

The ISBT e-learning module in transfusion reaction: An initiative for a global outreach

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1. Introduction

Physician's knowledge of transfusion medicine (TM) is critical for patient's safety. Blood transfusion is not without risks with ongoing concerns on both infectious and non-infectious complications. Practice interventions are essential in order to ensure safety of the transfusion cycle. The use of e-learning methodologies (such as computer software, smartphone applications, or website resource) has already become an integral part of medical education [1]. E-learning provides a self-paced platform that offers adaption to the recipient's learning objectives and speed of acquiring knowledge [2]. In addition, e-learning in medical education provides an interactive learning scheme that may contain information in the form of text or audio-visual materials, and clinical cases / scenarios to verify acquired knowledge and stimulate knowledge application and problem-solving. This learning scheme was reported to be more attractive for the learner and is associated with higher satisfaction [3,4]. Tools that implement innovative learning techniques, such as flashcards, mnemonics or creation of mind maps/ logic structures, have been proven to be highly effective in acquiring knowledge [5,6]. Ideally, these platforms should have some assessment of knowledge acquired. Quizzes are proven to have an effect on increasing motivation and commitment during the learning process [7,8]. The evaluation at the end of the module allows the participant to obtain a certificate confirming the completed training and acquired knowledge. E-learning methods demonstrate at least equivalent effectiveness in knowledge acquisition compared to traditional learning methods [9].

Published studies indicate that the knowledge in the field of TM is insufficient, and postgraduate training may be one of the interventions that have a positive effect on the improvement in this area [10–14]. Knowledge of transfusion-related adverse events was reported to be low among non-transfusion medicine physicians [15]. Continuous training of medical personnel in the field of TM is important to avoid preventable errors that account for most of serious adverse reactions and events as

per the Serious Hazard of Transfusion (SHOT) 2020 report; 224 out of 1072 of which were attributed to ineffective / inadequate training [16]. It is worth emphasizing that the basic condition for a safe transfusion is the possession of appropriate qualifications, obtained through continuous education, of all staff involved in the transfusion chain [11,17]. The objectives of e-learning courses in TM should not be limited only to learning, but also on continuous deepening and verification of acquired knowledge [18].

The source of e-learning modules in transfusion varies. In a recent survey, more than half of e-learning modules in transfusion medicine were developed inhouse within the organisations, while a third is offered by third-party providers [19]. In the field of TM, there are several examples of e-learning programs in use, a selected list is displayed in Table 1. The development of these modules can be labour intensive and involves input from a multidisciplinary team, including medical professionals and other disciplines [20]. Access to these modules can be challenging for many learners, especially in low- and middle-income countries (LMICs). Gaining access to existing transfusion medicine e-learning resources may help offset development and maintenance costs particular for countries with limited resources [21].

In line with its mission of enhancing global transfusion practice, the International Society of Blood Transfusion (ISBT), represented by the Clinical Transfusion Working Party (WP), and in collaboration with the European Blood Alliance (EBA), developed a freely-accessible transfusion reaction e-learning module tailored to young professionals [22]. The aim of this module is to provide opportunity for advancing knowledge and education. In this article, the development process, technical details, content and preliminary results on the utilisation of this e-learning module are presented.

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2. Development of the ISBT e-learning transfusion reaction module

The ISBT Clinical Transfusion WP is a multidisciplinary WP that aims to promote evidence-based clinical transfusion and patient blood management practices by developing educational tools and best practice recommendations, providing expert opinions, and conducting research with a global focus [23]. In 2015, the ISBT Clinical Transfusion WP leaders discussed the idea of developing an e-learning module on the recognition and management of acute transfusion reactions during its business meeting at the ISBT congress in London, United Kingdom. A member of the EBA was invited to the meeting to explore collaborative opportunities for developing this module. The objective of the module was to provide the learner with a basic understanding of the pathophysiology of different types of acute transfusion reactions, and how to investigate and manage them. In 2015 and 2016, funding options were explored and both the ISBT and EBA agreed to fund the project. In 2017, the WP created a subgroup of experts in TM education to develop the module content. This was followed by the design of the module in an electronic platform by the ISBT office in 2018. During 2018 and 2019, feedback was obtained from members of the ISBT hemovigilance and Clinical Transfusion WPs, EBA working group on education and training, WHO and experts in e-learning and TM. After in-cooperating the suggestions made, the module was tested and piloted by the working group and the ISBT Young Professional Council members in 2020. The working party members were also asked to share the module with young professionals from their countries for input and feedback. In March 2021, the module was launched on the e-learning platform of the ISBT Education website (<https://www.isbtweb.org/resource/-transfusion-reactions-e-learning-module.html>). The module was revised in May 2022 after reviewing initial participation and learners' feedback. Fig. 1 summarizes the steps undertaken to develop this module.

2.1. Overview of the module

The module was designed to be case-based, targeting hospital physicians in their early careers. The module is composed of 4 chapters and seven interactives case-based scenarios addressing common and serious acute transfusion reactions, with the aim of assessing learners' understanding and allow application of acquired knowledge (Table 2). The cases cover clinical presentation, with presenting signs and symptoms (e.g., fever, dyspnea and urticaria), differential diagnosis, investigation

and immediate management actions. The learner is expected to interpret the laboratory investigation done as part of workup of the transfusion reaction and to correlate the investigations performed with the clinical presentation.

Participants are required to register for the module to gain access. Completion of all components of the module is required to obtain a certificate of completion. The participant can review the module material at their own pace, and obtain continued medical education (CME) credits based on their progress throughout the content of the module. In addition, the module has different quizzes to assess learner's understanding of the module content on the most prevalent acute transfusion reactions. Moreover, the module contains a discussion board that allow the participants to share questions and initiate discussions with their peers and faculty.

The model is accredited by European Board for Accreditation in Hematology (EBAH). Participants can earn up to 8 CME points upon completion. The module is offered to any participant free of cost. Up to June 2022, there has been a total of 165 users of the module and 216 CME points issued.

3. Discussion

Many publications have highlighted the gap in knowledge in TM among the physicians early in their career [10, 24, 25]. This result in a wide variation in transfusion practice and increases the risk for transfusion errors. E-learning has gained interest in transfusion education. Learning delivery with increased accessibility to information, standardization of content and feasibility of updating content offers an advantage. In addition, learners have control over their learning sequence and use of this tool to meet their personal learning objectives [26]. This tool has proved its usefulness during the Coronavirus disease-19 (COVID-19) pandemic, which fundamentally altered how education is delivered [27]. This pandemic highlighted opportunities for global cooperation in higher education and research, and embracing technology as a powerful tool for under-graduate and post-graduate medical education [27,28]. This was reflected by the deployment of e-learning as a tool for online learning, simulation, assessment, among others. That being said, there are several shortcomings on the use of e-learning for medical education in LMICs [29]. Many of the e-learning initiatives in these countries are small scale, conducted as short-term pilots, probably due to the restricted financial resources for the development of these modules [29].

Table 1
Characteristics of selected freely available e-learning platforms.

E-learning platform (Provider)	Structure	Subjects covered	Target professional groups	Evaluation of the acquired knowledge	Certificate of Completion
"BloodSafe eLearning Australia" (Australian National Blood Authority)	Comprehensive online module	Transfusion practise & PBM (both with subsections)	Physicians, nurses, medical laboratory professionals	Yes, multiple-choice online assessment at the end of each module	Yes
"Learnbloodtransfusion" (UK Blood Services)	Comprehensive online module	Transfusion practise PBM Good manufacturing practice Legal issues related to transfusion Blood collection	Physicians, nurses, medical laboratory professionals	Yes, self-assessment exercise after each session	Yes
Patientbloodmanager (German PBM Network)	Single subject oriented module	PBM (with subsections)	Not specified	Yes, quiz after each module	Yes
eLearning in Transfusion Medicine (New York Blood Center)	Comprehensive online module	Acute & delayed Transfusion Reactions Blood groups Basics of PBM	Not specified	Yes, self-assessment exercise after each session	Yes
LearnTransfusion series (Canadian Blood Services)	Weekly webinars	Various scientific, technical and clinical aspects of TM	Medical practitioners in the field of TM	No	Yes (Certificate of attendance)
AABB Education Platform (AABB)	Webinars, annual meetings recordings	Blood banking, TM, PBM	Medical practitioners in the field of TM	No	Yes (Certificate of attendance)

PBM; patient blood management, AABB; Association of Advancement in Blood and Biotherapies, TM; Transfusion Medicine

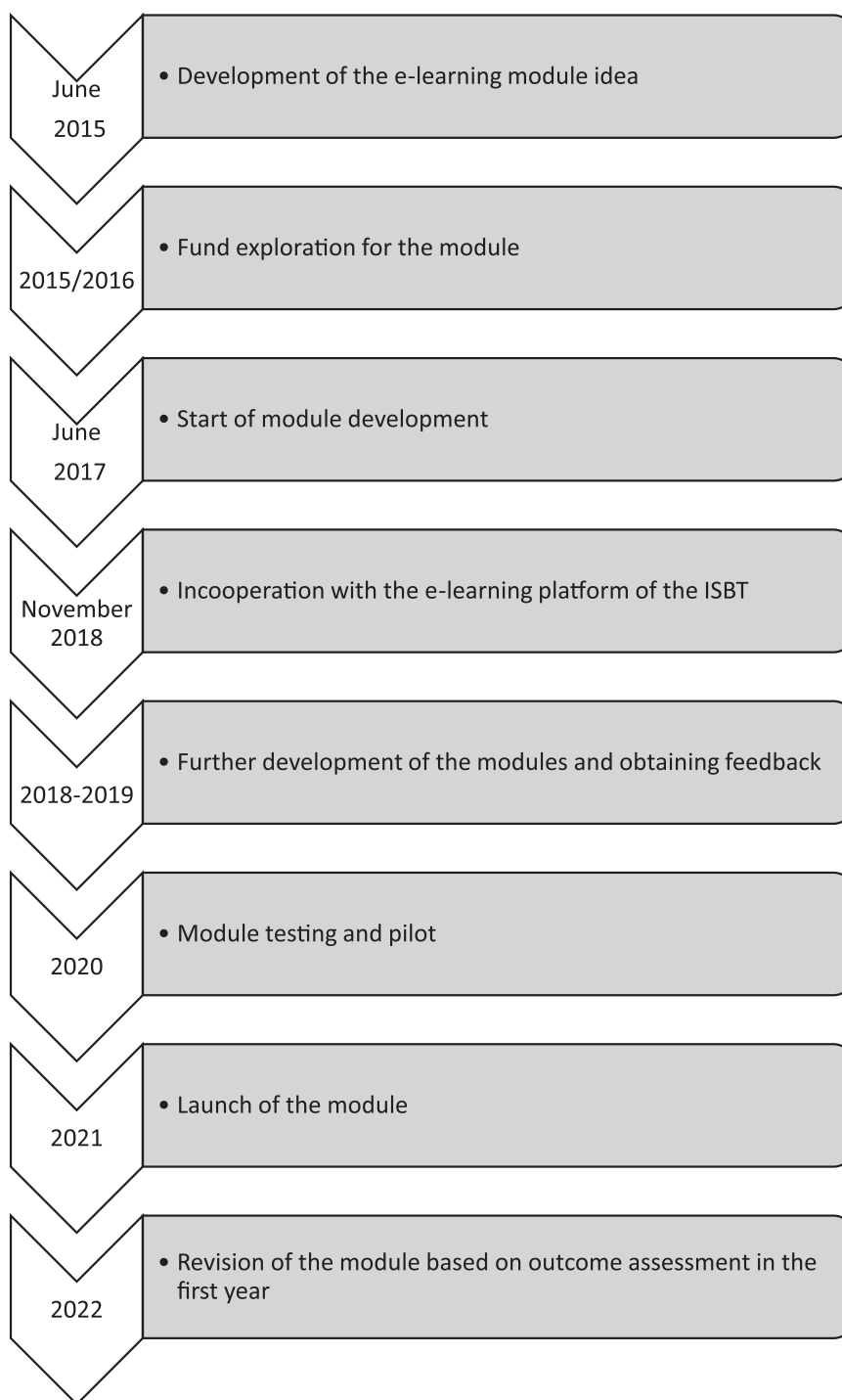


Fig. 1. Timeline of development of ISBT e-learning module.

There are several challenges in developing e-learning programs. Development of e-learning courses is labour intensive, consumes a considerable amount of time and budget for development and maintenance, especially when it is to be a high standard system [30,31]. These modules may not be free of charge, and may not be affordable to learners from resource-limited countries. Some of e-learning modules are tailored to country-specific or institution-specific practices that may not be generalizable to learners from other institutions. Collaboration offers an opportunity for enhanced cooperation to maximize the utilization of existing resources in developing necessary tools, for medical education. In addition, it offers an opportunity of involvement of multiple experts

and human resources in developing such tools. Considering the global scope of ISBT, the organization offers the ideal niche for such initiatives, particularly to support learners from less-resourced countries. By developing a universal and freely available e-learning module on transfusion reactions, a wide access for knowledge acquisition offered.

With the support from the ISBT and the EBA, the ISBT has developed its first e-learning module on transfusion reactions. This module is delivered in English and was designed to be case-based in order to resemble daily practice. There is a need to continuously monitor the performance of the module, assess learners' participation and improve e-learning interventions, as well as ensure their sustainability. Future

Table 2
Structure of the international Society of Blood Transfusion (ISBT) E-learning model on transfusion reactions.

Chapters	Topics
Chapter 1	Background
Chapter 2	Acute transfusion reactions: recognition and management
Chapter 3	Acute transfusion reactions
	<ul style="list-style-type: none"> • Febrile Non-Haemolytic transfusion reaction (FNHTR) • Allergic /anaphylactic transfusion reaction • Acute haemolytic transfusion reaction (AHTR) • Transfusion-Transmitted Bacterial Infection (TTBI) • Transfusion-Associated Cardiac Overload (TACO) • Transfusion-Related Acute Lung Injury (TRALI) • Transfusion Associated Dyspnoea (TAD)
Chapter 4	Interactive cases (n = 7)

opportunities for wider access would include translating the module in different languages such as French and Spanish. Utilization of other applications such as smartphone/mobile applications platforms offers an opportunity to have the module more widely accessible [32].

4. Conclusion

E-learning offers an opportunity for advancing knowledge in transfusion medicine. Offering a program through international societies such as ISBT offers a global access. The experience of developing the ISBT e-learning module in transfusion reactions can be extended to develop other e-learning programs in the field of transfusion and cellular therapy. Collaboration between different organizations and societies in the fields of transfusion and medical education is paramount to bring in required expertise, required resources and ensure wide access.

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