions on whether to utilise e-learning/online education for training and professional development in transfusion medicine.

AUTHOR CONTRIBUTIONS

Arwa Z. Al-Riyami initiated the research idea. All authors were involved in the development of the survey questions. David Peterson designed the online survey. Arwa Z. Al-Riyami, David Peterson and Jana Vanden Broeck analyzed the data and drafted the manuscript. All authors reviewed and approved the final version of the manuscript.

CONFLICT OF INTEREST

The authors have no competing interests.

ETHICS STATEMENT

This survey was conducted as per the ISBT privacy policy (https://www.isbtweb.org/about/policies/privacy-policy.html). No institutional review board approval was needed.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Al-Riyami AZ, Peterson D, Vanden Broeck J, et al. E-learning/online education in transfusion medicine: A cross-sectional international survey. *Transfusion Medicine*. 2022;32(6):499-504. doi:10.1111/tme.12920