



DEVELOPMENT OF AN EDUCATIONAL TECHNOLOGY AS A STRATEGY TO IMPROVE TRANSFUSION SAFETY

DESENVOLVIMENTO DE UMA TECNOLOGIA EDUCACIONAL COMO ESTRATÉGIA PARA A MELHORIA DA SEGURANÇA TRANSFUSIONAL

DESARROLLO DE UNA TECNOLOGÍA EDUCATIVA COMO ESTRATEGIA PARA MEJORAR LA SEGURIDAD TRANSFUSIONAL

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ABSTRACT

Objective: To develop, together with the interdisciplinary team of a health care institution, the essential characteristics of an educational technology (ET) aimed at enhancing transfusion safety. **Method:** Convergent care research was used to develop the intervention. After approval by a human research ethics committee, focus groups were established in which participants were invited to actively engage, through the Maguerez Arch, in the development of an ET. **Results:** The Maguerez Arch supported participants in critically reflecting on their concrete reality, enabling the identification of incomplete documentation, inadequate communication, and staff turnover as the main challenges to be addressed. Subsequently, stages of theoretical analysis were conducted, and the proposed applications to practice included the development of infographics and the use of digital technologies to support continuing education initiatives. **Conclusion:** The use of the Maguerez Arch in the development and proposal of interventions efficiently guided participants from their concrete reality to a process of critical reflection, generating outcomes directly related to professional practice. The contributions obtained promoted a more careful approach, particularly regarding documentation practices, contributing to the strengthening of transfusion safety and patient safety.

Descriptors: Health Education; Continuing Education; Blood Transfusion.

RESUMO

Objetivo: Construir, em conjunto com a equipe interdisciplinar de uma instituição de saúde, as características essenciais de uma tecnologia educacional (TE) voltada ao aumento da segurança transfusional. **Método:** Utilizou-se a pesquisa convergente assistencial para o desenvolvimento da intervenção. Após aprovação por um comitê de ética em pesquisa, foram constituídos grupos focais nos quais os participantes foram convidados a atuar ativamente, por meio do Arco de Maguerez, na elaboração de uma TE. **Resultados:** O Arco de Maguerez auxiliou os participantes na reflexão aprofundada sobre sua realidade concreta, permitindo identificar a falta de registros, a comunicação inadequada e a rotatividade de profissionais como os principais problemas a serem enfrentados. Posteriormente, foram desenvolvidas etapas de análise teórica, e as propostas de aplicação à realidade contemplaram a elaboração de infográficos e a utilização de tecnologias digitais para viabilizar ações de educação permanente. **Conclusão:** A utilização do Arco de Maguerez na elaboração e proposição de intervenções conduziu os participantes de sua realidade concreta a um processo de reflexão crítica de forma eficiente, gerando resultados diretamente relacionados à prática profissional. As contribuições obtidas favoreceram uma atuação mais criteriosa, especialmente no que se refere aos registros, contribuindo para o fortalecimento da segurança transfusional e da segurança do paciente.

Descritores: Educação em Saúde; Educação Permanente; Transfusão de Sangue.

RESUMEN

Objetivo: Construir, junto con el equipo interdisciplinario de una institución de salud, las características esenciales de una tecnología educativa (TE) orientada al incremento de la seguridad transfusional. **Método:** Se utilizó la investigación convergente asistencial para el desarrollo de la intervención. Tras la aprobación por un comité de ética en investigación, se constituyeron grupos focales en los que se invitó a los participantes a actuar activamente, mediante el Arco de Maguerez, en la elaboración de una TE. **Resultados:** El Arco de Maguerez ayudó a los participantes a reflexionar profundamente sobre su realidad concreta, permitiendo identificar la falta de registros, la comunicación inadecuada y la rotación de profesionales como los principales problemas que debían afrontarse. Posteriormente, se desarrollaron etapas de análisis teórico, y las propuestas de aplicación a la realidad contemplaron la elaboración de infografías y el uso de tecnologías digitales para viabilizar acciones de educación permanente. **Conclusión:** La utilización del Arco de Maguerez en la elaboración y propuesta de intervenciones condujo a los participantes desde su realidad concreta hacia un proceso de reflexión crítica de manera eficiente, generando resultados directamente relacionados con la práctica profesional. Las contribuciones obtenidas favorecieron una actuación más rigurosa, especialmente en lo referente a los registros, contribuyendo al fortalecimiento de la seguridad transfusional y de la seguridad del paciente.

Descriptores: Educación en Salud; Educación Permanente; Transfusión de Sangre.

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What is already known:

- The number of errors in blood transfusion processes remains unacceptably high.
- Continuing health education can contribute to improving the quality of care; however, few studies have investigated educational technologies aimed at enhancing transfusion processes.
- The Maguerez Arch is a promising tool, but it remains underutilized in the development of educational technologies in health care.

What this article adds:

- Inefficient communication, inadequate documentation, and high staff turnover are the main challenges associated with blood transfusion processes.
- The Maguerez Arch can support health professionals in critically reflecting on their own practices and implementing improvements within their services.
- Educational technologies should not be developed through a top-down approach, as the experience of professionals within the institution is essential for their development and adaptation to local needs.

INTRODUCTION

Blood transfusion is one of the most frequently performed procedures in hospital settings and consists of the infusion of whole blood or its components from a donor to a recipient patient. According to the 8th Hemotherapy Production Bulletin of the Brazilian Health Regulatory Agency, more than 3.4 million transfusions were performed in Brazil in 2019⁽¹⁾. These figures highlight the relevance of this therapeutic resource for patients of different age groups and clinical conditions, including those undergoing surgical, medical, and oncological treatments.

Despite its importance, blood transfusion is not free from risks. Transfusion reactions may be classified as immediate when they occur within 24 hours after transfusion or delayed when they manifest after this period⁽²⁾. Recent studies have documented several complications associated with the procedure, including acute hemolytic reactions, incompatibilities, allergic reactions, and anaphylaxis⁽³⁾, as well as transfusion-related acute lung injury and transfusion-associated circulatory overload⁽⁴⁾.

In addition to the risks inherent to the procedure, adverse events may result from failures at different stages of the transfusion process, such as improper sample collection, errors in medical requests, and incomplete or inaccurate documentation⁽⁵⁾. The significance of these failures is highlighted by data from the United Kingdom, where approximately 66.7% of transfusion-related adverse events are associated with errors in recipient patient identification. Although transfusion is a widely performed procedure, many professionals still demonstrate insufficient familiarity with its stages and safety requirements⁽⁶⁾. Studies indicate that both physicians and nurses have important knowledge gaps regarding blood transfusion⁽⁷⁻⁸⁾. This scenario reflects the complexity of the transfusion process and reinforces the need for its execution by adequately trained professionals⁽⁹⁾.

The literature reinforces the importance of professional training by highlighting that acute hemolytic transfusion reactions can be prevented through systematic training of teams involved in clinical and laboratory transfusion practices⁽⁴⁾. This perspective aligns with other authors⁽⁸⁾, who argue that transfusion safety depends directly on the knowledge and competencies of the professionals responsible for the procedure. However, the level of knowledge regarding blood transfusion varies considerably among professionals due to the heterogeneity of educational curricula and the complexity of the subject itself⁽¹⁰⁾. In this context,

continuing health education (CHE) constitutes a fundamental strategy for professional development, contributing to the prevention of adverse events and the strengthening of patient safety⁽¹¹⁾.

The Brazilian National Policy for Continuing Health Education, established by the Ministry of Health in 2004⁽¹²⁾, defines CHE as a process that integrates education, health care services, and patient care, bringing professional training closer to the real demands of practice. CHE recognizes professionals as individuals who possess knowledge and competencies that can be continuously improved and re-defined through learning. Among the strategies used to operationalize CHE, educational technologies (ETs) stand out⁽¹³⁾.

ETs play a fundamental role in teaching and learning processes by enabling more flexible, active, and collaborative approaches. From this perspective, the educator assumes the role of knowledge facilitator, while learners actively participate in the construction of their own learning. Within the context of CHE, the experience accumulated by professionals constitutes a central element of this process, allowing knowledge acquired throughout education and professional practice to be shared, discussed, and collectively transformed. Thus, critical reflection on one's own work environment becomes an important tool for the construction of new knowledge and the improvement of health care practices⁽¹⁴⁾.

Thus, the present study seeks to answer the following guiding question: which characteristics should compose an ET aimed at reducing errors in the transfusion process? Therefore, this study aims to develop, with the participation of the interdisciplinary team of a health care institution, an ET capable of assisting health professionals in reducing errors related to blood transfusion.

This study constitutes an excerpt from the master's thesis titled "Continuing Health Education as a strategy to improve mandatory documentation in the transfusion process to enhance patient safety."

METHOD

This is a descriptive, exploratory, qualitative study conducted through focus groups involving professionals from Instituto Estadual de Cardiologia Aloysio de Castro (IECAC). The reporting of results followed the CONSOLIDATED criteria for REporting Qualitative research.

Interviews were conducted by the principal investigator,

who was a master's student and a physician working at the institution under study. As a member of the IECAC professional staff, the researcher had previous contact with the participants. All health professionals directly involved in the transfusion process were invited to participate, including physicians, nurses, nursing technicians, and nursing assistants, provided they were employed under labor contracts, civil service appointments, or independent service agreements and agreed to participate in the study. Professionals who did not meet these criteria were excluded.

Three meetings were held, each lasting a maximum of 60 minutes, on dates determined according to participants' availability. The meetings took place at the workplace and involved 11 professionals in addition to the principal investigator. Although invited, no physicians participated in the meetings or provided justification for declining participation.

The study was developed based on convergent care research (CCR)⁽¹⁵⁾, a methodology in which research problems emerge from professional practice. Its purpose is to identify weaknesses and strengths within the investigated context, promoting the development of solutions tailored to the reality under study⁽¹⁶⁾. CCR comprises four phases: i) conception, corresponding to the definition and formulation of the research problem; ii) instrumentation, which includes defining the setting, participants, and data collection instruments; iii) scrutiny, characterized by obtaining the knowledge required and assessing the feasibility of the proposed solutions; and iv) analysis, in which data are apprehended, synthesized, theorized, and evaluated regarding their applicability to other contexts⁽¹⁵⁾.

CCR is considered a problem-posing methodology, that is, a strategy aimed at developing critical and reflective individuals capable of understanding their reality and transforming it through the development of contextualized interventions⁽¹⁷⁾. Furthermore, this approach promotes participants' awareness of their own behaviors and their relationship with the work environment.

Given the problem-posing nature of CCR, the Maguerez Arch was adopted as a complementary strategy for data production. Developed by Charles Maguerez and later adapted by Juan Díaz Bordenave⁽¹⁸⁾, this method is an active learning methodology that positions participants as protagonists in the learning process, valuing their knowledge, experiences, and ability to develop intervention proposals⁽¹⁷⁾. Thus, professionals were recognized as central agents in the educational process, fostering collective discussions grounded in both practical experience and theoretical knowledge.

The Maguerez Arch consists of five stages.

The first stage, called observation of reality, involves analyzing the concrete situation related to the problem under investigation. To stimulate the initial discussion, the following guiding question was proposed: What three to five words come to mind when you think about the relationship between transfusion documentation and patient safety?

The second stage, called key points, aims to identify the central aspects of the problem. During this phase, the following questions were presented: How and why is transfusion process documentation performed? and What

factors facilitate or hinder transfusion documentation?

The third stage, called theorization, involves the search for theoretical frameworks capable of supporting both the understanding of the problem and the development of potential solutions. To this end, participants were encouraged to reflect on their learning and training experiences through the following question: How did you acquire the knowledge and skills necessary to perform transfusion documentation aimed at ensuring patient safety?

The fourth stage, called solution hypotheses, corresponds to the formulation of intervention proposals based on the previous discussions. During this phase, the following question was used: Incomplete transfusion documentation: why does it occur? How can its recurrence be prevented? What can be applied in clinical practice?

The fifth stage, called application to reality, consists of developing concrete strategies for implementing the proposed solutions. At this point, collective discussions focused on how an ET could be developed and applied within the institutional context. Although the proposals presented by participants remained at a hypothetical level, the discussion was directed toward aspects related to the applicability and acceptability of the interventions. For this reason, the results concerning the application-to-reality stage were analyzed together with those from the solution-hypotheses stage. The question used in this stage was: Which ET, easily applicable and accepted by professionals, could contribute to improving transfusion documentation and enhancing patient safety?

All discussions were audio-recorded using a smartphone. The results were organized according to the different stages of the Maguerez Arch. Conducting three separate meetings made it possible to include professionals from different work shifts while minimizing disruptions to health care activities. To ensure participant anonymity, names were replaced by the letter "P" followed by a number corresponding to the order of participation.

Regarding ethical considerations, the dissertation from which this study originated was approved by the Research Ethics Committee of the School of Medicine, Universidade Federal Fluminense (CAAE No. 58124022.8.0000.5423; Approval No. 5,535,821) and by the Research Ethics Committee of IECAC (CAAE No. 58124022.8.3001.5265; Approval No. 5,590,868).

RESULTS AND DISCUSSION

The results are presented according to the stages of the Maguerez Arch and their respective guiding questions, while maintaining alignment with the principles of CCR. Thus, this section is organized according to the different stages of the Arch.

Observation of reality

To guide participants toward identifying the most relevant aspects of their work environment, the following question was proposed: What three to five words come to mind when you think about the relationship between transfusion documentation and patient safety?

I wrote venous access [...] check patient identification

[. . .] Vital signs, blood bag volume in both directions, both in the sense that [my colleague] mentioned and because sometimes physicians prescribe it. (P2)

I wrote process, thinking about everything we discussed regarding documentation, vital signs, the patient's clinical condition, actual need, attention from the moment the blood arrives until administration, care, and the condition of the patient's venous access. (P4)

Check, verify, observe, monitor, and care. (P5)

The aspect most frequently highlighted by participants was the need to verify the patient's condition and characteristics. In some reports, checking patient identification and documentation was emphasized, whereas in others, attention was directed toward clinical aspects such as vital signs and venous access conditions.

These findings corroborate with literature, who identified inadequate communication as one of the main factors associated with incidents in transfusion processes⁽¹⁹⁾. The authors emphasize the importance of adopting standardized procedures, including checklists and appropriate documentation. Similarly, other study states that, during the post-analytical phase of transfusion, which involves receiving and administering blood components, one of the most frequent failures is incorrect patient identification resulting from inadequate verification of patient data against clinical records⁽²⁰⁾.

The practical experience of the professionals led them to recognize the relevance of transfusion documentation for patient safety. Terms such as "check," "patient identification," "verify," and "documentation," among others with similar meanings, were recurrent in the responses provided.

Key points

At this stage, the following guiding questions were used: How and why is transfusion process documentation performed? and What factors facilitate or hinder transfusion documentation? Some of the reports obtained are presented below.

For example, a medical prescription facilitates the process. And if you do not have the prescription, it makes things more difficult because until the blood bag arrives, until the transfusion takes place, you have to run after more people, and it comes back to the physician. (P1)

We have many hematology patients, and we end up performing transfusions quite often, but there are people who were hired recently. They have only been here for 1 or 2 months. These people have not received training. (P2)

I think the main limiting factor here is communication. Sometimes communication is complicated. (P3)

I wrote that the problem is the lack of training and technical knowledge among the teams. We need to encourage training, provide education, and continually reinforce transfusion protocols. (P4)

And regarding the factors that make it difficult, I wrote

that not everyone knows the procedures. This goes back to the issue of new staff arriving, some people being trained and others not receiving training and therefore not understanding the importance and necessity of standardization. (P5)

As a facilitating factor, I think the form is very comprehensive because it already includes identification and everything that needs to be documented. The type of blood component, vital signs, and so on. As for limiting factors, I wrote none. Just paying more attention. But regarding what she mentioned, sometimes there is only one nurse for a very large ward, and documentation issues are failures that occur frequently. (P7)

The limiting factors are failing to document, failing to record adverse effects and reactions, failing to properly identify the material and the patient's name, and not recording the transfusion time. There is also a lack of communication among the health care team, patients, and family members regarding previous transfusions, whether any reactions occurred, whether they were reported, and whether they were documented. (P8)

The reports revealed two central problems: inadequate team training and communication failures. Regarding the first issue, participants associated these difficulties with high staff turnover, which results in the frequent arrival of workers who lack adequate training and in-depth knowledge of the institution's standardized procedures. The literature support this finding by identifying high staff turnover, work overload, and low remuneration as factors associated with the occurrence of health care errors⁽²¹⁾.

Although most transfusion reactions are related to human error⁽¹¹⁾, the adoption of standardized protocols and electronic prescribing systems can contribute to reducing such events, reinforcing the importance of proper documentation. Furthermore, the literature emphasize that effective communication should involve not only health professionals but also patients and family members⁽²²⁾. Patients who better understand their clinical condition become active participants in their own care, contributing to error prevention and improved quality of care.

The communication difficulties mentioned by participants extend beyond interpersonal relationships and include failures in documentation and in the transmission of relevant patient information. Effective communication requires the complete and accurate transmission of information necessary for patient care, including appropriate documentation and confirmation of information among those involved in the health care process⁽²³⁾. However, several barriers may compromise this process, requiring adaptive strategies to overcome them⁽²²⁾.

The literature demonstrates that educational interventions can reduce the occurrence of adverse events reported in hemovigilance systems. In the experience described by the authors, the implementation of an institutional transfusion manual preceded educational activities by 8 months, contributing to the consolidation of safer practices⁽⁸⁾. Therefore, the existence of manuals, protocols, appropriate prescriptions, and complete documentation emerges once again as a fundamental element of transfusion safety, consistent

with the reports provided by the participants.

Theorization

At this stage, the following question was proposed: How did you acquire the knowledge and skills necessary to perform transfusion documentation aimed at ensuring patient safety? Some of the reports obtained are presented below.

I never had any training. Because you learn through practice. [...] During undergraduate education, we have the theoretical part, right? (P2)

It was through practice in institutions that are, um... involved with continuing education services, right? It is in everyday work, although of course there is also the theoretical component. (P1)

In the unit where I worked, we had training as part of the learning process, and in the different units I had the opportunity to put into practice the training I received during my residency. (P4)

My initial experience was during undergraduate education. I graduated in nursing from UERJ. [...] At Carlos Chagas, I spent 10 years in the orthopedic service. In orthopedics, you deal with trauma patients. Therefore, blood transfusion was a constant. I was able to combine what I learned in college with practice, but you learn a great deal through practice, much more than in undergraduate education or any other course, because it becomes part of your daily routine. (P5)

Now, in terms of training, it occurs all the time. It is not only formal, like gathering in a room. It is also colleagues sharing their knowledge [...]. (P9)

The convergence of these reports indicates that the primary setting for learning about transfusion processes was the workplace itself. This finding directly relates to the previously identified issue of high staff turnover. If much of the required knowledge is acquired through everyday practice, it is expected that newly hired professionals may not yet possess the same level of experience and mastery of procedures.

These responses reinforce the relevance of CHE as a training strategy, since this approach promotes learning in and through work⁽²⁴⁾. As highlighted by the participants, although academic education provides important theoretical foundations, knowledge is consolidated mainly through practical experience. In this context, CHE plays a fundamental role by fostering ongoing learning processes linked to the real needs of health care services.

Furthermore, the knowledge produced in everyday clinical practice is not limited to the technical training of workers. As argued by the literature, the workplace constitutes a privileged environment for knowledge production⁽²⁵⁾, while others emphasize its potential to promote critical, reflective, and participatory analyses of professional practices⁽²⁶⁾.

The statement provided by P9 also demonstrates that learning processes do not need to occur exclusively through traditional top-down educational models. The continuous exchange of knowledge among colleagues represents an

important strategy for the collective construction of knowledge, consistent with the principles of CHE and with the horizontal approaches to health education described by literature⁽²⁷⁾.

Solution hypotheses and application to reality

As described in the Methods section, the stages of solution hypotheses and application to reality were analyzed together because both are directed toward transforming the observed reality. In the solution-hypotheses stage, the following guiding question was used: Incomplete transfusion documentation: why does it occur? How can its recurrence be prevented? What can be applied in clinical practice? Initially, this question sought to revisit the causes of the problem and promote a broader and more theoretical discussion regarding possible coping strategies.

In the application-to-reality stage, the proposed question was: Which ET, easily applicable and acceptable, could contribute to improving transfusion documentation and enhancing patient safety? Unlike the previous stage, this question directed the discussion toward the practical feasibility and acceptability of concrete proposals.

Some of the responses related to the fourth stage are presented below. Although most remain at a more conceptual level, some already point toward concrete intervention possibilities:

Through health education. Through what is being done here right now, bringing people together, talking to them, conveying the importance of complete documentation, the importance of following criteria, and understanding why the transfusion is being performed. (P5)

Your idea aligns somewhat with mine, which is lecture-based teaching combined with active learning methodologies. (P5)

I wrote that continuing education should be prioritized as a way to eliminate these small problems that undermine professional qualification and the overall integrity of patient care. (P6)

The professional themselves must take the initiative to recognize their limitations and acknowledge what they do not know, understanding that this is part of their daily work [...]. Not simply waiting, comfortably, for someone to provide them with that knowledge [...] but seeking to improve their own practice. (P9)

When you talk about active methodologies as a learning channel, exactly, the professional becomes the protagonist. They are the manager of their own profession, their own career, and the type of professional they want to become. (P9)

And the third point is continuing education. Training. Knowledge exchange with colleagues. I think that is it. (P11)

The responses obtained at this stage demonstrate, more than at any other point in the study, the importance of involving health professionals in the development process of the ET. They also illustrate the culmination of the path-

way proposed by the Maguerez Arch, as the sequential organization of its stages led participants to reflect on their work environment, revisit their educational experiences, and subsequently return to that reality with proposals for transformation. In other words, the knowledge and experience of professionals were mobilized throughout the entire process, resulting in proposals that were consistent with the problems identified in the previous stages.

However, it was observed that some participants used the concepts of CHE and continuing education interchangeably. This confusion is common, although important conceptual differences exist between the two approaches⁽²⁸⁾. While continuing education tends to be more fragmented and directed toward specific professional categories, CHE is characterized by a continuous, participatory process integrated into everyday work, accompanying changes in the professional environment and social relationships⁽²⁹⁾. From this perspective, P11's statement includes elements of both approaches, since training activities may assume characteristics of either continuing education or CHE, whereas learning through knowledge exchange among colleagues represents a strategy more closely associated with CHE.

Regarding the fifth stage of the Maguerez Arch, the discussion on application to reality generated several intervention proposals and simultaneously enabled participants to identify potential barriers to their implementation.

No! Do you listen to a 5-minute audio message when someone sends it to you? I do not. (P1)

I would go with an infographic. (P1)

Those who are more comfortable with technology will access it through a QR code. (P2)

Workshops are not very accessible to everyone. [...] Almost no one is willing to leave their unit to attend one. (P4)

But there could be an explanatory leaflet. With an image [...] containing the key information you need regarding documentation. (P4)

I believe a short video is more useful as a guidance tool. No one is going to learn and master a technique in 1 or 2 minutes from a video. [...] But it can provide guidance. [...] Something that addresses a need specific to the characteristics of the unit. (P5)

With modern interactive technology, especially for younger people, a reel, a TikTok, or a podcast would work. But we do not have those technological resources. (P9)

However, because the institution operates through an intranet, we cannot access some YouTube videos. So there is no point in having a QR code if the content is hosted there. We do not have cloud storage or another structure available. (P9)

In reality, most of these activities only happen if we pay for them ourselves because there is no institutional policy supporting them. (P9)

Another motivating factor would be linking participation to an event. For example, a congress, symposium, or seminar. "Whoever participates in the training will be eligible to compete for a place at a cardiology congress, symposium, or seminar." Then you are working on motivation as well. (P11)

She mentioned the SOP [...] but I support technology, something like a Help 10 [a quick 10-minute training session that does not require leaving the workplace]. Let's conduct a 10-minute bedside training session with the team. [...] It should be something dynamic and interactive that engages the professionals involved. (P11)

These reports highlight the importance of professionals' experience not only as health professionals but also as members of the institution under investigation. Their accumulated knowledge of the organizational reality enabled them to anticipate barriers and identify practical limitations that could compromise the implementation of certain strategies. One example was the recognition of restrictions imposed by the institution's internal network, which would prevent access to content hosted on external platforms such as YouTube.

Involving professionals in research has positive effects on health care processes and patient outcomes⁽³⁰⁾. The findings of the present study reinforce this assertion, as the participation of professionals in the development of the ET stimulated critical reflection not only on existing problems but also on concrete possibilities for transforming the institutional reality.

Among the proposed strategies were short videos, infographics, workshops, informational leaflets, participation in congresses and symposia, and bedside training sessions. However, participants also identified several limitations associated with these approaches. In the case of videos, technological constraints related to institutional infrastructure were reported. For workshops, congresses, and symposia, challenges included limited time availability and the lack of institutional financial support for participation in such events.

Regarding infographics, this resource is among the most well-accepted communication tools by professionals because of its visual language, rapid readability, and ease of consultation, characteristics that are particularly valuable in dynamic health care environments⁽³¹⁾. The proposal of bedside training sessions is strongly aligned with the principles of CHE described by the literature⁽²⁸⁻²⁹⁾ as it promotes horizontal learning within the workplace itself.

This proposal also represents a concrete example of the outcomes generated by the reflective process triggered by the Maguerez Arch. It is a strategy consistent with the needs identified throughout the previous stages because it is dynamic, quick to implement, integrated into routine clinical practice, and easily directed toward newly hired professionals, a particularly relevant group in settings characterized by high staff turnover.

One limitation of this study is that the investigative process concluded at the ET development stage and did not progress to validation or practical implementation. In addition, the limited number of studies describing in detail the development of similar ETs restricted the depth of the

theoretical discussion. Finally, although physicians involved in the transfusion process were invited to participate in the study, none agreed to take part in the ET development process.

The implications of this study include strengthening the use of the Maguerez Arch as a strategy for developing ETs with health professionals, an approach that remains underexplored in the Brazilian context. Furthermore, the findings represent an important step toward the development of an ET adapted to the investigated setting and highlight critical issues related to the transfusion process that require ongoing attention to ensure transfusion safety and the quality of patient care.

CONCLUSION

Through the application of CCR, the participants in this study were able to develop relevant proposals for implementing CHE within their work environment, following the methodological principles of the Maguerez Arch.

The study's main contribution is the development of an ET grounded in this methodology. The use of the Maguerez Arch proved particularly valuable because it enabled a criti-

cal analysis of the institutional reality in collaboration with the professionals involved, facilitating the identification of needs and the development of proposals compatible with the context under investigation.

Thus, the present study not only contributes to expanding the use of the Maguerez Arch in research focused on the development of ETs but also establishes a theoretical and practical foundation for the creation of an ET that may be applied within the investigated setting. Future studies should prioritize the application-to-reality stage proposed by the Maguerez Arch, as well as the development, validation, and evaluation of the ET proposals identified by the participants.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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AUTHOR CONTRIBUTIONS

Study design: Miranda TA, Valente GSC.

Data collection: Miranda TA, Valente GSC.

Data analysis: Miranda TA, Valente GSC.

Data interpretation: Miranda TA, Valente GSC.

All authors are responsible for the textual writing and critical review of the intellectual content, the final version published, and all ethical, legal, and scientific aspects related to the accuracy and integrity of the study.



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